
Planetary Health
Bioethics

Planetary Health and Bioethics

Alexander R. Waller and Darryl R.J. Macer (eds.)

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Forward

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For much of the twentieth century, bioethics existed in two versions that all too rarely engaged with each another seriously. One version was exclusively to do with humans and primarily concerned medical ethics. It was also very Western, having in large measure grown out of the abuses of medical research and practice that took place during the Second World War (e.g., the high-altitude experiments, freezing experiments and experiments on twins undertaken by the Nazis) and afterwards in a number of countries (e.g., the Tuskegee syphilis experiment in the US, and forced sterilisations in many countries). Based on such fundamental ethical principles as deontology and consequentialism, this version of bioethics gave special emphasis to the need to respect patient autonomy and therefore obtain informed consent as a condition of medical research or treatment of patients. The second version of bioethics was principally to do with non-humans and considered the implications of new technologies and practices, for instance in agriculture (e.g., genetic engineering of crops and farm animals) and the use of animals in scientific research.

What this important book does is advance bioethics in a number of ways. Above all, it does not start with the interests of humans but focuses on the entire Earth – hence the title *Planetary Health and Bioethics*. Humans are therefore not considered as distinct from other organisms but as part of a single global system. At times this means that human interests concur with the interests of non-humans; at times this means that the interests of humans and non-humans conflict. Thus it is with interspecies relationships in any biological system, as Charles Darwin himself realised. The fox eats the rabbit and bees pollinate many plants. Less obviously, the actions of the wolf change its habitat, thus affecting many species in the ecosystem in ways one might not anticipate.

·pp. 1-2 in *Planetary Health and Bioethics,* Alexander R. Waller and Darryl R. J. Macer (eds.) (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

A focus on planetary health requires us to take seriously indigenous bioethics in a way that classical Western bioethics has often failed to do. Hence the welcome diversity of authors in this volume, in addition to a consideration of citizen science. Nor does this book shy away from contentious and contemporary issues. Anthropogenic climate change is no longer contentious for most of us but there is material here on human overpopulation – still a somewhat 'taboo' subject – and on corruption, migrant workers, colonization, culling as a way of dealing with zoonoses, extractive industries, water engineering and children's rights.

For many years I have held that the three biggest ethical issues of our time are loss of biodiversity, inequalities between humans, and our farming practices. This book helps show how these issues are interconnected.

1. Introduction to bioethics for planetary health

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1.1. Why bioethics for is relevant to all

Bioethics is the love of life (Macer, 1998), and is the construction of all the decisions that we make across the entire planet. This collection of writings involving bioethical deliberations of situations, actions, events and policies that affect human wellbeing and fitness of the environment may at times appear to value more people in positions of authority for policy making, but it is the accumulated individual choices and actions that shape our planet. The way forward to align both improvements in human wellbeing whilst safeguarding all life and the natural environment are less subjects for debate which divides and polarizes opinion but should catalyse discussion and dialogue that unites parties. Many of the readers of this book will not be in positions of direct responsibility to make difficult policy decisions. However, we can all contribute to this discussion, and increasingly we can see that in many countries citizens can exert influence at different levels of governance and advocate for all stakeholders, and thus promote more ethical decision making.

There are regularly media reports and scientific papers of environmental issues that grow more and more alarming, such as Mora et al. (2022) who reports that over a half of human pathogenic diseases may worsen due to climate change. These need to be reflected on and addressed in morally acceptable ways both for individual

·pp. 3-25 in *Planetary Health and Bioethics,* Alexander R. Waller and Darryl R. J. Macer (eds.) (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

peace of mind and to find workable solutions in our multicultural world. Many environmental issues show no regard for national boundaries and must be seen as transboundary concerns. Scientific and technological advances will play a most significant part in our future pathway towards living sustainably on Earth. But even the UNEP (2021) scientific report *Making Peace with Nature: A scientific blueprint to tackle climate, biodiversity, and pollution emergencies* recognises the necessity for making ethical considerations. Bioethics per se is not explicitly referred to, but comments such as the following clearly involve bioethical reflection:

"Environmental change is driven by accelerating human activities that result from an array of underlying causes anchored in societal values, behaviour and governance. Indirect drivers of environmental change reflect socioeconomic dynamics, including developments in population, economy, consumption, production, equity, technology, human health, culture, conflicts, governance and behaviour." UNEP (2021) *Making Peace with Nature,* p.54.

The emphasis by the UNEP is on the use scientific solutions, however this should not exclude ethical consideration as Heather Douglas (2009) argues: *"Science, even science to be used in public policy, should not be value free. Scientists must make judgements about the acceptability of uncertainty, and these judgements require a range of values, including ethical and social values where relevant."* Douglas (2009) p.156

Yet ethical considerations are not exclusive to scientists and / or policy makers – not just those who have expertise in any one occupation, educational background, ethnicity or those in positions of authority and power. All of humanity can be held accountable as moral agents with responsibility to cause unjustifiable harm. If viewed from an ecocentric perspective all of nature can be seen as moral subjects capable of being harmed, so therefore bioethics is relevant to all people.

1.2. How bioethics relates to planetary health

The term "Planetary Health" has arisen within the last decade, and could be viewed as just another buzz word, but it clearly signifies concern for the wellbeing of Earth itself and by implication that includes all within the biosphere. Although the recognition that the natural environment has significant impact on human health has been voiced for at least thirty years since the WHO Commission on Health and

Environment (1992) published their report *Our planet, our health*. Yet declines in biodiversity, rising average global temperatures, soil degradation, deforestation, ocean acidification etc. etc. have continued unabated. Indeed, the human population alone has increased by more than 50% since the report was published. The awareness that life on Earth is suffering, from increasing pressures and stressors of the Anthropocene, is dawning albeit gradually akin to the frog in the saucepan of heated water meme, on politicians around the world.

Three decades after that WHO report the UNEP (2021) stated that *"Human health and the health of the planet are closely interlinked, underlining how policies aimed at protecting human and planetary health should be integrated."* UNEP (2021) *Making Peace with Nature (*p.47). There is no excuse to continue inaction following the IPCC (2022) Sixth Assessment Report that holds no punches – the UN secretary-general Antonio Guterres said upon the release of the second working group report that it was a *"damming indictment of failed leadership."* The report cited ongoing patterns of colonialism that contribute to vulnerability to climate change and that physical environmental changes directly impact on physical and mental health.

The global pandemic of the early 2020s and changes in human and commercial activity have led to various reported changes in the natural environment – from reductions in localised urban air pollution due to less traffic during lockdowns and some rising numbers of wildlife observed in gardens and other cultivated landscapes. Conversely in former years there was growing evidence that human intrusion into and destruction of primary habitats was linked to new human disease outbreaks, like Lassa virus, as people came into increasingly closer contact with "wild" animals. Zimmer (2019) for example reports in *National Geographic*, just before the COVID-19 pandemic broke, how burning forests in Indonesia at the end of the 20th century forced fruit bats to move to orchards, carrying with them Nipah virus.

There have been various initiatives or strategies that link human health with that of other species and/or the natural environment including *EcoHealth* that aims to link social, economic and ecological factors and establish the extent that these interactions determine the overall health of ecosystems. This can be summed up as the condition, sustainability and ability of ecosystems to provide ecosystem services. Subsequently the smooth flow or working of these services are essential for human health and wellbeing. Another is *One Health,* which promotes interdisciplinary

collaborations and communications to address the health effects of interactions between humans, wild and domesticated animals and the environment (Pattanayak et al., 2017).

The is quadripartite definition One Health made by FAO, WHO, WOAH, and UNEP is as follows: "*One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent.*

*The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate changes and contributing to sustainable development.". (*Adisasmito et al., 2022)

The Rockefeller Foundation–Lancet *Commission on Planetary Health* defined planetary health as: *"the achievement of the highest attainable standard of health, wellbeing, and equity worldwide through judicious attention to the human systems—political, economic, and social—that shape the future of humanity and the Earth's natural systems that define the safe environmental limits within which humanity can flourish."* (Whitmee et al., 2015)

The motivation behind the commission was largely due to the growing awareness of increasingly rapid declines in biodiversity and ever rising levels of greenhouse gases within the atmosphere. Accelerating anthropogenic activities have undoubtedly led to improvements in access to education and water for millions, life expectancy and incomes for the majority of the global population; and that population has increased several-fold in the last seventy years. However, over that period increasing degradation of nature and the environment can also be directly linked to human activities. Yet, despite these serious concerns there was little effective commitment to changes in international policy, action and practice. Increasingly our living planet can be seen to be suffering from a growing list of sicknesses including:

- Climate Change.
- Ozone depletion.
- Biodiversity loss.

- Pollution of air, water and soil.
- Depletion of certain mineral resources including fossil fuel reserves.

Likewise, human concerns are increasing regarding:

- The more frequent emergence of novel diseases such as Marburg virus and the growing range and spread of diseases e.g. Lyme disease and the immense impact of the Covid-19 pandemic.
- The increase in prevalence of non-communicable diseases including heart disease, stroke, cancer, diabetes and chronic lung disease.
- The continued provision of energy for transportation, manufacturing, domestic heating, cooling and cooking whilst reducing greenhouse gas emissions.
- On-going, but increasing, levels of injustice and extremes of wealth with growing geopolitical and global economic concerns that do not readily aid conflict resolution.

A growing sense of urgency to address these issues has been reflected in a number of recent reports that have been internationally launched. In *The Economics of Biodiversity* Dasgupta (2021) says that the use of GDP is 'based on a faulty application of economics' because it only measures the flow of money, not the stock of assets, including natural capital, into national accounting systems (Waller, 2021). The IPCC (2021) report projects that: *"...in the coming decades climate changes will increase in all regions. For 1.5°C of global warming, there will be increasing heat waves, longer warm seasons and shorter cold seasons. At 2°C of global warming, heat extremes would more often reach critical tolerance thresholds for agriculture and health...."*

"Shifting decision-making towards the multiple values of nature is a really important part of the system-wide transformative change needed to address the current global biodiversity crisis," said Prof Patricia in July 2022 Balvanera, the co-chair of a recent IPBES values assessment report (Briggs, 2022). Later that month the UN declared that everyone has the *right* to a healthy environment (UNEP, 2022).

From a legal perspective bioethical considerations help to provide guidelines for workable policies, as such the Universal Declaration on Bioethics and Human Rights (UNESCO, 2005) may be regarded as soft law, though parts of it are now becoming customary law. However, the International Court of Justice recognised in 1996 that there is a 'general obligation of States' to ensure protection of the environment because it forms a part of the corpus of international law, so called customary law.

During 2021 the *Stop Ecocide Foundation*[1] prepared a practical and effective definition of the crime of 'ecocide' that was passed to the International Criminal Court for consideration.

All the points listed above have ethical, or more precisely bioethical, relevance as all people need to be on-board with proposed pathways forward to address the urgent situations of both human health and climate change. WHO chief, Dr Tedros Adhanom Ghebreyesus, warned that *"the world is on the brink of a catastrophic moral failure – and the price of this failure will be paid with lives and livelihoods in the world's poorest countries."* He was referring to the global distribution of the Covid-19 vaccine at a WHO executive board meeting on 19 January 2021, but his comments be applied to the accelerations of biodiversity loss, climate change or environmental degradation in general.

Planetary health calls for an immediate recognition of the self-imposed plight we as humans are in regarding our relentless growth, consumption and thoughtless pollution; but we can halt and reverse this if we face up to global nature crises and act collaboratively with a revised focus. Waller (2019b) says that "By not acting then the Catastrophian Age cannot be prevented." In a paper entitled "The insanity of endless growth". Washington and Kopnina (2018) with a more positive focus, put it this way:

"Change is not easy but it is possible, but only by accepting the nature and scale of our predicament. If we break the silence of denial, then everything becomes easier. The other great game-changer is changing our worldview from anthropocentrism to ecocentrism. We can then move to slow (then stop) growth in population, and minimize resource use via a steady-state economy. We can stop global ecocide, improve social equality and move to a truly sustainable future. Then, this era could become, not the egotistical 'Anthropocene', but the start of the sustainable 'Ecozoic'. That is a worthy vision for the 21st century, a 'Great Work' we can all help bring to reality." Washington and Kopnina (2018).

1.3. Planetary health ethics

Bioethics as a word can be traced to Van Rensselaer Potter (1971) and Fritz Jahr (1927) who recognized that ethical values were inextricably linked to biological facts

[1] The *Stop Ecocide Foundation* commissioned an independent expert panel of twelve internationally recognized lawyers to establish a legal definition of ecocide. Full details can be found at the website: www.stopecocide.earth

(Lee, 2017; ten Have, 2019). Bioethics largely became focused on biomedical ethics and isolated from environmental ethics, with a few notable exceptions such as Universal Declaration on Bioethics and Human Rights (UNESCO 2005) which in article 17 specifically calls for protection of the environment, biosphere and biodiversity, and in the Eubios Declaration of International Bioethics (2002). The recognition that human health and the state or fitness of global ecosystems are not independent highlights the weakness of limiting bioethics to exclude environmental considerations. According to Lee (2017), the overlap of public health ethics and environmental ethics has increased with the recognition that community health is essential for individual health and that individual health affects the health of the community. This was never more apparent than in the current pandemic. The overlap has further evolved as global climate change and devastation of habitat have exacerbated new and neglected infectious diseases.

Lee notes that: "*Public health ethics straddles the highly individual focus of contemporary biomedical ethics and the broad ecosystem focus of contemporary environmental ethics, supporting public health's goal to improve the health and lives of all of the planet's inhabitants by integrating medicine, veterinary medicine, and environmental sciences.*"

Environmental health ethicists are developing methods for considering ethical dimensions of human health and the health of the environment simultaneously, suggesting an approach that includes both instead of preferencing one over the other." Lee (2017).

Gruen and Ruddick (2009) compare environmentalists as working beyond formal boundaries to protect species in a similar way to Doctors without Borders – now is not the time for environmental ethicists and bioethicists to debate over differences but to unite efforts over common ground. Within this in mind debates over ecocentrism and anthropocentrism may be less fruitful than considering the merits of the relevance and application of different ethical principles.

A list of these principles includes, but is not limited to:

- Transparency of research
- Protecting vulnerable individuals and disadvantaged populations
- Promoting justice, human dignity and inclusiveness
- Beneficence

- Non-maleficence
- Consideration of future generations

Johnson and Degeling (2019) analyse various ethical frameworks for One Health and conclude that a new ethical framework is not required as it can fit within existing frameworks. Foster et al (2019) propose 12 principles for planetary ethics as a starting point for discussion. They include: non-maleficence; interdependence and stewardship; intergenerational equity and fair sharing of costs; collaboration, participation and active engagement; a shift towards biocentrism to extend to biosphere rights; re-valuing economic growth to include indigenous peoples values of nature; monitoring, regulation and rectification; precautionary principle; and transparency. These are divided these into three challenges of imagination, knowledge and implementation.

In this book there are many illustrations of the value of taking wide bioethical considerations and applying those ethical principles to planetary health deliberations that ultimately aid policy making decisions. The time is ripe for bioethicists and environmental ethicists who have worked collaboratively to build this portfolio, as a resource to aid health or environment policy makers and bioethics researchers.

1.4. Background to planetary health

Planetary Health is a small but growing field of research largely aimed to inform policy makers of the best ways forward to address public health, recognizing that this goal is interdependent upon and nested within the health of the biosphere. Accordingly, planetary health draws together and employs skills, knowledge and understanding from workers and researchers in the fields of health and ecology, along with insights from politicians, business, industry, administration and education professionals. Connections between human health and the environment have been known for centuries, if not longer. Growing concern over the impact of humans on the global environment has been escalating over the past fifty years. The Club of Rome Limits to Growth report in 1972 was primarily related to global population and economics. However, since the middle of the last century there are a number of other stressors that are increasingly affecting the overall fitness of the biosphere, some of which may be approaching tipping points. The list includes climate change,

disruption of biogeochemical cycles, alterations in land use, soil erosion and degradation, water scarcity, biodiversity loss and the pollution of soils, water and air.

These all have direct or indirect effects upon human health and well being (Montira et al., 2009). Human health defined by WHO in 1948 is: "*a complete state of physical, mental and social well-being, and not merely the absence of disease or infirmity".* Environmental degradation often has greater impact on more vulnerable communities, as Yang et al. (2015) find in relation to ecosystem services and human well-being. This inequality is also clearly apparent in the gap between fossil fuel polluters and energy consumers (Engelman et al., 2020). Furthermore, reduced human wellbeing in communities and societies as a whole often leads to negative impacts on the environment (Myers and Frumkin, 2020). This can lead to a viscous circle. The complexity and extensiveness of the interactions between humans, the environment and other living systems, and subsequent changes in health requires multidisciplinary analysis and response. The Planetary Health approach is beginning to influence governmental consultations and decision making. In the UK for example, the House of Commons Environmental Audit Committee (2019) produced the *Our Planet, Our Health* report, which addressed climate change, biodiversity loss including pollinator decline, food and sustainable healthy diets, green spaces and sustainable cities all in the context of human health.

In 1992 the WHO Commission on Health and Environment produced a report called *Our planet, our health*, which referred to water, energy, food and agriculture, pollution, urbanization and made recommendations for research in environmental health issues. A decade later in 2005, the Millennium Ecosystem Assessment developed the concept of ecosystem services, initially presented in the Convention on Biological Diversity (1992), such as the provisioning, regulating and cultural goods that come from nature. Human health is clearly dependent on these services as much of the global diet for example is ultimately sourced from, and many crops are pollinated by, organisms in nature. Waller (2019a) describes a host of services and functions of soil including antibiotics sourced from a variety of soil microorganisms, yet how overuse of some veterinary medicines is now correlated with reductions in some soil biota. The UN declared the Decade of Biodiversity for 2011-2020. Bringing biodiversity into the forefront of our minds led to valuable work such as Ethics and Biodiversity (Bosworth et al., 2011), which outlines many principles, perspectives

and values associated with biological diversity. Ten Have (2019) uses the current awareness of rapid biodiversity loss globally as his approach to make a plea for the unity of medical with ecological bioethics in his book *Wounded Planet.* According to Steffen et al (2015), genetic diversity is one of the planetary boundaries at very high risk of being crossed.

Linking ecosystem services, biodiversity and human health lead to the conception of Ecohealth, founded on principles of transdisciplinarity, participation and equity, (Lisitza and Wolbring, 2018). In the last decade the One Health approach recognised that the health of people is closely connected to the health of animals and our shared environment. This was propelled by new zoonotic disease outbreaks such as AIDS, Ebola, SARS, and MURS, as well as vector borne diseases like malaria or Lyme disease spreading into new territories due to environmental changes. Van Herten et al. (2018) refer to One Health as the worldwide standard.

In most scientific research experimentation is seen as the gold standard. However, this methodology is not always possible for ethical or practical reasons. Planetary health relies largely on correlations such as Yang et al. (2015) linking ecosystem services with human wellbeing, modeling used by, amongst others, Alkishe et al. (2017) to predict geographical distribution of tick-borne diseases, and meta-analyses such Salkeld et al. (2013) seeking to shed light on the dilution effect hypothesis that suggests increasing biodiversity reduces the chance of zoonotic disease transmission. Gibb et al. (2020) conversely show that human altered ecosystems are more likely to support mammals with short life cycles that also harbour more pathogens and thus be an amplification effect. Metcalf et al. (2017) acknowledge at the end of their study of climate drivers on infectious diseases that used various models and statistical analyses is that a correlation is not proof of causation, but there is a need to identify causal mechanisms.

Planetary health goes beyond documenting and establishing causal links to seek solutions and make recommendations to ensure workable strategies and policies are developed recognizing that declines in human health can lead to further environmental degradation in a downward spiral. It also anticipates that unforeseen events will be encountered and that we must be prepared to handle unwelcome surprises. Almada et al. (2017) illustrate this point with a study into the underlying causes of preeclampsia and hypertension in Bangladeshi pregnant women due to

high salinity in coastal groundwaters. Foster et al. (2019) assert that a key aspect of planetary health is recognising the urgency with which policies must be developed and adopted. Sri and Prasad (2007) observed, more than a decade ago, that due to different perspectives of economically-founded "weak" and conservationist "strong" sustainability, trade-offs and compromises will inevitably have to be met as there will be winners and losers. Foster et al state it as being vital to determine what is and what is not viable, and urge awareness raising, participatory education to defend and champion environmental action since: *"In the face of ideology and vested interests that often seek to ignore, denigrate, and undermine evidence, the Planetary Health approach must seek to sustain advocacy."* (Foster et al., 2019).

To limit the power of vested interests, Attfield (2018) commends the Hungarian model, which has one governmental office acting in the role of ombudsman with the potential to assure protection of future generations and bring those acting in non-compliance to environmental protection laws to account.

Planetary health draws together and employs skills, knowledge and understanding from workers and researchers in the fields of health and ecology, along with insights from politicians, business, industry, administration and education professionals. The recurrent themes of interdependence, using systems thinking, seeking resilience and equity, employing ethics such as stewardship or accounting for externalities, along with urgency and hope, are seen to bind the field of thought together.

1.5. Unity of bioethics and environmental ethics

Ethics provides the foundation on which a principled framework for building a holistically healthier world can rest (Macer, 1998; Foster et al., 2019). The potential for bioethics to contribute to planetary health is manifold. IPBES (2019) explicitly states that for sustainability to be achieved it would be effective to focus on various leverage points including; visions of a good life, values and action, inequalities, justice and inclusion in conservation, education and knowledge generation and sharing. These are clearly ethical considerations.

The following list is no particular order, but provides some further illustrations of this relevancy:

- Relevant case studies are a source to support evidence based policy making that is needed, Redford et al (2014) and Canavan et al (2017) and IPBES (2019).
- Transformative change will only occur if social (including moral) factors are taken into account. In the medium term to make meaningful progress towards many SDGs such poverty reduction, hunger, energy, health, water, cities, climate change, oceans and land which all impact on human wellbeing either directly or indirectly; IPBES (2019).
- Many indigenous cultures have spiritual and ethical values or beliefs linked to the environment, IPBES (2019). Their role(s) of being exemplar custodians of much of the wilderness areas must not be underestimated. E.O.Wilson's hypothesis of biophilia can be seen as being developed by extension of how many indigenous peoples relate to nature, Irvine et al (2019).

IPBES (2019) identifies that there are knowledge gaps such as data on:

- nature's contributions to people on good quality of life
- interrelationships between gender equality, nature and nature's contributions to people
- nature's contributions to people in mitigating or reducing vulnerability to disasters
- the benefits to human mental health from exposure to natural environments
- the comparative effectiveness of access or benefit sharing to ensure fairness and equity
- long-term monitoring of relational and behavioural implications of participation
- the extent of the participation of local communities in environmental governance
- areas of uncertainty in applying the precautionary principle

Many of the chapters within this book contribute towards filling or suggest how to fill some of these gaps. The IPBES assessment is credited several times in the UNEP Global Biodiversity Outlook 5 report published in September, 2020. This report notes the leverage points identified above, stressing the need for a more integrated and holistic approach to planning and strengthen stakeholder engagement, especially with respect to indigenous and local communities who will be more likely to be directly affected by declines in biodiversity. It advocates a One Health approach as a component of transformative change that is essential to achieve a vision of living in harmony with nature (Secretariat of the CBD, 2020).

Some of the chapters within this text present small pilot and/or case studies. Case studies provide a deep insight into individuals, communities, systems and relationships though a rich source of qualitative and semi-quantitative data. They can be used to provide insight for further research and used to investigate situations that would be otherwise impractical or unethical, such as experiments into biodiversity loss and the impact on human health as opposed to correlations and models. McMichael (2017) contends that more traditional scientific methods such as reductionist experimentation are insufficient to deal with the complex interactions, knock-on effects and unpredictable or unforeseen consequences and calls for greater emphasis on systems thinking and analysis for global environmental solutions and planetary health.

Collectively this anthology of studies addressing the list of knowledge gaps, identified in the IPBES (2019) report, listed above has substantial value. It meets many the requirements of Myers and Frumkin (2020) that ethical statements must be: useful, usable, universal and used. They consider five integral themes of planetary health: intergenerational responsibility, stewardship and indigenous peoples' values, distributive justice, the precautionary principle and the right to know. The Planetary Health Alliance has produced a compendium of case studies, yet not all these studies explicitly focus on ethical considerations. One distinct and interesting exception is entitled *The Interconnectedness of People and Planet: Learning From Maori Worldviews*, which celebrates environmental personhood being bestowed upon forest such as Te Urewera, rivers like the Ganges, Whanganui and many rivers in Columbia and all in Bangladesh, or mountains of which Mount Taranaki is one such place that has spiritual significance and value for certain indigenous people. This means that if these "bodies" are harmed, then legal repercussions will be enforced just as if a similar crime had been committed against a human person.

Case studies can be criticized, as lacking scientific rigour, providing little basis for generalisation of results to the wider population, and possibly prone to researcher bias. The point that case studies provide limited generalizability can be argued against as Attfield (2004) states a-one-size-fits-all approach is not necessarily feasible, thereby the prerequisite for universality may not be possible. Nonetheless, the case study from the New Zealand, referred to above, illustrates that we can learn

general principles from one society that can in reality be applied in very different societies around the world.

Building on this approach illustrates alternative ethical concepts or themes in planetary health that inform and help address public health for a wide range of policies. Three building blocks recommended by ten Have (2019) are interconnections, future consideration and the analogy of cultural as well as natural evolution. In his exploration of the ethical use of water for example he advocates the concept of water footprints, promoting collaborative use rather than conflict, explores water security, rights, justice and governance founded on the guiding principles of ethics for the use of freshwater. Many of these are identified in *Water Ethics and Water Resource Management* (Liu et al., 2011), illustrating the extensive years of experience of many of the contributors to this volume. To this can be added that there are contributions from a wide breadth of expertise including industry, governmental and academia – medical ethicists, environmental, education, energy, agriculture and health.

Lee (2017) says that: *Efforts such as "health in all policies" that include concepts like health promotion, equity, and sustainability; intersectoral collaboration; ensuring widespread benefits; stakeholder engagement; and structural change are critical to informing local, state, and federal policymakers of the interconnectedness of health and well-being."* Lee (2017).

A contemporary example of stakeholder engagement for example comes from the UK with the world's first people's assemblies, which made climate change recommendations for government. Their Path to net zero report should give impetus to policy makers as the range of contributors came from a cross section of British society who volunteered their free time. The fact that assembly members were able to arrive at clear recommendations, whilst respecting each other's opinions and values, demonstrates the validity of a participatory approach, Climate Assembly (2020). This respect for other persons is one of the three virtues along with beneficence and justice that Gribble (2017) can be extended into compassion, inclusivity, cooperation, justice, respect for nature, prudence and wisdom, that he proposes as principles or virtues for environmental health.

Cole (2019) published a compendium of essays by different researchers that includes using a systems approach, considerations of planetary limits, infectious and

non-communicable diseases, mental health, natural capital, agriculture and land use change, food and biodiversity, urbanization, pollution, energy use and climate change. There are reflections on evolutionary philosophy and cultural psychology, but in general ethics are not explicitly addressed within each of these topics. One distinct exception within this collection is the proposal of Quilley and Zywert (2019) who firstly observe that decades of environmental education alone has informed but not transformed. They suggest that a land-ancestor-descendant ethics could induce societies to embrace a new spiritual perspective that would reflect deeper values towards the biosphere. The larger and more recently published volume of Myers and Frumkin (2020) also lacks systematic inclusion of ethical considerations. Their work does include an afterward, written in April 2020, that reflects on how COVID-19 pandemic epitomises why development in the field of planetary health is vital. But this zoonotic disease is just one of a number of stressors on global health. Air pollution, water scarcity, climate change, declines in biodiversity and so forth all need to be addressed if we are to avoid what Waller (2019b) terms a potential Catastrophian Age. This designation is not used to be dramatic or alarmist, as warned against by thinkers such as Derr (1996), but to help focus attention and discourage procrastination when it comes to taking effective action to achieve sustainability. The concluding comments of the editorial in *Lancet Planetary Health* August 2020 are: *"The very real danger is that COVID-19 looms so large in our minds we miss the obvious writing on the wall about the other problems we must still address. Slipping progress, while very understandable is simply not a viable option, the climate will cut us no slack."*

This urgency should arguably be extended beyond solely action on climate change to many of the environmental stressors referred to above. Additionally, emphasizes the demand to take feasible action and by implication judicious compromises and trade-offs could be necessary to reach achievable goals. As the Decade on Biological Diversity draws to a close, now is a timely occasion to collect an anthology of bioethics essays or case studies which would be a source of evidence to assist the education programmes, awareness raising and policy making required to make the transition towards reaching planetary health.

1.6. The structure of this anthology

There are diverse causes, impacts and approaches to improve both human health and the wellbeing of the living natural systems we are an integral part of. This book contains a selection of writings that reflect this diversity. As Sam Myers[2] (2021) of the Planetary Health Alliance says, *"It is not just climate change; It is everything change."* This is reminiscent of the WHO (1992) report that identified population, urbanization, poverty, resource use, macroeconomic frameworks, food production and agricultural systems, water management, industrialization and energy generation and consumption as all impacting on human health. To address this diversity there are contributions in this volume from writers around the world many of whom have extensive experience. Collectively they reflect a breadth of expertise including industry, governmental and academia – medical ethicists, environmentalists, education workers, energy researchers, agriculturists and health professionals.

The collection in this book sheds some light onto a range of issues and makes some insightful recommendations for workable ways forward, that include ethical implications necessary to fully engage the actors involved. The initial chapters of this text include a transcript of an online discussion between two graduates from an online planetary health course. The second is a call for action on human population control, which in the authors opinion is often omitted or glossed over in debate and there is little policy directly addressing the fact that overpopulation puts enormous strain on natural resources and the environment. These two chapters give some insight into how some very different, but typical members of the public, perceive both planetary health issues and bioethics. The format of the remaining collection of essays, case studies and papers is divided into four sections:

1. **Bioethical principles** – four chapters relating to the principles of environmental justice relating to the North-South economic differences, participatory engagement of all actors through citizen science, a discussion biological determinism in relation to inequalities in wealth being a threat to planetary health, and the wider role of museums in public education. Justice is essential to harness long term support of policies, without justice there will not be peace and

[2] Dr Sam Myers in an interview for News Medical 7 April 2022. Available online at

engagement of all parties. Citizen science has huge potential to get more people[3] actively on board with environment and health related projects. The need to engage and educate people provides opportunities for museums to take a lead both through sustainable management and providing more viewing opportunities.[4]

2. **People and the environment** – six chapters including reflections from the perspective of Bangladeshi indigenous people, the impact of Covid-19 on Indian migrant workers, the impact of colonialism on the health of native Americans and the need to safeguard farmers during the Covid-19 pandemic. In the fifth chapter of this section Macer explores the necessity for planetary health in order to achieve a good life (eubios) and how by eubios helps maintain a healthy planet. The final chapter of this section, Chakraborty and Macer argue for a revised approach to culling animals in response to pandemics such as bird flu. All these authors lucidly argue what the IPCC (2022) *Climate Change: Impacts, Adaptation and Vulnerability* report acknowledges – that the negative effects of the Anthropocene activities disproportionately affect marginalized and vulnerable communities.
3. **Hazards from the environment** – seven chapters focus on issues beyond the frequently discussed problems of climate change caused by anthropogenic release of greenhouse gases. To start with Nasyrova and Espona demonstrate how the development of bioethics and biosafety programmes is an essential ingredient to ensure the scientific research and innovation progress in a sustainable and acceptable way. The following chapters explore environmental pollution and nature regeneration in environments when human influences have been reduced, a reminder of the importance of the ozone layer and that the success of the Montreal protocol cannot be taken for granted or used as an excuse for complacency. The next chapter in this section is a report on sites of local radioactive pollution in a former tin mining region in Thailand, again illustrating

[3] Jonathan Smith outlines the success of the EU Extreme Citizen Science programme that has engaged indigenous Baka communities in the Congo Basin using mobile phone apps to record and monitor local biodiversity. The system has been expanded to Namibia and parts of the Amazon.

[4] Museum digitization projects make millions of otherwise unseen specimens available for access to help inform historical analysis and inform predictive models of environmental change according to Gunton (2022). She further reports that this will benefit the global economy by billions of dollars through benefits to agriculture for example.

that some potential harms are unseen and therefore may not be recognized. Fortunately, there are some inexpensive concrete recommendations that can limit harm from this hazard. Ketan Mor discusses various methods for water collection and rejuvenation in India, some of which are globally used. Huiying Ng discusses how participatory methods can be brought to soil science for diverse, global social soil communities.

4. **Moving forward** – six chapters that demonstrate how applying principles central to bioethics can contribute to some workable solutions that will improve both the viability or fitness of the "natural" environment and have positive benefits for human health. These recommendations include a chapter advocating the re-establishment of hedgerows that can be achieved to different degrees around the world, a discussion of the role and capacity for technological solutions and a call for the teaching of nurturing nature. The final two chapters give details of a bioethics educational programme, *Basics of Bioethics and Biosafety* relevant for planetary health education that has been developed and issued to several universities in Republic of Tajikistan and separately there is an outline of a proposal to raise awareness and create a more "responsible and safe" environment for the scientific community by preparing a sustainable foundation for further legislation in the Republic of Armenia. The final chapters in the book explore the role of, need for and potential of education at different levels to promote ethical learning of planetary health issues.

This book can be read sequentially or selectively used to inform a particular focus of interest. There are also poems and pictures interspersed among the papers. There is a wealth of information, some detailed analysis along with much well considered thoughtful reflection.

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Conflicts of Interest

The authors declare no conflict of interest.

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2. Planetary Health graduates in conservation

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Note

Both authors are originally from the UK. Naomi lives and works in the Netherlands and Alex is working in Thailand. During the Covid-19 pandemic they were in conservation using an online chat platform. They both, independently, studied the Telessaúde Support Foundation of the Federal University of Rio Grande do Sul distance learning course. This massive open online course (MOOC) is designed for undergraduate or graduate students, health professionals, and any individuals who are interested in the topic of planetary health. It was created with the belief that education is a human right; to be free and accessible to all. Available at: https://www.ufrgs.br/telessauders/documentos/step_by_step.pdf

Naomi closely followed the recommended timeframe, although it took Alex several months to muster the discipline to commit to finishing the eight modules.

Our Dialogue

Good afternoon Naomi, firstly congratulations on completing the course and for doing it several months before I did!

Hello Alex and thank you. It was indeed quite a lot of material to get through and I must admit, I did not read all the additional suggested reading.

I would like to ask you, as a representative adult living in a Western country, some questions related to your experience from studying this course. What drew

·pp. 26-32 in *Planetary Health,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

your attention to this particular course and why were you sufficiently interested to sign up for the one hundred hours of learning?

It was a friend who drew my attention to this course, as they had already started on it. After looking at the material the course covered it seemed like an interesting and excellent starting point to build on my, in retrospect, limited knowledge of Planetary Health.

The last year there have been periods of homeworking due to the Covid pandemic, was this instrumental in helping you complete the course?

Absolutely, with activities outside the home being limited for such a long period of time, I think most people were looking for a distraction of some sorts. During the first few months of the pandemic, there was a lot of media coverage on how the lockdowns had directly impacted the environment, as well as conversations about how we interact with nature and how global travel contributed massively to the spread of Covid. These issues linked nicely to the course and how Planetary Health is such an important discipline.

You are well established in your book publishing career. Have you studied other academic courses since leaving formal education? Did you think the course would be demanding?

This was not the first course I have completed since leaving school but definitely the first in a long while. I would say that finding something demanding is relative, if you are learning about something that really interests you then it does not feel as such, which was the case for me.

You work for an international academic publisher, are the books and journals you have been involved in primarily arts, management subjects or scientific?

I work for the production department of an international academic publisher and have been involved with journal peer review and book production across many disciplines over the years. Having said that, working in the production department leaves little time to actually read any of the material we publish.

Yes I can appreciate that. I found that even during periods of Covid restrictions in Thailand there were so often other immediate tasks to do rather than studying the MOOC.

I am a teacher and have to update my methodology, curriculum knowledge and assessment criteria regularly. In recent years a number of CPD providers employ

online courses or training. How did you find following an academic course compared to doing CPD learning at work?

This was the first MOOC that I have completed. Like anything you undertake in your own time, self-discipline is important, which can be challenging in itself. So to help with that, I found myself a study buddy who was also interested in the course. Every weekend we blocked off a few hours to get together and tackle a module, this was after the first complete lock down and restrictions relaxed slightly to allow one or two visitors. This worked well for me, as we could discuss the material as we read through it. I considered myself to be fairly green and my study partner somewhat less, as such our discussions were always interesting and educational, pushing us beyond just the text we were reading.

Aha a learning buddy, so with someone to bounce ideas off it worked well for both of you. So can I assume you *enjoyed learning* about the concepts of Planetary Health?

Without a doubt. Although I did find the more I learned the more concerned I became and even more aware of my own behaviour and choices. There is so much that still needs to be done and, for me, it highlighted how intangible the severity of the current situation is for many of the non-academics in the population of Western Europe.

Yes, the barely perceptible rate of temperature changes, the enormous scale of biodiversity loss and in former years our distance from disasters like famine or devastating fires, can make the climate change seem like an abstract concept. Yet, the gravity of climate change is not something we can shy away from as the recent IPCC report emphasises.

I am a science educator with a background in biology and chemistry. So I was interested to learn of new developments in understanding of Infectious diseases sensitive to climate change. What topics that were covered did you find that you were already well aware of?

I had some basic knowledge of most of the modules, but the modules on *Heatwaves and Heat stress* and *Air Pollution and Health* were probably the two that I knew most about.

Were there particular aspects that you found conceptually difficult or prompted you to do further searches on the internet to help you get a clearer picture?

The aspects I found most difficult were about social participation and management. There are so many factors associated with planetary health and the differences

across the globe when it comes to education, policy and management of those factors. Although the internet is a valuable resource I found it can be quite mind-boggling when trying to find the right information.

I agree, and the lack of personal tutor guidance is a clear disadvantage when doing a MOOC.

At the beginning of the course there was an ecological footprint calculator. I remember that your personal value was much lower than mine. Actually, I was quite challenged to admit the impact that my travelling has on the wider world. Did you find any specific information or perspectives personally challenging that may have influenced any of your lifestyle decisions?

Undoubtedly. I was blissfully misguided in thinking that my lifestyle was as healthy as I could achieve in planetary terms. However, I found the more I learned the more I was making different choices and found myself constantly challenging the way I consume with the question 'Just because I can, does it mean I should?'. Choices extending from how much effort and attention I put in to my weekly shopping, or any other product I need; how I travel locally and abroad, especially with most of my family across seas, and more. Once you start really thinking about your own choices and consumerism the more you realize you can change.

Were there aspects of the course that you felt were missing or were only lightly touched on?

As a course to get to grips with the basic concepts of planetary health this was a good course. However, I would have liked to have learned more about *Mental and Relational Health*, which was one module that we covered and educational policies.

Do you find yourself discussing about issues related to planetary health with friends, colleagues or family more frequently now?

Yes. I have long talks with my daughter who is very involved in all sorts of local environmental projects in the inner city and an activist, in fact I learn a lot from my conversations with her and she keeps me on my toes. Colleagues and friends can be more challenging though. People can find these issues quite confrontational to talk about and have lot of excuses to avoid changing their own behaviours, which is human nature, we all do the same at some point whatever the change may be. I think that most of us are aware of climate change, planetary health issues and our personal responsibility within that but I think for a lot of people, it still feels so intangible and

therefore quite easy to stick our head in the sand and not let it influence the choices we make.

How do you feel now that you have graduated from this course?

To be honest, I sometimes feel quite overwhelmed. Although there are many exciting and positive developments across the globe, it feels like they are just a drop in the ocean if we are to maintain, let alone improve, the health of our planet. This feeling can make you freeze. If other people are feeling the same way, I would recommend reading Active Hope by Joanna Macy and Chris Jones which really gave me some tools to work with.

Are you inspired to do further study or take action with local or internet groups to address any planetary health issues?

Yes, I have been involved in a couple of action groups over the past few years but they were more environmental protection on a very local level. I am definitely interested to find out more about local projects geared towards any aspect of planetary health and intend to do so and I have joined my Green Office team at work.

Would you recommend others to study planetary health?

The one thing that really hit home whilst doing this course, was the lack of, or minimal degree of, education on planetary health. It feels like this should be a compulsory subject for all levels of education, from elementary and secondary school to all forms of higher education. Helping children and adults to translate such a huge subject by breaking down the extensive aspects discussed within this discipline into more tangible values is a must. Perhaps more so in the West where consumerism and attitudes adopted to maintain convenience lifestyles are polar opposites of what we need to be doing. Of course, there are carbon footprint tests online but this doesn't provide much information on the direct impact we are having with the choices we make as an individual as well as a community. Take a child's wish list for a birthday or Christmas, most gifts would probably be purchased online and most likely shipped from abroad … how would a child understand the impact this has? Perhaps breaking this down into personal or family weekly/monthly/quarterly/ annual carbon quotas and a way for any individual to work out what and how a purchase or activity impacts our planet, I think this would help children and adults be more aware and make informed and healthier choices?

Your suggestion of compulsory planetary health education and your commitment to take part in local activities remind me of the closing comments of this year's report *The Economics of Biodiversity: The Dasgupta Review*. Reflecting your thoughts, it advocates that nature education should be integral to studies for the youngest children through to tertiary level students and that communities and civil societies have vital roles in the economics of biodiversity. Educational changes are an achievable action we can urge authorities to address. Indeed, ethical consideration and approval of all research conducted involving people or animals is now a requirement by all academic institutions, following guidelines laid out in the Belmont Report, British Psychological Society Code Ethics and Conduct or similar legislation. This was not the case at the time when the great acceleration began around 1950, so to end this acceleration it would be timely to have ethical planetary health educational requirements from now onwards.

In 1970 Van Rensselaer Potter, who coined the term bioethics, summarized his paper with these words: "Man's natural environment is not limitless. Education should be designed to help people understand the nature of man and his relation to the world. The subject matter should include both the reductionist view and the holistic view of biology and should be broader than both together. Man's survival may depend on ethics based on biological knowledge, hence bioethics."

Where would you place bioethical questions in relation to the challenges of planetary health?

One question would definitely be the transition to a circular economy and how to accomplish that without impacting local incomes and resources.

Yes, there are many big challenges ahead and shifting towards a steady state circular economy involves so many actors that it needs consideration from the perspectives of all stakeholders. *The Pathways for planetary health: from social participation to management* module provided some hopeful suggestions. Yet, the recent report from the IPCC clearly states that we cannot ignore the fact of climate change and the associated impacts any longer. So by learning about Planetary Health and taking steps to reduce your personal footprint and engaging in more local action you are inspiring others to work together towards becoming a healthier world.

Naomi, it's been a pleasure to chat with you. I'm glad to hear that you enjoyed the course and now have a taste to so more. Thank you for sharing your thoughts and giving your time for this interview.

References

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This massive open online course (MOOC) is designed for undergraduate or graduate students, health professionals, and any individuals who are interested in the topic of planetary health. It was created with the belief that education is a human right; to be free and accessible to all. Available at: https://www.ufrgs.br/telessauders/documentos/step_by_step.pdf

'Save The World'

p. 33 in *Planetary Health and Bioethics,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

3. Don't Mention the O word: An ethical dilemma

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3.1. Abstract

In this chapter the author discusses seven key planetary health problems facing the world in 2022. The conclusion is that solutions will never be found because of the refusal to recognise, or even discuss, the single basic cause of each of the poblems and this is due to the weak and totally ineffective global leadership the world has been saddled with for over seventy years.

Key words: *Global leadership, United Nations (UN), World Health Organization (WHO), World Environment Fund (WEF), Environment, Economic Migration, Overpopulation, Poverty, Conflict, Resource depletion, Climate change.*

3.2. Setting the stage

If you were to ask anyone to list the key planetary health issues of 2021 and you will, generally speaking, get a list of seven, broad topics.

1. Poverty, wealth disparity and health disparity
2. Third world debt and globalisation
3. Degradation of the natural environment and biodiversity loss
4. Climate change and global warming
5. Food and water shortages and resource depletion
6. Unemployment and economic migration
7. Conflict, ethnic tension and refugees

How many organisations exist to address these? The answer probably runs into thousands: big, small and mostly publicly funded organisations or charities.

I'm a biologist who started and ran his own international business, has represented small businesses in meetings with government and the public sector and

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5 pp. 34-64 in *Planetary Health and Bioethics,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

has become a writer of what I call 'feasible fiction'. I say this now in case, from what follows, you quickly draw the conclusion that I'm inclined to be highly critical of others especially those in the public sector. Rest assured that criticism of others still comes second to criticism of myself. Running a successful business requires constant self-assessment and self-criticism, but I'll start with some criticism of bioethics that will, I hope, lead to a better understanding of my views on the wider and more specific matter of planetary health.

Bioethics is the study of ethical issues emerging from biology and medicine and covers aspects of politics, law, theology and philosophy. That's fine. Such issues are important and I've contributed my own thoughts in the past – most notably on the ethics of gain of function research on viruses. My problem with bioethics is deliverability. Without effective delivery businesses crumble so any subject that merely provides food for thought without converting conclusions into an action plan is, for me, problematic.

Whilst it's interesting to sit and listen to experts expounding on their favourite topic, often, at the end of the day, it seems to me that little or nothing is done about it. Instead, the participants leave their ponderings in, perhaps, a typed report and expect others to read it and, if they feel so inclined, to act. There is no urgency, no follow up and no-one it seems is ever given a list of things to actually do before the next meeting.

In business, ethical dilemmas have to be resolved and that requires decision making, strong leadership and an action plan. Unlike a business meeting, a pure bioethics discussion can, if it chooses, completely circuit the issue at stake to avoid drawing unwelcome conclusions. At the extreme, raising sensitive matters or proposing radical solutions might well be ignored, passed over or never even presented in case a reputation is tarnished. It's not just bioethics meetings. I've sat in public sector meetings where the sense of discomfort amongst the public servants sitting around the table is palpable if someone from the private sector asks for a clear-cut decision and for someone to be nominated for its delivery.

The objective here is to demonstrate the importance of identifying problems, pinpointing root causes and, however difficult and sensitive they are, solving them. To do all that needs strong, single-minded and determined leadership. To demonstrate what happens when strong leadership is lacking is the point of this

article but as a hint to where our conclusion is heading, I suggest you log on to the worldometer website[6] and check how the number on the opening page changes between when you start and when you finish.

Amongst the big players involved in planetary health matters there is the United Nations, the World Health Organisation (WHO) and the World Economic Forum (WEF). For this chapter I will focus mostly on the first two and leave out the WEF because it is difficult for me to see exactly what the WEF has actually done in its 50 years. The following quote from Alan Ortiz (2020) of the Valdai Club perhaps best summarises public opinion on the WEF.

"…there is no paucity of good intentions, just a sheer lack of understanding that failure to communicate and collaborate is not an option. The spectacle of enlightened presidents, kings, prime ministers, businessmen, and civil servants partaking of the nippy air of Davos, seeking to imbibe the swirling winds of hope and wisdom, will continue year after year. And yet the tumult, and the chaos of world affairs continue unabated. Plus ça change, plus c'est la même chose."

All these organisations, big and small, run countless meetings and conferences and release long and detailed reports, all at huge expense. I am also sure that some, especially the charities, do things that actually help resolve problems in small, local areas. It is the global problems that matter here. Indeed, I suggest that the general consensus on planetary health is that the problems, with perhaps a few exceptions, have become worse during the last fifty years. From the mindset of a small, privately owned business the inability to solve problems is a death sentence and this global inability to solve global problems after so long and after incalculable amounts of investment would seem to amount to gross failure.

Let's continue with more criticism. Does anyone ever ask these organisations to provide evidence of achievements? Are they asked to provide a sort of balance sheet (inputs versus outputs) of the sort that businesses are required to do by law? Of course not.

So how is it that, despite evidence that planetary health is getting worse, organisations that employ thousands and have been paid vast sums to solve problems are allowed not only to continue operating but to grow and grow into mammoth unaccountable bureaucracies? From a business perspective, these

[6] The worldometer website with data of the human population is https://www.worldometers.info/world-population/

organisations need to undergo fundamental changes in their accountability and attitude, adopt some very basic business principles and recognise that for most problems there is usually a single root cause. Deep, unsolved problems will always cast a dark shadow for as long as they exist. But, as the Buddha once said, *"To remove a shadow, you must cast a light on it."*

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As a starting point, let us imagine a private business called Planet Earth Enterprises that has been suffering from various problems including a drop in sales that could mean total collapse. That is their shadow onto which someone needs to cast a light. Let us also imagine that a management consultant has been brought in as a last resort and has tasked each person to bring along a list of the problems and that someone has been writing that list on a flip chart. Our consultant now looks at the list, ponders on it for a moment and says:

"That is a very long list and e*very one of them is vital to your survival. Do we need to solve each of these problems if Planet Earth Enterprises* is *to survive?"*

The circle of heads nods in despair.

"How long has this been going on?" the consultant asks.

A brave member of the team says, *"Oh a long time, a very long time."*

"So, are *you admitting to a fundamental, longstanding refusal to face up to the realities?"*

Another member glances furtively at his boss and says, *"Oh yes. Not that I'd like to blame anyone in particular of course."*

There is an embarrassed bout of coughing around the table mixed with widespread scepticism that a management consultant could do anything to solve any of the problems but, fortunately, our consultant is a born optimist, entrepreneur and leader who tends to enthusiastically use the wise quotations of others. He smiles.

"Problems are the price we pay for progress," he says. "It isn't that we cannot find a solution. It is that we must first understand the problem. Charles Darwin once said that he had become a machine that observed facts and ground out conclusions. So, in honour of that great man, we must analyse each problem in turn and draw up another list, this time of likely causes. Here's what we do. Each of you will take one problem at a time and decide what you think is the single, root cause of that problem."

Our consultant, I imagine, retires to the bar whilst the work begins. Later he returns to the group at the table. *"So,"* he says approaching the flip chart with a red marker pen. *"What have we got here?"* The team watch the red pen underlining words and drawing arrows. *"Good news," he says at last. "It seems to me that you have identified one, single root cause common to all problems. Do you see it?"*

Heads nod as the team recognise what they have just done. In short, they have been made to see the wood for the trees. Suddenly the picture is clear. From analysing a complex mixture of different problems, they have distilled it all into one single issue common to all. Solve that and you solve them all.

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We will never know if Planet Earth Enterprises survived long enough even to pay the consultant's invoice, but let's assume that each member of the management team was then instructed to go away with a list of jobs and to report back at the next meeting.

Let us now compare that to public sector meeting where issues can be deliberately circuited or, in my experience, dutifully ignored if input is deemed to be unwelcome, sensitive or politically incorrect. These meetings almost always end with no clear-cut decisions and no group or individual taking responsibility for further action. The result? No change. The problems continue ad infinitum.

This is what I'd like to address in relation to planetary health. As our management consultant, with his liking for quotations might say, *"Pride and prejudice has no place in business. If you can't see the glorious light, it's because you refuse to open your eyes."*

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Let me say that I do not underestimate the extreme complexity of improving planetary health. My point here is that, our seven planetary health problems will never be solved with pride and prejudice sitting alongside a reluctance to consider input that is deemed unwelcome, sensitive or politically incorrect. By refusing to accept unwelcome, sensitive or politically incorrect views the root causes of the seven issues will **never** be addressed. And that is being generous in assuming that at least some attempt has been made to identify root causes by running an exercise similar to the Planet Earth Enterprises one.

To me, there are two overriding characteristics that prevail in addressing planetary health problems. The first is **the refusal to accept** (or even discuss) **an obvious fact**

that stares everyone in the face. The second is **the lack of effective leadership.** As the lack of leadership is the cause of the first characteristic then finding and then delivering effective solutions becomes nigh on impossible. So, with planetary health what is that one basic problem, that root cause that stares us all in the face but which is deliberately ignored? It can be described in one word.

The problem is that it is a word that rarely passes the lips of our leaders. If they ever use the word then it must be in private or being whispered behind their hands because I have waited for years but have still not heard it spoken aloud in terms of it being a problem. Fear explains why they refuse to utter the word but true leaders are supposed to be fearless, brave and courageous. Plato had clearly met a few poor ones in his time when he said, "*Courage is knowing what not to fear.*"

"So, what is this most frightening word?" I can hear you ask.

3.3. Overpopulation

Overpopulation is the O word. I think you'd find that if you did what our imaginary management consultant did with his simple flip chart, you'd find that human overpopulation is the root cause of every single problem in our list. But as so few will mention it and because the **O word** is anathema to so many it stands to reason you should not expect any solutions to our seven issues.

My point here is that if our leaders are serious about improving planetary health then they must stop playing silly childish games and treat us like adults. They need to be brave enough to point out the dirty facts of life that during a mere 70 years humans have bred like rabbits in a field with an endless supply of green grass and no predators. The graphs[7] in Figures 1 and 2 show the trends and a correlation in relation to this. Figure 1 is a simple graph that shows where we are right now**.** Furthermore one impact of this exploding population is illustrated in Figure 2, which is a graph that shows how just one of the problems in our list (Item 3: Degradation of the natural environment and biodiversity loss) correlates with human population growth over the last 200 years. Note that the greatest effect is during the last 70 years when the human population was allowed to, almost, quadruple. We've focussed entirely on breeding healthy, vigorous, fertile and long-lived rabbits but ignored the fact that the more rabbits there are the quicker the grass runs out. For many, the

[7] Both graphs in Figure 1 and Figure 2 are used with permission from Population Matters.

grass has already run out. In the meantime, our leaders do nothing and, more significantly, say nothing. You certainly won't hear them liken us to breeding rabbits.

The **O word**, overpopulation, cannot be mentioned in polite circles. Our leaders have never shown much inclination to face the consequences of the **O word** even though Thomas Malthus predicted exactly what we now have in his 1798 book *An Essay on the Principle of Population.* In that book Malthus (1798) makes the most profound statement that should, in my opinion, echo like a morning prayer along the corridors of the United Nations and the WHO and be the lullaby that puts members of the WEF lying in their 5-star beds in Davos to sleep at night but as Malthus's prophetic words no longer ring out, I'll repeat just one sentence here:

"*The power of population is indefinitely greater than the power in the earth to produce subsistence for man.*"

There's no need to analyse that statement. It states the blindingly obvious and should be written into the mission statements of every organisation that receives public money for solving planetary health problems. In Malthus's time the population stood at less than one billion. Right now at the beginning of the third decade of this century it is almost 8 billion and even with 'declining' growth rate is expected to be 10 billion by 2050 and 11 billion by 2100.

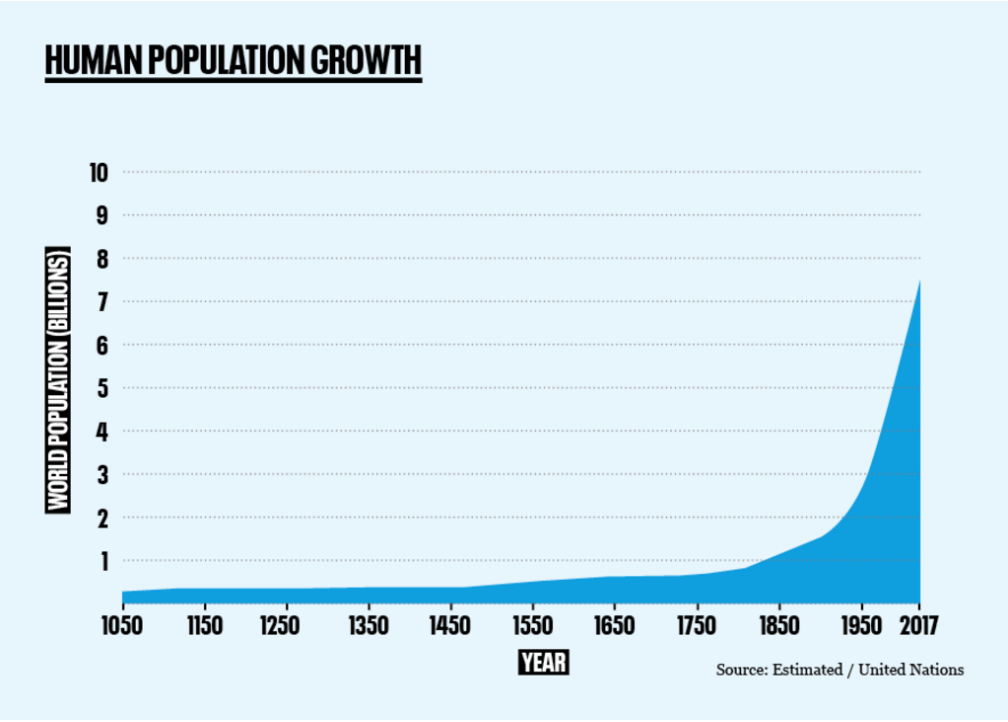

Figure 1: Human Population Growth over the last millennium.

Some will claim that as we've not yet seen mass starvation then this proves the world can and will, in defiance of Malthus's predictions, cope through technology etcetera. That may be so to some extent but that is not the sort of optimistic language you hear from the climate change, global warming and environmental lobbyists who also find it difficult to mention the **O word.**

Neither does it satisfy those who experience another **O word** – overcrowding – by being crammed into a packed and stinking London Underground train or cling to the outside of an Indian train, as can be seen in Figure 3. All of which suggests to me that **"Quality of Life"** should go in at number 8 in our list of seven planetary health problems.

The mass transport of pigs and cattle is covered by more legislation in terms of dignity and quality of life than humans.

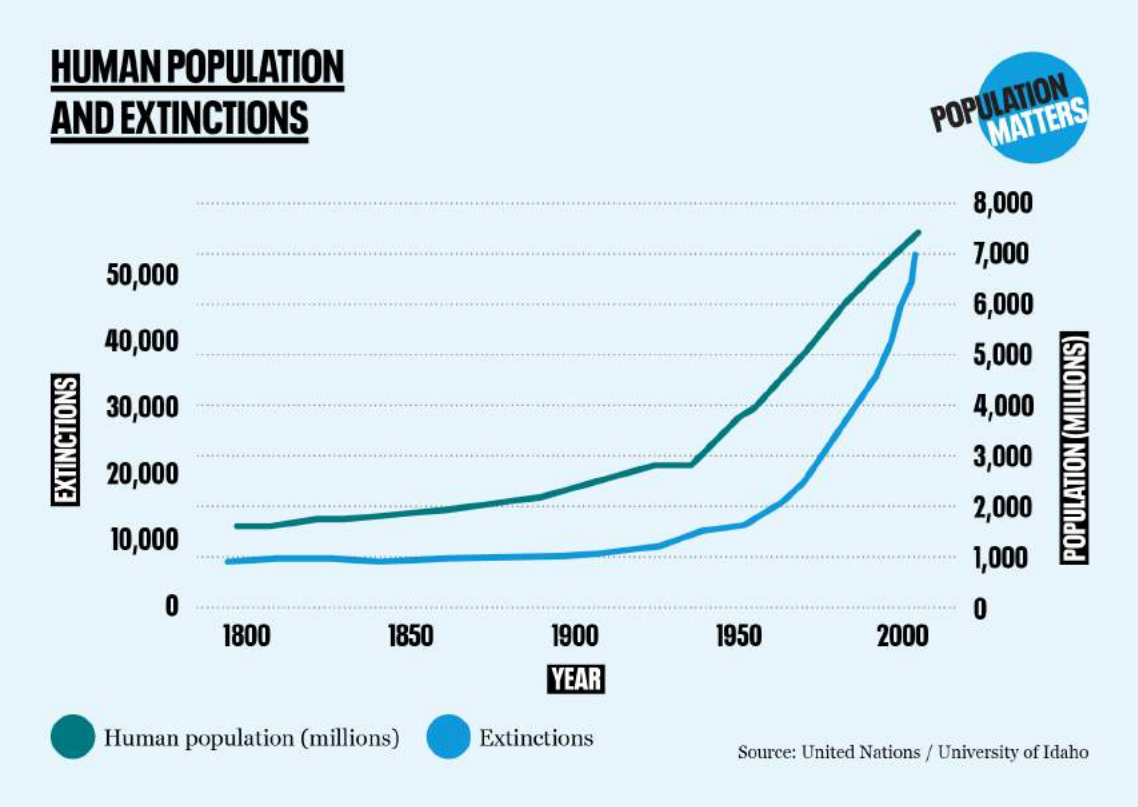

Figure 2: Human population and the extinction during the last two centuries.

The two hundred years since Malthus passed on is a long time in which to do nothing except criticise his foresight, so is anything likely to change now? Well, if we refer back to the two characteristics of where we are right now (the refusal to accept overpopulation as the basic root cause of all planetary health problems and the lack of effective leadership) then the answer is an emphatic no.

Figure 3: An overcrowded train in India. Are our mass transport systems commensurate with ideals of respect and dignity?

3.4. Leadership

We could illustrate the problem of poor leadership by looking at how our fictitious business consultant might have handled a problem like item 3 on our list: 'Degradation of the natural environment and biodiversity loss'. *"What are the problems?"* he might ask and amongst the long list the plight of insects might be raised.

"World insect numbers are hurtling down the path to extinction," is the reply.

"Why?" he asks. It's not that he doesn't already know that insect numbers are dropping and that the outcome is likely to be devastating but he wants everyone to spell it out clearly, unambiguously.

"It's loss of habitats," comes the reply.

"Why are we losing habitats?"

"Because we need space."

"For what?"

"For farming. For food. For houses and roads and…"

"Why are insects particularly at risk??"

"Farmers use insecticides and herbicides because they need to increase food production and crop yields and so…"

"Why do they need to increase yields?"

"To meet the growing demand?"

"Why is the demanding growing?"

"There are more people now and they all need…"

Our consultant pauses before posing the next question. "*Does the survival of people depend on the survival of insects?"*

"Yes. They are needed for pollination."

"*Then it seems to me you are in a dilemma,"* our consultant says*. "Either the insects become extinct and people die or the people stop killing the insects, stop the encroachments, stop building houses and roads and restore habitats to allow the insects to survive. Which is it to be?"*

Of course, in real life, no-one is ever asked point blank to answer that question because it might lead to mention of the **O word** as the root cause of why demand is growing and why the natural environment is being ruined?

In real life what happens is that everyone scratches their heads and things continue as they are. Those in charge like the UN, the WHO and the FAO continue to take their salaries and the staff continue to produce statistics and churn out reports that support what we already know. The **O word,** if it is ever mentioned at all, is edited out or the Post It notes with the scribbled mention of **i**t are tossed in the bin.

Let's look at each of the seven planetary health issues in turn.

3.5. Poverty, wealth disparity, health disparity, third world debt and globalisation

These are complicated, closely linked and it is impossible to do any of them justice in one short chapter. There is, anyway, a huge amount of published data already out there. That said, the single word that, for me, stands out is the **D word** (Disparity) and it's worth reminding ourselves that the population of African and Asian countries, where disparity is so obvious, amounts to around 75% of the total world population and is growing faster than anywhere else. The median age in Africa is also only 20 years.

Let's start with a few quotes:

"Income-related health disparities appear to be growing over time. Poor health then contributes to reduced income, leading to the so-called health-poverty trap. Income

inequality has grown substantially in recent decades and exacerbates health disparities." (Khullar and Choksi, 2018)

"The trend of decreasing poverty – both in absolute numbers and as a share of the world population – has been a constant during the last three decades but is not what we can be expected during the coming decade." (Roser, et al., 2019)

There is no doubt that Covid has caused a deep crisis in the already suffering developing world, which contains nearly half of all humanity. Whilst Covid began as a "Western" affliction it is now rampant through developing countries and this will have serious implications for disparity, the future of the world economy and political order.

Steve Schifferes (2021) has written a good summary of the current problem in The Conversation in which he highlights the need for: *"Massive economic stimulus to reduce mass unemployment, poverty and starvation, help to stabilise currencies and a temporary halt to debt repayments to strengthen health systems."*

Estimates of the cost of all this could be US$2.5 trillion. Meanwhile, there are serious implications for the future of the world economy and political order. Economic migration (already high) is likely to increase as poverty and joblessness increases. Gesture politics of throwing cash at problems has never struck me as a particularly effective long-term solution. Injecting skills and expertise and improving access to education might be better, but benefits can still take a generation to show. Also there is the political sensitivity of 'interference' in another country's affairs.

The Malthus deniers, of course, believe that technology will remove the wealth and health disparities, will feed 3 billion more mouths, will create enough new local jobs and improve local healthcare and local education across Arica and Asia by 2050. Exactly what technology is not clear for there is no sign of miracle technologies or industrial investment that will soak up 7.2 million unemployed South Africans (33% and growing) or 22 million unemployed Nigerians (also 33% and growing). To cap it all, Albero (2020) quotes some of the WEF's rich and wealthy contributors as having this to say on the subject:*"…focusing on human numbers obscures the true driver of many of our ecological woes. That is, the waste and inequality generated by modern capitalism and its focus on endless growth and profit accumulation."*

Fine words so what exactly are they proposing to do about it? Indeed, what exactly does anyone do except write reports which generally speaking all say the

same thing. The World Bank will probably cough up a tidy sum although accurate accounting for its distribution might be a challenge. After all, we wouldn't want to see the disparities increased because the money found its way into the pockets of the already wealthy, would we?

Unlike the **O word** at least disparity gets mentioned. And why do you think that is? Is it because using certain words like healthcare and poverty and disparity in conversation or in reports sounds as if you actually cared about your fellow humans? So much so, in fact, that you'd be happy to invite anyone who cries about poverty and disparity home for dinner to meet the family? But what about the person who mentions human overpopulation? What might such a person say or think on discovering you had two kids and another on the way? Worse still, might their dinner conversation lead to discussing ethnic cleansing, death camps, nuclear war or the treating of water supplies with chemicals that would put a stop to procreation? I suspect that's not too far from the truth but it shows why using the **O word** in general conversation is not always a good idea.

3.6. Environmental destruction and biodiversity

Some of the best comments on degradation of the natural environment and biodiversity loss can be found on the Population Matters website. As its name suggests, Population Matters (2020) is not frightened to drive its message home with quotes like the following: *"Biodiversity, the diversity of life on Earth is essential to the healthy functioning of ecosystems. Habit loss and overexploitation, driven by our rapid population growth and unsustainable consumption are the primary causes of biodiversity loss which is now happening up to ten thousand times faster than four million years ago."*

There is also a particularly good quotation on the Population Matters website from E.O. Wilson, the American biologist, naturalist and writer, who has variously been described as 'Darwin's natural heir' or 'The Darwin of the 21st century.' *"We are in a bottleneck of overpopulation and wasteful consumption that could push half of Earth's species to extinction in this century."*

Newspapers like *The Guardian* sometimes cover the issue well because it fits with their green agenda although they mostly avoid using the **O word** preferring, instead, to use phrases like '*the effect of humans'*[8].

Human society, this article says, is in jeopardy from the accelerating decline of the Earth's natural life-support systems. Personally, I think I would have forced the issue a little harder by saying *'Human life is in jeopardy.'* Nevertheless, this report goes through the full list of what is threatened, from the destruction of coral reefs to the biomass of wild mammals (falling by over 80%) and rainforests being turned into savannahs. Natural ecosystems have lost half their area, a million species are at risk and the rate of destruction is increasing. By now we surely don't need to ask why this is. It's the **O word.**

It's the outcome of a breeding programme that would make those running chicken and rabbit farms marvel at their success rate. However now, with 7.9 billion of us needing to be fed and watered and more and more wanting cars, phones and refrigerators all of which requires power generation, clearing space, digging up land and pulling down trees and, as a result, truly wrecking the natural environment.

Sir Robert Watson, who chaired the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) to produce the *Global Assessment Report on Biodiversity and Ecosystem Services* (IPBES, 2019), puts it this way: "*The health of the ecosystems on which we and other species depend is deteriorating more rapidly than ever. We are eroding the very foundations of economies, livelihoods, food security, health and quality of life worldwide."* The **O word** is missing from this statement, of course, but he seems braver than some.

Only an extremely unrealistic optimist is likely to see a positive future. I'm definitely a realist and I try desperately hard to be an optimist. Wearing my optimists' hat, I'll say that one day we will see the land recover and the jungle, animals and insects return. With my realists' hat on, I'd say that to achieve that we'd need a few billion less humans around. Put like that you can see why the **O word** is so unpopular.

Let us look at this question from the perspective of one group of those billions of creatures we take for granted - the insects. Insects have always been on the wrong side of human patience. They can find themselves squatted merely for being a

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[8] https://www.theguardian.com/environment/2019/may/06/human-society-under-urgent-threat-loss-earth-natural-life-un-report/

nuisance during a picnic. In the last fifty years, insects have suffered the equivalent of a nuclear war for the sin of having evolved to eat vegetation. The optimist in me hopes the insects will still have the last laugh through a few hardy specimens surviving long enough to witness humans self-destructing. In the meantime, though, the estimate is that the use of insecticides and herbicides has put $577 billion of crop output at risk and land degradation has reduced the productivity of 23% of global land. Meanwhile, all we see is handwringing and fear mongering and hardly anyone other than Population Matters brave enough to mention the **O word.**

3.7. Climate change and global warming

I'm assuming that anyone who has got this far without giving up must be well acquainted with climate change and global warming and has no desire to be inundated with more. As far as I can tell, however, no-one has ever been put through the exercise that the management of Global Health Enterprises was treated to by our consultant and so be forced to come to the one simple conclusion that would enable them to pinpoint the likely cause of their angst. Instead, we have hundreds of studies with almost identical conclusions and a few exceptions like one published by the Centre for Biological Diversity that almost used the **O word** but chickened out.

"People around the world are beginning to address the problem by reducing their carbon footprint through less consumption and better technology. But unsustainable human population growth can overwhelm those efforts, leading us to conclude that we not only need smaller footprints, but fewer feet."[9]

This report then goes off into the usual discussion on greenhouse gas etcetera using phrases that are OK to use in polite circles. They first raise your hopes but then they dash them with: *"Time is short, but it is not too late to stop the climate crisis. Economy-wide reduction of greenhouse gas emissions to a level that brings atmospheric CO_2 back from 386 parts per million to 350 or less, scaling back global north consumption patterns, and long-term population reduction to ecologically sustainable levels will solve the climate change crisis and move us to toward a healthier, more stable, post-fossil fuel, post-growth addicted society."*[4]

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[9] This quote comes from The Center for Biological Diversity website *Human Population Growth And Climate Change* [Accessed online 30-8-21. Available from: https://www.biologicaldiversity.org/programs/population_and_sustainability/climate/].

Let me remind you this is a professional body. How, therefore, is it possible to say that *"long-term population reduction"* will solve everything and in the next breath, in all seriousness, call it a *"crisis of the here and now".*

If the crisis is of the here and now then surely the overpopulation crisis is also of the here and now. So where is the **O word?**

At this point let us now refer to the latest report from the UN's Intergovernmental Panel on Climate Change (IPCC) in August 2021, a date that coincides with writing this chapter. The authors of the *Sixth Assessment Report* are a group of scientists whose findings are "endorsed" by the world's governments. The report itself was released three months before the key climate summit in Glasgow known as COP26. It is a sober assessment, which the UN Secretary-General António Guterres (2021) described as *"a code red for humanity".*

The problem is that having trawled through this report (which is supposed to be a call for action to the world to avoid impending doom) I can find no mention of the **O word.** The closest they get to using the word is "human influence" and "human activity". Yet, when looking at one of the key graphs in the report, shown here in Figure 4, what strikes me most is its correlation with the population growth graph shown above. The graph is headed *'Human influence has warmed the climate'* and it uses what is mysteriously called '*simulated human and natural factors*.' Surely someone could have added in another line showing actual population growth. Clearly, no-one wanted to shine a light on black shadows and risk using the **O word.** This graph comes from a section headed, *"Summary for Policymakers*". Quite what policy is expected to change as a result is impossible to say, but this is the UN, don't forget. They pass the buck. Others must decide how to make use of this in their 'policy making' or whether the **O word** might be relevant.

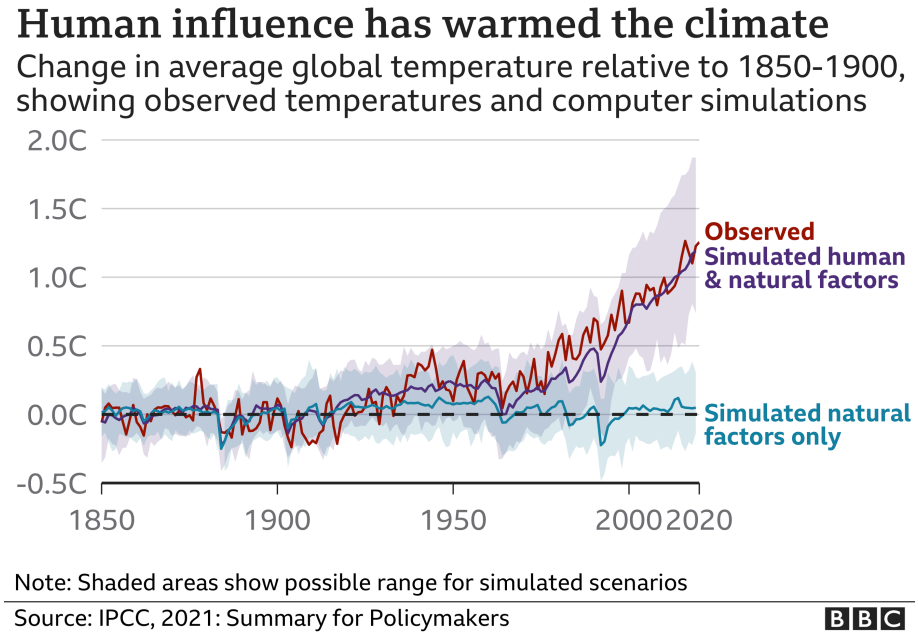

Figure 4: Human influence has warmed the climate. Rather than overtly relating this to alarming increases in population using the O word the IPCC report uses the term human influence to indicate the combination of both population and consumption impacts, which masks the relative contribution of the factors.

In looking at this confusing and untidy-looking depiction of facts we are left to dwell on global temperature which we know enough about already because either we've been brainwashed with it or have studied the geological and palaeontological data going back for millennia, certainly long before 1850. So, what are we to make of this latest IPCC report? Many will, I'm sure, ignore it as alarmist. It might also be mentioned in schools where constant barrages of this sort are known to particularly affect young people who should be being taught to think for themselves. Instead, they are being taught to expect apocalyptic events in their lifetime. Whether the O word is mentioned in schools as the root cause of this pending doom I don't know.

That sums it up exactly. It also fits perfectly with the opinions of those who say this entire subject is designed to spread alarm, fear and terror, especially amongst the young. They've been doing it for years without using the **O word.** In the BBC's take on the report their 'environment correspondent' Matt McGrath (2021) ends by asking, "*What are **you** doing to protect the environment?"* which is a classic example of how low the debate is allowed to go and how responsibility is placed on individuals to do something when we all know things of this magnitude could, even if you believe them, only be dealt with through global agreements and action. On that note, it was

interesting to read one online contributor, a realist, who commented on the BBC's report with:

"Well, China and Russia will ignore it, the US will pay lip service and the EU will debate it for the rest of time."

In 1989 the UN forecast that by 1999 low lying parts of Bangladesh and a lot of the Maldives would be underwater and in 2005 another UN forecast said that the North Pole ice cap would be gone by 2010. What happened? Has anyone asked for an explanation? Perhaps they really meant to say that Bangladesh would sink under the weight of human numbers. They didn't actually say that, of course, but perhaps a warning of that sort in conjunction with using the **O word** would have acted as a better warning to the world, especially for a country besieged by poverty and tropical cyclones and yet has seen its population grow from 48 million in 1960 to 165 million in 2020. Meanwhile, we can look forward to the COP26 summit later in 2021 and I will trawl it for any mention of the **O word.**

3.8. Food and water shortages and resource depletion

According to the UN's Food and Agriculture Organisation (FAO), by 2050, food production is projected to increase by about 70 percent globally and nearly 100 percent in developing countries (FAO, 2018). That may be true but it is only likely to be achieved by practices associated with further environmental destruction, loss of biodiversity and degradation of land and water system. It's like the sales director of our imaginary company, Global Health Enterprises, planning a sales drive while the production director is planning a cut back in production. Such reports often contradict one another.

In a report entitled '*The state of the world's land and water resources*' the FAO (2011) says that farming systems *"face the risk of progressive breakdown of their productive capacity under a combination of excessive demographic pressure and unsustainable agriculture use and practices."* So, which is it? Breakdown due to excessive demographic pressure or production up 70 or 100 percent? And what about water? Currently, annual rainfall is not enough to replenish the amount of water required by food producers, industry, mining or the increased domestic consumption (drinking, bathing and washing the car). This is despite the climate

change and weather alarmists forecasting more storms and more floods whilst also blaming the weather for low levels of reservoirs.

But, let's be frank and critical. Most of the people who write reports and 'newsworthy' articles do it for money. Their writing needs to fit the agreed narrative because they're overseen by another paid army of editors whose job it is to ensure the right messages are sent and that the right boxes are ticked. Unwelcome and insensitive truths must be avoided at all costs in case they cause upset amongst a few. So don't ever bother looking for mentions of single root causes in these reports because the **O word** will have been edited out and, if anything, replaced by more delicate phrases like "*human impact*" and "*human demand*".

3.9. Unemployment and economic migration

Perhaps we should have addressed this issue along with poverty, wealth and health disparity and third world debt and globalisation. However, by dealing with it separately allows us to discuss another issue that rarely passes the lips of our leaders: **Quality of Life.**

The WHO calls it QOL because they love acronyms. Using acronyms means you can lose touch with reality and for the WHO using an acronym means you can avoid saying the complete phrase and focus, instead, on measuring QOL in graphs and pie charts. The WHO[10] defines QOL as: *'An individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns.'* I don't. I define quality of life as the attainment of happiness and contentment but that's far too simple for the WHO.

The WHO employs statisticians, psychometrists and other technocrats who need to be kept busy and so I will merely make one observation that sums up how trying to assess happiness and contentment can be ruined by employing educated paper pushers. Here's a quote from the 2012 WHO guidance for measuring quality of life to show just how far we've come in understanding QOL since the WHO was founded in 1948. *"All fit indices regarding the one-dimensional structure suggest that this model does not fit the data well. Compared to the one-factor model, the original four-factor model significantly improved the fit of the data,* X^2 *(6, N = 644) = 465.764, p*

[10] This definition can be found on the WHO website [Accessed online 30-8-21 from https://www.who.int/tools/whoqol].

< 0.001. However, the original 4-factor model did not yield a good fit according to the fit indices."

Got that? It goes on: *"The WHOQOL-Bref is suitable to use across gender, education and age, but for assessment in the oldest age group, the WHOQOL-Old module could be a good supplementary…"*

Enlightenment about quality of life is impossible and boredom will set in if we delve further into this stuff so let's leave it there to gather dust and return to the real world. Ask any normal person what is needed to lead a happy, contented and satisfied life and I guarantee that the first thing they will mention is a job: in other words, a way to make a livelihood and to raise a family. That the family unit has broken down in many parts of the West and is leading to all sorts of social problems is apparent to most observers. Let's not be distracted onto this subject, other than to say there may well be a link between overpopulation, urbanisation and overcrowding and a sense of worthlessness.

Suffice it to say that the availability of ways to make a living is paramount but global unemployment is expected to be 5.7% in 2022 and in the countries with the fastest growing populations far higher. As noted previously, labour force data from Africa's two largest economies, Nigeria and South Africa, for instance, show very high unemployment rates, with almost half of young people between 15 and 34 without a job. These trends have implications for social cohesion and stability way beyond the borders of Nigeria and South Africa,

The challenge is that a job, ideally with the security that a formal contract provides, is what most youth want and is the type of job that 'economic policy' should aim to grow. The problem is, even within the framework of an economic policy, could enough jobs ever be created to reduce unemployment whilst the population is still growing? Let's be honest with ourselves and face it. The answer is no. It is impossible. So where is the acceptance of this devastating fact? The fact is that the J word (Jobs) very closely correlates with the **O word** but there is almost no data to prove it. As far as my own research is concerned, I can find nothing that I would call "readable". What there is, is questionable.

The UNDP Human Development Report Office background paper entitled 'Population, Labour Force and Unemployment: Implications for the Creation of

(Decent) Jobs, 1990-2030' is a good example of a UN report (Bloom, D.E. and McKenna, M.J., 2015). This report uses 'accounting identities' such as:

$$N_{a,i,k,t} = LF_{a,i,k,t} + NLF_{a,i,k,t} \quad \textbf{(1a)}$$

$$LF_{a,i,k,t} = E_{a,i,k,t} + U_{a,i,k,t} \quad \textbf{(1b)}$$

$$LFPR_{a,i,k,t} = \frac{LF_{a,i,k,t}}{N_{a,i,k,t}} \quad \textbf{(1c)}$$

$$UR_{a,i,k,t} = \frac{U_{a,i,k,t}}{LF_{a,i,k,t}} \quad \textbf{(1d)}$$

Where N is population; LF is labour force; NLF refers to people not in the labour force; E is employed people; U is unemployed people; 2 LFPR is the labour force participation rate; UR is the unemployment rate; and a denotes age group, i denotes country, k denotes sex and t denotes year.

Following standard convention, they treat 15-64 as the working age, which they further divide into a youth working age (15-24) and an adult working age (25-64). Tables with data from 1990 are included in the report. After ploughing through this you will find their conclusion which is:

'While the world faces a formidable task of job creation through 2030, reason for optimism exists regarding the challenge post-2030. Job creation requirements between 2010 and 2030 predominantly reflect population growth in the prior two decades, which was the largest period of population growth in history. Because of these lags in the effect of fertility, currently decreasing fertility and population growth rates imply that this is a transitive issue rather than a permanent one."

If you believe that solving worldwide youth unemployment is a temporary problem and will ease after 2030 then you can sleep easy. To me, the report suggests that, in the absence of a deliverable plan, someone in authority decided it was best to turn a blind eye, appear to be optimistic and to bore readers to tears with data. What's more, their 'accounting identities' completely failed to include one of the most important elements, one which we will call the X factor. The X factor is that many employers are increasingly shedding jobs through automation merely to stay competitive. What we need is an up to date, readable paper on trends in job creation and unemployment set against population growth through to 2050. That is no simple task but what we have to go on right now fails to provide anything remotely useful.

So, what should this vast number of mostly young, jobless people do in order to live happy, contented and satisfied lives? Well, increasing numbers of them decide to up sticks and go somewhere where they think they might find a job and a better QOL. So-called economic migration will get worse and if some doors are shut the problems will move elsewhere or go to swell the ranks of dissident groups who pay well with money from fraud and corruption.

The root cause of dissatisfaction over QOL is quite obvious. It is the **O word** again but no-one, and especially the grossly overpopulated countries themselves, will admit it. Meanwhile we can expect many more reports strong on word count but devoid of solutions on what is, let's face it, a human tragedy not of the future but of the here and now. In conclusion, to illustrate what solving the human tragedy of continued population growth and unemployment is up against, let's refer once more to the report which ends with the immortal words:
"Further studies are needed."

3.10. Conflict, ethnic tension and refugees

This final issue is not dissimilar to the previous one (unemployment, economic migration and the search for QOL) but is made worse by other factors. Ethnic conflict arises if ethnic groups compete for the same goal—notably power, access to resources, or territory. Other issues like prejudice and religious differences can exacerbate it. Conflicts are nothing new. They began with fighting over the spoils of a day out by ancient hunter-gatherers and history books are full of conflicts going back thousands of years in every corner of the earth that humans visited in search of food and water. So, has conflict increased and is the **O word** relevant? The Institute for Economics and Peace (2018) says that:

"Europe was the most peaceful region in the world in 2017, while the Middle East and North Africa were the least peaceful" but that "there is an ongoing deterioration in global peace. It's gradual and it's been going on for the last decade. The conflicts in the Middle East and Africa and the spill over effects into other areas have been the main drivers in the decline of global peace."

If power, access to resources and territory are the main causes of conflict then there must be clear correlations with population densities but I cannot find any statistics (or even a graph) that makes the direct link. Instead, let's take one African

country, Ethiopia, as an example of how conflict and ethnic tension is dealt with by bodies like the UN. Conflict between the government of Ethiopia and forces in its northern Tigray region have thrown the country into turmoil. Fighting has destabilised the country leaving thousands of people dead amongst widespread famine conditions.

The UN, of course, then steps in. It does so with reports estimating that 353,000 people in Tigray are in phase 5 (catastrophe) and a further 1.769 million in phase 4 (emergency). For the uninitiated, that's UN speak for mentioning "famine" but they won't use that word because this **F word** is as sensitive as the **O word** and the Ethiopian government wouldn't like it. Another unmentioned fact is that the population of Ethiopia in 1983 was around 40 million. By 2020 it was 112 million - an almost three-fold increase.

So what lessons were learned by the UN and others after 1983 to lessen the chances of human disaster in 2021? As far as I can see none. Besides categorising the resulting "problems" as phase 3 and 4 to avoid embarrassment the **O word** was never mentioned or even identified as a future problem if it went unchecked. Presumably the UN decided that likely (forecastable) population growth in the 28 years between 1983 and 2020 could be ignored. Why?

The only reason one can conclude seems to be that the UN (and all the other organisations involved) think human breeding is a side issue that has to be ignored because breeding is a natural instinct and a human right that cannot be interfered with. The proof is there in that their primary mission is protecting the unborn child and its mother and providing food and healthcare. In other words, the overlying philosophy is to show compassion and grant rights rather than to point out that producing children goes hand in hand with serious responsibilities. Is it any wonder that, with that lop sided philosophy and strategy, the world is now scratching its head at the knock-on effect of offering easy, soft compassion rather than the harder task of demanding individual responsibility? That's it in a nutshell. It's all about leadership. Weak leaders grant rights and give things away to be popular. Strong leaders shun short term popularity and spell out the long-term consequences of soft options.

As an aside, I visited Ethiopia during the 1983-85 famine. During that time 1.2 million died, 400,000 refugees left the country, 2.5 million people were internally displaced and almost 200,000 children were orphaned. I was only there for a few

days but the memory of seeing hundreds of wretched people scratching for food amongst emaciated pigs and trash bins is something that has never left me.

3.11. So, what is it about the O word?

As we attempted to show at the beginning, most problems, however widespread and complicated they are, can usually, if the will is there, be distilled down to a single, basic cause. For a failing business the basic cause could be a bad product, poor sales and marketing, poor customer service or weak and ineffectual management and leadership.

Identifying, understanding and admitting the problem is the first priority. Solving it is the next challenge but if the business is to survive then a solution must be found. If the will is there, bad products and poor sales and marketing and customer service can be improved. But what about poor and ineffectual management if it refuses to step down or change? A good definition of a poor manager or leader is one who refuses to admit its weakness. From a biological perspective, poorly led companies die out through the basic principles of 'natural selection' and 'survival of the fittest'. The same principle does not apply in the case of big international bureaucracies. Miraculously, they grow.

For the sake of simplicity, let us, once again, ignore the thousands of charities, foundations and other bodies trying to solve our seven problems and focus on the United Nations (UN) and its 'wholly owned subsidiary' the WHO. In its early days the WHO (a specialised agency of the UN) had some noticeable successes such as in mass TB vaccination, the eradication of smallpox and research on tropical diseases. It published its list of "essential medicines" and its "health for all" campaign and was happy to report improvements in child survival and reduced infant mortality. Then, around 1977, with the population around 4.5 billion and with its objective of *"the attainment by all people of the highest possible level of health"*, the WHO began what in commercial terms we might call its diversification. It diversified into health conditions associated with drug use, unhealthy diets, physical inactivity, sexual activity, food safety, food security, public health initiatives and sustainable development. No-one seems to have questioned why this was or how success was to be measured against its efforts.

For the WHO, child survival rates were accompanied by unsustainable population growth to 7.9 billion by August 2021 and each of our seven issues becoming worse. It's like a start-up business selling cheap goods, pocketing quick gains and closing when the complaints start flooding in.

And then there's its parent organisation, the UN itself. There is the UN's paper on "*World Population Policies*" (UN, 2018). As far as I can tell from this document the UN does not have a policy or even an opinion on population. Instead, it delegates responsibilities to nation states.

This, in business parlance, is called passing the buck. It's a cop out. In effect you grant control of the business to other businesses without setting any targets and without any due diligence. It's doomed to failure. Whilst some of the subcontracted perform OK, others will totally fail. But it is easy to understand why the UN decided to subcontract things out. Someone would have declared they each nation state had a right to govern themselves in the way they thought fit. In other words, the UN handed over rights with no responsibilities even though what each nation did or did not do would have global significance. A well-run company that subcontracted out work would have written a few things into a contract. In essence:
"Here's your target and here's a budget to help you deliver it. But we'll be keeping a close check and if things don't go to plan, then your budget will be slashed or cancelled altogether and we'll take over."

In the real world, of course, the world of compassion and the never-ending handing out of rights without responsibilities, that never happens. Despite utter failure to deliver, the subcontracted, the nation states, continue to get their money and the world then sits back and wonders where it all went wrong. Despite that, the UN continues to issue profound statements such as the comment in its "*World Population Policies*" paper where it says *"Population dynamics play a critical role in the achievement of social, economic and environmental development."* And then we get the useful observation that *"the need to monitor population policies and programmes remains crucial."* It's like a company's sales director, faced with a long-term drop in sales, announcing that the company really needs to start measuring its sales figures.

You might think that the UN's highly publicised *'2030 Sustainable Development Agenda*' might help clarify what is required to achieve sustainability but what did we get in 2020? We heard the Secretary-General of the UN, António Guterres,

announcing proudly that, *"I've never seen so many people animated around sustainable development goals"* Perhaps he should have stopped at "*I've never seen so many people."*

What did he then present? We got the so-called *'Decade of Action*' and a pledge to mobilize financing, enhance national implementation and strengthen institutions to achieve the 'goals' by the target date of 2030. What were the goals? Here is a quote: *"At the core of the 2020-2030 decade is the need for action to tackle growing poverty, empower women and girls and address the climate emergency*."

We'll come back to the empowerment issue later because it does, in a vague sort of way, suggest that having children has a certain relevance in sustainability. But there is not a single mention of the **"O" word** or that further human population growth might ruin the chance of achieving these goals by 2030. Whether the **O word** was mentioned behind doors, in breakout groups or similar is not known but one might think that a few scary statistics about population growth might have stirred attendees to become even more animated, but it chickened out. If it had been me running the show, I'd have played the 'worldometer'[11] on a big screen throughout.

Meanwhile, the UN has what it calls the UNFPA, run under the somewhat misleading heading of the UN Population Fund. The UNFPA is the UN's sexual and reproductive health agency that exists to "*deliver a world where every pregnancy is wanted, every childbirth is safe and every young person's potential is fulfilled".* [12]

UNFPA is a global family planning agency with no link to sustainability but it's probably what the UN was referring to in its Decade of Action when it mentions empowering women and girls. Make of that what you will. If the UN was a business, then those tasked to write the company's 2020-2030 business plan would have been required to factor in potential problems that could derail it. Once accepted as a working document, someone would then be required to keep a close eye on it and report back at regular intervals on whether it was on target. My point is, of course, that someone should be held responsible for delivery. They should carry the can. But the UN doesn't work like that and because it is unaccountable to anyone why should it care? Unlike a business the pay cheques keep coming.

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[11] The worldometer website is available at: https://www.worldometers.info/world-population

[12] UNFPA is the United Nations sexual and reproductive health agency based in Bangkok. More information is available on their website: https://thailand.un.org/en/admin/structure/unct_static_tag/41].

The big question that remains of course is how the WHO, the UN and other organisations get away with refusing to acknowledge the single most significant factor affecting delivery of their plans. Why is it that while we are incessantly bombarded with a fear-mongering narrative that "*time is running out" and* that "*climate change will destroy life as we know it"* the **O word** is never mentioned by the UN, the WHO, every government, every President, every Prime Minister or every leader of Christians, Moslems, Hindus or Buddhists? What are they frightened of?
US Republican Senator Marco Rubio once said, *"We live in a society obsessed with public opinion. But leadership has never been about popularity."* That's it. Every one of our world leaders fears unpopularity.

So, who is out there, strong enough to discuss the O word and try to do something about it? An internet search throws up a long list of organisations a number of which are located in countries known to have a population growth problem. Their sincerity to do something positive is in no doubt but the fact remains that whilst population growth might be slowing the world will still hit a population of 10 billion by 2050.

If indeed we are faced with global catastrophe as so many, not unrealistically, predict then it is totally unrealistic for the root problem of the catastrophe to be left to these small organisations. Praiseworthy though their efforts are, on the scale of things their impact is negligible. But it is not unreasonable to have expected a better outcome by the world's largest, most familiar, most representative and most powerful international organization, the body that was established to maintain international peace and security and is funded to the tune of $3.1 billion – the United Nations. It could be argued that peace and security is now at risk precisely because of the UN. Will anyone stand up and say that?

Surely, the UN must have seen this situation coming 50 years ago when the population was 2.5 billion. Perhaps Dag Hammarskjold (UN Secretary-General 1953-61) was more concerned with the UN's internal organisation than to ponder on the fact that the population was growing so fast it would become unsustainable. Perhaps if Dag Hammarskjold had mentioned the **O word** back in his time something could have been done to ensure the population stabilised at around 5 billion by 2021 and so make many of the problems in our list of seven more manageable. But that

would have required a style of leadership that didn't exist then and certainly doesn't exist now. So why do we still have a 'United Nations' when it appears that no-one has, and never will have, the leadership skill to make it work?

3.12. Can democracy survive the effects of overpopulation?

It's a good question that is well discussed on the World Population Balance website: *"Politicians like to talk to people, but because of overpopulation, they can't talk to everyone. So, they talk to a few, a self-selecting small group of wealthy and influential people. Because of this dilution, the old statement, 'One person, one vote,' is now being replaced by 'One dollar, one vote."*[13]

The WEF (and others) might like to discuss a New World Order or World Government but endless academic discussion is no substitute for immediate action and, anyway, we've had something similar since 1947 with a track record for all to see: the United Nations, of course. The obvious next question to whether democracy can survive the effects of overpopulation is to ask whether democracy is what has brought us here in the first place.

3.13. So where are we?

Having earlier defined bioethics as the study of ethical issues emerging from biology and medicine with aspects of politics, law, theology and philosophy thrown in, shouldn't the **O word** and the failure to face up to it and deal with it during the last 70 years be the subject of high profile, debate in bioethical circles? If we can be honest enough to accept that the **O word** is the root cause of all planetary health issues, then should we not dig a little deeper and find out why the mention of the word causes so much of a problem?

Is it shame? Is it embarrassment? Is it because to use the word and point to it being the root cause will lead to such deep moral and ethical questions that we shy away from it? It seems to me that the **O word** is the most fundamental bioethical question and yet it is noticeable only by its absence from lists of topics for bioethical

[13] World Population Balance website is available at: https://www.worldpopulationbalance.org/

debate, such as suggestions listed by the Northwest Association for Biomedical Research recommendations.[14]

Thomas Malthus presented the **O word** as a bioethical dilemma back in 1798 but what hope is there if modern-day bioethics 'experts' are too afraid to discuss it? Even in serious journals like the *New Scientist* and *Scientific American*, despite all the evidence, Malthus is still dismissed as a purveyor of doom by writers such as Michael Shermer (2016):*"The solution to overpopulation is not to force people to have fewer children. It is to raise the poorest nations out of poverty through democratic governance, free trade, access to birth control, and the education and economic empowerment of women."*

Such views, admirable though they appear at first glance, just do not fit the facts. The UN has been trying to do all that is proposed here since the 1950's and in that time we've seen the population grow from 2.5 billion to almost 8 billion.It is precisely because we still refuse to accept Malthus's predictions that we are where we are.

We've adopted the softly softly approach. We've promoted and defended human rights and established courts that judge if your rights have been denied but where are those that promote human "responsibilities" with as much vigour? Rights without responsibilities are a recipe for disaster. A list of human responsibilities that balances the given rights doesn't exist because the modern, certainly Western, attitude is to regard strong, determined, no-nonsense style leaders as bad whereas soft, generous, forgiving, rights-granting leaders are good. Without an equal balance of rights and responsibilities the rights brigade will always win and, as we've seen, elected leaders or those appointed to head 'humanitarian' organisations will always avoid doing or saying anything that is unpopular.

With weak leadership the head-in-the-sand approach will persist, kept alive by a barrage of myths and half-truths that few have the guts to denounce. If we return to the subject of what bioethics is there to do, then Population Matters (2021) has published a list of ten myths which could well form the starting point for a bioethics conference.

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[14] Northwest Association for Biomedical Research has a list of recommended topics for bioethics discussions with an absence of references to overpopulation. The recommended topics are listed here on their website: https://www.nwabr.org/sites/default/files/TopicsList.pdf

Myth: That population will stop growing soon.

Fact: Population will keep growing until 2100 and possibly beyond.

Myth: That having a smaller family won't make a difference.

Fact: Choosing smaller families is exactly how to end population growth and (ultimately) achieve a sustainable population.

Myth: Focusing on population is a distraction from climate change.

Fact: It's the opposite. Addressing overpopulation is the key to solving environmental problems.

Myth: There are plenty of resources to go around.

Fact: The planet's resources are finite. They cannot provide for a huge and growing population.

Myth: Environmental damage is about consumption not population

Fact: Damage is about both - numbers and consumption.

Myth: We need a growing population to support old people.

Fact: Young people also become old. It's like an unsustainable 'pyramid scheme' that benefits the present generation at the expense of the next.

Myth: You can't reduce the human population without coercion or abuse of human rights.

Fact: Many countries have achieved rapid fertility rate reductions using perfectly acceptable and effective solutions.

Myth: The problem is only an issue in developing countries.

Fact: Every additional person in a rich country has a much greater impact on the environment than a person born in a developing country.

Myth: Technology will save us

Fact: Technology does not enable limitless growth in a finite planet.

Myth: There's plenty of space for everyone. All of us alive today could fit into Texas.

Fact: Yes, by living one on top of the other. But shelter and provision of food, water, healthcare and education all need space. We've already used half of Earth's habitable land and other creatures also have a right to exist.

3.14. Conclusions

A struggling company that recognises the source of its problems can, if its leadership is strong enough, solve those problems and survive. On the other hand, the outlook

for a struggling company with weak leadership that refuses even to discuss its problems is poor. It will, inevitably, collapse. So, what is the outlook for the company of humans with its current 'management' and its 10 billion 'staff'? The realist will conclude that it's at the tipping point and that it'll be just one of the seven things on our list that'll push it over the top. Which one of the seven won't really matter because the root cause will be the same. For those that are left, just don't mention the **O word.**

A final word from Thomas Malthus:

"I think I may fairly make two postulata. First that food is necessary to the existence of man. Secondly, that the passion between the sexes is necessary and will remain nearly in its present state. These two laws ever since we have had any knowledge of mankind appear to have been fixed laws of our nature: and as we have not hitherto seen any alteration in them, we have no right to conclude that they will ever cease to be what they are now, without an immediate act of power in that Being who first arranged the system of the universe: and for the advantage of His creatures, still executes according to fixed laws all its various operations."

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4. Environmental Justice

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4.1. Abstract

Planetary health is inter-subjectively connected to ecological health systems that have been damaged by global warming; a conception of a holistic approach to human sustainable health standards as an integral part of the health of ecosystems as a whole.

The Covid 19 virus is just an example of a mild pandemic and a warning of how viruses can mutate and hence develop serious implications, particularly during climate change, due to increasing anomalies in average temperature, levels of humidity, intensity of precipitation, shortages in food and drinking water, species migrations including flora, fauna and human, zoonotic and plant diseases, as well as other changes affecting the myriad elements of the biosphere.

This paper intends to define environmental justice from a contemporary perspective based on ethical, socio-economic and political issues, within the framework of eco-integrity, global warming and the subsequent UN Climate change "Conferences Of the Parties" (COP), as well as within the escalating North-South cultural, political and economic tension; with Jordan as a case study.

The results of the discussion would hopefully reflect on planetary health at a global scale from the perspective of "relative environmental justice" worldwide, and the need for more democracy and local communities participation in environmental governance, particularly in developing countries.

Key words: *Cost of Environmental Degradation (COED)**,** Energy Efficiency (EE), Gross Domestic Product (GDP), Green House Gases (GHGs), Jordan Dinar (JD), Middle East and North Africa (MENA), Mediterranean Environmental Technical Assistance Program*

·pp. 65 - 86 in *Planetary Health and Bioethics,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

(METAP), Particle Per Million (PPM), Planetary Health, Renewable Energy, United Nations Framework Convention on Climate change Conference of the Parties (COP).

4.2. Introduction

In the second sub-title: **Climate injustice between North and South,** after discussing gender environmental behavior from a holistic perspective, we shall discuss the magnitude of damage incurred on the South by the industrial and energy thirsty North, as a consequence direct and indirect impacts of climate change, and at the same time, empirically comparing the magnitude and ratio of some anthropogenic of the activity shared by each party (North and South). I shall also question whether the impact of climate change on each party is fair and proportional to the amount of compensation set up by the United Nations Framework Convention on Climate change Conferences of the Parties (COP), starting in Berlin 1995 (COP1) which negotiated the strengthened commitments for developed countries to ensure environmental and climate justice accordingly.

Further questions will be asked and discussed concerning injustice between North and South, such as: Is it fair for those who are the least responsible for climate change, in terms of the emission of Green House Gases (GHGs), to suffer more from the consequences? Is it fair for the unprivileged peoples of the South who produce the least of GHGs to be the victims of poverty, famine, wars and epidemics exacerbated by climate change? Forcing people from developing nations to become potential environmental refugees around the world as a result of fresh water shortages, saltification of soil, soil erosion, breakdown of agricultural systems and the consequent civil wars that follow.

The third and fourth subtitles entitled **environmental injustice and climate change in Jordan** address several real-life situations in Jordan concerning environmental conditions, policies and environmental degradation of the country due to mining, climate change, desertification, soil erosion, uneven distribution of wealth and land, changing land use, misuse of forests, deforestation, potable water shortages, industrial waste, sewerage pollution, foul agricultural activities, public transportation quality, health services and solid waste pollution, among others.

4.3. Climate Injustice: North - South

4.3.1. Gender environmental behaviour

It seems that women, by nature, are more attached to environmental concerns and have a strong instinct for protecting the environment that is necessary to protect their families and offspring. Therefore, a woman is ready to express behaviors of altruism, responsibility and empathy towards nature, which had been proved by many researchers so far, some of which we shall discuss later and question whether this gender approach can differ between North and South.

A particular research study concluded that women in industrialized nations "*are more likely to buy ecologically friendly and orgasmic food, more likely to recycle … drive and fly less …*"[(1)], suggesting that this gives us hope that environmental justice is possible. Nay, do women in developing countries, who constitute more than 80% of world`s women population, have choices of food (organic food, for example), water quality, comfortable and affordable transport mode, education, etc?

From personal experience, many women in Jordan, at least those whom we have met and communicated with during anti-nuclear campaigns, have become anti-nuclear advocates after Fukushima's nuclear disaster in March 2011. The idea of a genetic mutation, or an abnormal fetus, touches them deeply in their historic instincts preserved in their genes. Men, in general, and by contrast, tend to worry about their material benefits, cost efficiency parameters comparing between different sources of energy, and also tend to prefer short term profit rather than long term safety, health and sustainability.

To support the notion of "*gender difference*" between the perspectives of men and woman concerning an environmental attitude and behavior in the adoption of energy-efficient lighting at homes, for example, it was clear that women were more likely to engage in practicing energy saving strategy at homes and also be more likely to pay a higher price for energy efficient lights, or even a higher price for a more expensive green source of energy (clean renewable sources, say). It has been concluded that environmental attitudes that women enjoy are higher as they possess more refined "*altruistic and biospheric values than men …*"[(2)]. Therefore, more attention towards empowering women can be an advantage to the wellbeing of the environment and a step forward towards environmental justice, for achieving the final goal of planetary health, which is interconnected with the health of the

ecosystem in its totality. This can be possible through solving gender injustice; including empowerment of women and providing them with grants and subsides in the renewable energy industry to help them avoid other higher polluting options.

Concerning differences in stances between rural and urban residents, in a statistical study of the mood of the public regarding the nuclear issue, it was revealed that Jordanian students studying in rural areas were more pro-nuclear compared to those students residing in urban areas [3], which reflects the dire need in rural areas for job opportunities and the clear need for a better infrastructure. They seem to believe that mega-projects, such as a nuclear project, could bring prosperity to their community, disregarding the cost of their health and environmental degradation.

Energy efficiency (EE) and renewable energy (RE) projects can improve the livelihood, health and quality of life for almost 17% of the world impoverished population who have no access to electrically, fossil fuels or fresh water [4]. For example, renewable energy can play an important role in providing jobs and social security across its chain of benefits, through providing electrical power, desalinated water, and valuable byproducts, such as food processing and canning agricultural products in the rural areas, particularly in the impoverished "*Ghor Region*" of Jordan, in the vicinity of the Dead Sea and along the long trail of River Jordan. Such projects can save farmers from becoming bankrupt when prices of vegetables drop sharply at times of maximum yield when they are forced to leave their crops unharvested. Small scale RE projects can have a better impact on communities, compared to large-scale projects which have negative impacts on these groups, including gender violence due to increased alcohol consumption and family dissolution [5].

In Jordan, possible polygamy amongst workers in large-scale projects can arise following a sudden increase in income and hence can lead to family dissolution, lower annual income per capita and a higher birth rate. Consequently, this causes more stress on the environment and public health system. Again, bigger projects, such as transmission lines and mega pipelines, such as Disi water and Israel gas pipelines, for example, tend to displace communities due to the confiscation or dissemination of their land. Fears of huge power lines that have adverse effects on health conditions might also lead to dislocation of inhabitants and migrations as the population become alienated from their habitat. Hence, families are separated,

education interrupted and social and economic conditions deteriorate, which impacts mostly on women and children in developing countries.

4.3.2. Unequal development

What did fishers and farmers shout out aloud for during their march on October 28th 2002 in New Delhi, India, during "*COP 8*" meeting on climate change? It is believed that they were demanding climate justice that they considered a human rights issue. So, how did they see that justice could be restored?

The Social Justice Movement at "*COP 13*", in Bali, Indonesia reflected on their aspirations as they demanded action for sustainable development, as well as serious action for a post 2012 Kyoto (COP 14, Poland), finding a way out to solve "*ecologically unequal exchange*" and a mechanism to solve "*ecological debt*". These two concepts are profoundly connected to "*unequal development*" and environmental justice. For "*ecologically unequal exchange*", it is essential to discuss the trilogy concerning energy, natural resources and cheap labour, which are unevenly flowing from South to North. This outflow of cheap goods and raw materials from the South has an environmental cost of degradation to natural habitats, as well as a social and health cost due to hastily extracting natural materials without regard to the impact and cost to restoring habitats or even ecosystems that suffer dire environmental conditions!

Mining natural resources (coal, phosphates, potash, uranium, etc), processing them and transportation have a huge carbon footprint in developing countries and dooms the South as a source of anthropogenic pollution. It has also become a sink for local and foreign waste to be stored, due to exporting waste to the South, including radioactive waste and dangerous chemicals. Therefore, as a consequence, damage to the environment and planetary health is deepening over time, as the international division of labour between North and South intensifies and the concentrations of resources in raw materials become rarer requiring extraction from deeper underground sources. The world average concentration of uranium oxide in the ores has dropped dramatically, meaning more pollution and tailings left over. Also, natural resources reserves are now extracted at much deeper depths, which consequently requires more energy compared to traditional open-cast mines. For example, 60 years ago the average concentration of uranium 235 in natural ore was 2800 particles per million (PPM), in 2007 it has become below 900 PPM [(6)], leaving more

radioactive waste exposed in the air and on the surface of the ground as tailings, thus polluting underground aquifers making water radioactive for millions of years, particularly so in developing countries where precautions are far from safe. Cases of bad lining are even reported in many developed countries too, such as in the case of Australia Ranger Uranium Mines [7].

Each ton of uranium oxide extracted at 100 PPM leaves ten thousand tons of radioactive soil exposed on site as radioactive tailings that is ready to pollute underground water at the first instant of rainfall. We can notice in Figure 1, of the Boyle *et al* document, how the concentrations of uranium 235 in the natural ore is the lowest in Africa (Namibia, Niger and South Africa), making mining uranium in poor countries of the South an environmental injustice disaster. For example, "Rossing Mines" uranium oxide concentration in Namibia`s ore vary between 0.034-0.041 (Table 1 Boyle *et al*), which represents concentrations between 34-41 PPM that produce 45.3 ton CO_2/ton U_3O_8. In contrast, one of the world's largest uranium processing facilities of the North, McLean Lake Mines in Canada, where concentrations range between 1450-2290 PPM producing approximately 8.43 ton CO_2/ton U_3O_8. Therefore, this represents only 18.5% of the pollution emitted in Namibia (Table 1 Boyle *et al*) [8]. To add insult to injury, precautionary measures and safety conditions are limited by capacity and expertise in developing countries due to limited resources, corruption and poor management. This can be detected clearly once comparing the amount of GDP per capita in Namibia with that of the United States, for example. The GDP per capita in Namibia dropped by 6.12% from 10,266 USD in the year 2016 to 9,637 USD in 2019. However, in Jordan it almost stayed the same, from 3,271 USD per capita in 2016 compared to 3,284 USD in 2019, while the US was 52,555 USD in 2016 rising by 6.2% to 55,809 USD in 2019 [9].

As for unequal development between North and South on the level of trade, unequal development becomes a natural outcome of unequal trade between the two, as shown in the example of exporting uranium with devastating consequences on developing countries. Exchanging raw materials of the South with high tech goods from the North can be reflected through monetary terms through this example: one ton of EU15 exports to Africa and Latin America, for example, embodies ten times the monetary value compared to an equal amount of imports in the reverse direction [10].

4.3.3. North – South GHGs emission injustice

Who is mainly responsible for global warming, and what are the consequences of climate injustice? Who is paying a higher price for climate change; the South or the North? And how can climate justice be possible?

Uneven emissions of GHGs between North and South incite climate injustice, as the US in 2017 was responsible for almost 15% of all global emissions, which came second after China with a share of 28%. However, 136 developing countries in the South altogether contributed to only 24% of global warming [(11)]. Is it “fair” or “just” by any means that developing countries should pay the price of global warming through environmental degradation? This disparity is causing injustice because the South is paying a higher price for the consequences of climate injustice resulting from droughts, floods, hurricanes, rising sea level, fluctuating rain intensity, pollution … etc. Everything in poor countries is fragile; from the infrastructure (roads, services … etc) all the way up along the trail towards the superstructure (governance, subsides, health services, resources, technology … etc).

There are new ideas and suggestions for climate justice to produce more balanced relations between North and South that are abroad today. Some are based on " *hybrid* " proposals, such as assigning responsibility for past and present overall emission intensities, carbon dioxide intensity, average income per capita, GDP per capita,…etc, and thus countries can be classified accordingly to identify those who ought to act now and those who can be allowed to act either now or later. Other perspectives suggest that the notion of "*Eco-equity*", which was suggested to classify income per capita and put a threshold for those countries, ought to take action now. To identify this threshold, some criteria was necessary; therefore, it was suggested that action should be taken now for those countries which enjoy an income per capita that exceeds 9000 USD annually. Other criteria can be improvised for those countries which should take action now [(12)]. On the other hand, some strong approaches are pursued today for advocating boycotting "*carbon colonialism*" through carbon trading. This entails gradually withdrawing from trade with wealthy nations, diversifying developing nations economies, and investing in energies of peace [(13)] (clean renewable energies). The associated technology transfer reduces the technology gap between North and South, whilst at the same time acknowledging who pollutes more – the North or the South.

If we exclude Russia and the Ukraine's drop in emissions in 2015, as shown in Table 1, which is mainly due to the decrease in oil and gas production and the impact of the international embargo over the Russian conflict in Ukraine and annexing Crimea, then the only group of countries that can be said to be following the right track of reducing CO_2 emissions since Kyoto 1997, that is concerning GHGs reductions in particular, are the EU28 countries (including the UK).

Table 4.1: Trends in CO_2 total emissions of countries in descending order (1990 – 2015) (14)

Country	**Mega tons of CO_2 equivalent**	
	1990	**2017**
China	3859.07	13067.69
USA	6117.77	6444.40
EU 28	5743.61	4499.85
India	1363.60	3346.95
Russian Federation	2996.88	2233.88
Japan	1296.36	1359.55
Brazil	652.76	1229.25
Canada	612.80	779.87
Saudi Arabia	243.54	707.79
Australia	467.98	658.59
United Kingdom	807.23	559.64
Taiwan	142.00	304.49
Ukraine	948.42	294.19
New Zealand	68.21	84.38
Jordan	12.72	33.03
Global Total	32772.31	49113.03

Table 4.2: Contribution of CO_2 emissions from gas flaring (15)

Country	Mt CO_2 / 2012	Change compared to 2005	Share in global total 2012
Russia	66.3	- 40 %	23 %
Nigeria	29.2	- 31 %	10 %
Iran	21.6	- 9 %	7.5 %
Iraq	20.7	46 %	7.2 %
US	16.3	232 %	5.6 %
Algeria	10.6	- 18 %	3.7 %
Venezuelan	10.0	85 %	3.5 %
Kazakhstan	9.3	- 25 %	3.2 %
Saudi Arabia	9.1	12 %	3.2 %
Global Total	**288.1**	**- 17 %**	**100 %**

Hence, the largest eight emitters of GHGs in the year 2015 were: China, USA, EU 28, India, Russia, Japan, Brazil and Canada; except for India and Brazil, all the others are countries of the North (including China which ought to be considered as such). However, if we exclude India and Brazil from table 1, then the proportion of CO_2 emissions for the first six biggest emitters, would be something in the range of 58% of the world`s total emissions – all of which are in the northern hemisphere. However, if we consider the world`s oil producing countries emissions in terms of CO_2 from gas flaring, we shall find out that they do not add significantly to pollution, which can be seen in Table 2, for top polluters.

It can be seen in Table 2 that oil and gas producing countries are not substantial contributors to GHGs (except Russia). However, total emissions of CO_2 from gas flaring reached 288.1 Mt CO_2 in 2012. If compared to the overall 35.7 billion tons of CO_2-equivalent produced in the whole world in 2013, it becomes clear that it is very small indeed (less than 1%) and thus cannot reverse the argument. Actually, the impact of producing emissions from the oil industry in the South is becoming smaller due to the fact that the fracking industry of oil and gas has been expanding

greatly in the North since 2007 / 2008 economic crisis, particularly in North America. Fracking wells leak 40 to 60 per cent more methane than conventional gas wells [16], making the argument over who pollutes more even more biased against the South, and renders the climate change responsibility even more obvious and fingers are pointed firmly again towards the North.

Let us try to evaluate the latter judgment further. In the North, the impact of climate change on the different sectors of the economy can possibly follow the following scenario. Most EU 28 are already facing much warmer climate on average, ranging from 21% to 28% more warmth. Also in China, some provinces were becoming much warmer (Shanghai and Beijing, for example) while others have become cooler (Chengdu and Guangzhou). However, in the US, the city of Los Angeles, for example, has become much warmer, meanwhile, New York, Washington DC and Atlanta are facing cooler weather [17]. It appears that climate change is here to stay, even if GHGs plateau by 2030. However, due to structural and administrative difficulties in keeping accurate records of climate change in the South, a North-South comparison cannot be established on accurate basis. Yet it can be predicted that a slightly warmer winter could be prosperous for the North, as it implies lower energy consumption, much better yields of agricultural products and allowing the introduction of new crops at higher latitudes, such as grapes and olives, which have already been seen thriving in the south of the UK during the last two decades, for example. By contrast, the trend of heat waves increasing in frequency and intensifying in magnitude and duration in the Middle East and North Africa (MENA) would require more fossil fuels burnt in power stations to cover for cooling loads. In most Gulf States cooling loads in summer account to almost 70% of the electricity load. In Jordan, however, interestingly enough, electricity peak loads have shifted from winter to summer in the past few years.

As for the environmental impact of climate change on soil erosion in the North and South, we can say that unevenly distributed rain storms, as a result of climate change, can do limited damage to the top soil in a green landscape with stable top soil in many countries of the North. Whilst soil erosion can be of great relevance to the well - being of the population living in the arid and semi-arid South when sudden flash floods strike, quickly erodes large volumes of soil, uproots trees, destroys the harvest and pollutes drinking water. Furthermore, the North is more fortified against

climate change and weather fluctuations as it has a balanced investment in the different sectors of the economy; industry, commerce, services, agriculture … etc. However, in the South, usually one or two sectors are dominant: services, commerce or agriculture. So, if agriculture constitutes the backbone of a country in the South, as is the case in many countries of the South, then any climate change effect will impact almost the entire population in those impoverished countries.

As for the impact of climate change on the infrastructure in the North, such as roads, bridges, power lines … etc, it is more likely that it shall withstand the impact of climate change far more efficiently compared to the shoddy public services in the South. Hence, it has become obvious that although the South produces the least of pollution, the impact of climate change will be far more disastrous in the South; and that explains climate and health injustice towards developing countries. Ironically, the South is struggling with corruption and stagnant investment in renewable clean energy, while the North is setting records in refining democracy and achieving escalating green energy infrastructure and uptake. For example, Sweden aims to attain completely fossil fuel free electricity generation by 2040. Many other countries in the North such as Scotland, have already reached 100% renewable electricity, Germany is targeting 65% by 2030 and ≥ 80% renewable electricity and 60% share in final energy consumption by 2050. Other amazing goals are for smart cities, such as in California or Sydney both targeting 100% renewable electricity soon. The same follows for countries like Denmark aiming at 100% fossil fuel free by 2050. Now France and the United Kingdom are vowing 100% electric vehicles by 2040[18].

Although the rapid utilization of solar power, biofuels and wind energies in Europe can help reduce GHGs on the long term, the effect would still be marginal on a global scale. The greatest emitters being China and the US who ought to demonstrate a good will towards the environment rather than withdrawing from Paris COP21 (back again in 2021). If we add this set back to the impotence of developing countries in the South to accomplish serious environmentally friendly achievements independently, the future of our Earth is bleak. In Jordan, taken as an example of the South, we wonder: does it make sense that a country such as Jordan, enjoying two to three times more solar intensity compared to the EU average, has no similar substantial aspirations in renewable energy production as that of the EU? Why?

The four basic GHGs causing global warming are carbon dioxide, methane, nitrous oxide and hydroflorocarbon (**HFC).** According to World Bank statistics, HFCs emissions in Jordan increased dramatically by 75% from 110.3 Kt (thousand metric tons of CO_2 equivalent) in 2008 to 193 in 2010. Methane emissions are mainly produced from agricultural products, livestock and fossil fuel industry, which reached 2203 Kt of CO_2 equivalent in 2008, but dropped to 2114 Kt in the year 2012[19]. This 4% drop is possibly attributed to improving conditions of waste disposal and treatment, as well as due to the drop in agricultural production and developing more efficient methods. Thanks to international funds in this respect. However, it is important to note that a molecule of methane has 21 times the potential to absorb heat compared to carbon dioxide molecule, yet fortunately it is in far lower atmospheric concentrations than CO_2. Nitrous oxide emissions, which are mainly products of agricultural products, land use activities and biomass burning, dropped from 873 Kt in 1998 to 604 Kt in the year 2012 [20]. This 30% drop is attributed to a drop in agricultural activities and developing more efficient methods, as well as reduced production of agricultural goods, diminishing use of land and reduced biomass burning due to increasing government protection. Carbon dioxide emissions from all anthropogenic activities dropped from 26571 Kt in 2014 to 25107 Kt in 2016. This regression can be explained by the fact that carbon dioxide emissions from heavy fuel consumption dropped from 22442 Kt in 2014 to 14873 Kt in 2016 [21]. This reduction of 5.5% is attributed mainly to replacing heavy fuel and diesel burning at power stations by natural gas which started flowing immediately after the Aqaba Floating Gas Terminal was commissioned in May 2015.

Where is Jordan heading now? In 2020 in Jordan oil, gas and electricity generation contribute 14% of the GHGs emissions, cannot be possibly balanced by the publically announced new energy strategy for 2020-2030, which plans a future increase of only 3% in renewable energy. Therefore, carbon dioxide will be on the rise in the coming decade undermining Jordan`s pledge to reduce emissions by 14% by 2030, according to Paris 2015 Climate change agreement that has been ratified by Jordan. Further noting that 12.5% of emission cuts are dependent on foreign funds, if they are available! The reason behind this impotence is both politically oriented and bad governance, which will be discussed henceforth.

4.4. Environmental injustice in Jordan

4.4.1. Jordan`s socio-political structure

Jordan, since its birth, almost a century ago, is a tribal country by structure. J. Rowland suggests that the tribal sentiment in Jordan "*is not to blame for the failures of the political system. Instead, it is the system itself, ... "* [22]. So, can such a system be resilient to climate injustice and hence sustain the health standards of its population which exceeded 10 million in 2019?

To put this in perspective, one of the biggest tribes in Jordan accounts for nearly one million people that constitute 10% of the population of Jordan. Emphasizing tribal relations has proven to be effective means to accede to as many governmental posts as possible, which is of great importance in a welfare state where nearly half the local labor force is either employed by the state as civil servants or employed somewhere else within the system, such as the military and security services.

The electoral system bolsters tribalism, especially the "one-man-one-vote system" where one has no choice but elect the candidate closest to him by blood, rather than a candidate with a political agenda from outside his tribe who reflects the ideology and agenda of a political party with a utilitarian conception . The merits of a tribal code of ethics are sometimes deviously and pragmatically utilized as an example of good governance within the framework of a strong central state with a powerful king of a totalitarian status.

Within this complicated system of tribal relations and system of governance, many Jordanians still conceive the overall picture of a "moderate king" who ensures political resilience to Jordan in the midst of a bloody Arab Spring still ongoing since 2010/11. This added value of political stability in Jordan is what makes other economic and environmental factors sound trivial and secondary. Therefore, it is almost impossible to insure environmental justice within this framework of existing governance.

4.4.2. Is environmental justice possible?

Environmental justice requires enough funds that can be spared to deal with environmental damage and embark on mitigation. However, with the country`s annual budget scoring perpetual deficits, achieving the basic needs is almost impossible for the majority of the population, particularly with increasing inflation,

high unemployment rates and the accumulation of foreign debts that exceeded the national GDP in 2019. The situation has become that people can no longer afford reasonable health care, and are forced to send their children to public schools which have a tremendous education quality inferiority compared to private schools of international standards and public schools have become a breeding hub for fundamentalists.

Environmental injustice is additionally reflected through depriving local people from their right of rehabilitating old and existing phosphate and potash mining dumps in the Dead Sea area, Rusayfa and Hasa. Some of these sites have been decommissioned many decades ago. This case ought to be considered as a minimum basic requirement for an acceptable preliminary environmental condition, of an allowable pollution limits and a sustainable nature, that might open the way to environmental justice, yet achieving this standard is almost impossible. Existing and aspired energy policies will restrict attaining environmental injustice, particularly by limiting the increases in renewable energy share in the energy mix by 3% according to the new energy strategy over the next decade in the new energy 2020-2030 with an almost stagnant energy efficiency plans, intentions to mine uranium in the middle of the kingdom, mining copper in a reservation area under environmental protection for decades and mining oil shale across the kingdom.

Furthermore, there is an inefficient plan for managing the transportation sector which accounts to almost 50% of the final energy consumption and produces almost the same GHGs as all other energy production cycles. Upgrading fuel quality refined from fossil fuels at the Jordan Refinery is a serious cause of environmental injustice, as well as depriving the majority of the low income population from an efficient, reasonably comfortable and inexpensive public transport. The issue of transportation is a major source of pollution in cities that ought to be addressed in the framework of air quality and health injustice as part of a holistic perspective for environmental justice. The Rapid Bus System has messed up the main capital streets since 2009, and no signs of a soft landing are visible so far.

Although official unemployment rate was 19.7% in 1993 [(23)], it was thought to be much higher in reality, even higher still amongst women and in areas where refugees reside. To add further pressure on the unemployed, inflation levels keep ascending; sustaining a very low average of GDP per capita, as well as the unfair

competition when seeking further education and jobs, due to biased feelings of favoritism and nepotism. In the wake of the latter misery, Covid 19 strikes. A study published by UNDP in 2020 during the total lockdown in Jordan, based on an online survey of 12,084 respondents, a mere 6.8% reported “still employed” compared to pre-lockdown measures, 37% lost their income altogether, 10.8% suffered from a much lower income, 5.9% suffered a slightly lower income, and the rest 7.1% reporting that they were not affected by the pandemic [24]. This shows how susceptible peoples of the South are, particularly with the collapse of the social and health systems.

The average Jordanian citizen, therefore, as he feels socially, economically and health wise insecure, it marks him as a potential threat to social and political instability in the short and medium range future, particularly as means to justice are becoming harder to achieve with democracy on the decline. Burning what is left of Jordan`s forestry, which is already below 1% of the land, has become common; acts of arson for selling wood due to greed, poverty and the corrupted system of surveillance. Widespread corruption threatens people's security, as Jordan was ranked 45 on the world corruption index in 2012 out of 175 countries, then moved astray to rank 48 in 2019 [25].

Conversely, Denmark was number one ranked in 2019 and was at the top of the transparency list in 2019 scoring 87%, followed by New Zealand, Finland, Singapore, Sweden and Switzerland [26]. All states mentioned being countries of the North. *Reporters without Frontiers* ranked Jordan 128 out of 180 in the index of global press freedom in 2020, the highest five on the list are Norway, Finland, Denmark, Sweden and the Netherlands. Again, all are countries from the North [27].

4.5. Climate Change in Jordan

4.5.1. Evidence of Climate Change

Impact of climate change on the MENA region is becoming more evident; in Jordan it was proved that Jordan has experienced a clear positive increasing trend in the minimum mean annual temperature, while the annual temperature range showed a decreasing trend, with a strong evidence of a decreasing precipitation trends too [28].

This research verifies another earlier one that proved an increasing trend by 2 ^{o}C of minimum air temperature for eight meteorological stations in the Eastern

Mediterranean, including Amman; as well as a decreasing trend in maximum air temperatures of 1 ^{o}C [29]. To add insult to injury, severe heat spells and prolonged drought, during 2015 – 2016 in North Africa, was catastrophic on small peasants [30]. A phenomenon which might be more frequent and far more severe in the future. In Jordan, for example, a two week continuous heat wave in September 2020, unprecedented in the past 100 years, has left air ambient temperatures surge to unrecorded 48 degrees Celsius in Aqaba [31].

The following data taken in Amman- Jabal Elweibdeh shows an increasing number of sunny days, between 2011 and 2016 in one part of Amman, as shown in table 3, thus verifying the warming nature of climate change in this region.

4.5.2. Environmental degradation

In 2000, Mediterranean Environmental Technical Assistance Program (METAP) estimated the Cost of Environmental Degradation (COED) in Jordan at 2.2-3.3% of GDP [33], and estimated the damage cost to the global environment at 1%. The environmental categories and its mean percentages of the study were: Water (1.2%); Air (0.8%); Land (0.6%), Waste (0.2%) and Coastal Zone (0%).

Comparing this study of the year 2000, with that of the World Bank data 2006 and to a third one (estimated mean of year 2011), which is more up to date on air pollution, where all are summed up together in table 4. The outcome estimates environmental degradation cost in Jordan during 2016 at $ 1,625,000 which represents 4.2% of Jordan GDP in 2016. This is a huge cost to a small country like Jordan. As a matter of fact, other factors contribute to more damage to the environment, such as air pollution and its impact on health; *"...air pollution has emerged as the fourth factor for premature death worldwide. Those deaths cost the global economy about 200 billion euro's in lost labor income in 2013*" [35]. If we add lost labor income to the environmental degradation cost in Jordan on the basis that Jordan producers approximately 0.1% of the world's GHGs, therefore this reflects 200 million Euros, equivalent to $ 220 million, raising the environmental degradation cost to $ 1,845,000 which amounts to approximately 4.8% of Jordan`s GDP. In Asia and the Pacific the environmental degradation cost *"were the equivalent of 7.4 percent and 7.5 percent of the regional gross domestic product ..., at the low end, losses were still equal to 2.2 percent of GDP in the Middle East and North Africa*" [36]. However, this

will be on the rise as climate changes to the worse and the GDP share per capita in the South decreases. For example, in Jordan it was US$ 3069.2, in 2010, and then dropped to US$ 2801.1 in 2016, a high population growth rate of 2.4% and a fertility rate of 3.38%, and an average size of household reaching 4.78 in 2016 [37].

Table 4.3: Sunny days in Amman / Jabal Elweibdeh (2011 – 2016) [32]

Season	Cloudy and Rainy	Partly cloudy	Sunny
2011 - 2012	27	63	275
2012 - 2013	61	29	275
2015 - 2016	52	29	284
2016 - 2017	50	28	287

As for external air quality, fine airborne dust particulates in the Middle East have increased by 70% since the beginning of the century (In Saudi Arabia, Iraq and Syria) [38], inciting lung and other diseases. Inhalable particles less than 10 μm in diameter trapped in the upper respiratory tract, causes asthma, tracheitis, pneumonia, allergic rhinitis and silicosis. However, finer particles can enter the blood stream and hence affect internal organs [39]. Therefore, with deteriorating public health in the South, people will become poorer and the numbers of environmental refugees worldwide are expected to increase. Climate-exodus is highly predicted in the MENA region as large parts of these areas may become uninhabitable due to climate change. Meanwhile, water deficiency increases as the climate becomes warmer and as water is exported to rich countries through exporting natural agricultural products that are water intensive through irrigation. Illustrations of this from Jordan include exported tomatoes, bananas and other cash crops which demand a lot of water to grow. Not to mention leisure water spent on tourism and hotels. Therefore, climate justice requires "*food sovereignty*", "*water sovereignty*", "*conscious tourism"* and "*land rehabilitation*" [40].

Table 4.4: Jordan environmental degradation % of GDP for years 2000, 2006 and 2011

Type	**Ref./year METAP/2000**	**World bank [34] /2006**	**Estimated mean 2011**	**GDP 2016 $ 38700 million**
Water	1.2 %	0.82%	1.01%	390.87
Air	0.8 %	1.13%	0.97%	375.39
Land	0.6 %	0.12 %	0.36%	139.32
Waste	0.2 %	0.24 %	0.22%	85.14
Coastal	0.0 %	0.47 %	0.24%	92.88
World COED	1 %	----	1 %	387
Aesthetic value (tourism, etc)	----	----	0.2 %*	77.4
Damage to biodiversity	----	----	0.2 %	77.4
Total				**$ 1625**

* Estimated at approximately 2% of annual tourism turnover.

In developing countries, “extractivism”, which includes mining minerals, fossil fuels, agriculture, fishing, tourism … etc, is done in response to requests from world markets. The cost of environmental degradation is not included in the price of mining and the extraction of phosphate, potash and other minerals on a global scale. For environmental justice this price must be included to rehabilitate mining sites. Consequently, demand worldwide will decrease when prices increase and so shall the amount of pollution correspondingly. The same positive effect on the environment will prevail with carbon tax once imposed. Unfortunately, it has been postponed from one summit to another, postponing the possibility of getting anywhere near environmental justice.

Unfortunately, there is official approval to mine copper in a preservation area at Dhana in Jordan, and there were serious intentions earlier to mine uranium in the basin that recharges the Disi aquifer that feeds Amman with almost 100 million cubic meters of fresh water annually. Thanks to the low concentrations of ore and to the drop in uranium prices worldwide after Fukushima nuclear disaster in March 2011, mining uranium was rendered unviable in Jordan and elsewhere, particularly in Africa (Namibia, for example). Prices of uranium oxide have dropped from over 130

US$ in 2007, to around 24 US$ by the end of 2019 [41]. It is believed that the uranium mining industry is a disastrous endeavour to the environment, as the damage it causes substantially exceeds its profits, particularly on the extremely long term basis due to leaching radioactivity that can persist for millions of years affecting surface and underground water, the entire food cycle, flora and fauna. This disregards the rights of future generations to a reasonably resilient, sustainable and healthy environment.

4.6. Conclusion

For environmental justice to be possible, and to ensure public health within a healthy ecosystem, many, if not all dichotomies presented in this chapter ought to be solved. In order to achieve this goal, not only public physical health but mental health has to be taken into consideration too. In addition, environmental justice includes solving social and political dichotomies, such as: gender (male and female), poverty (rich and poor), religious and ethnic diversity, social and class discrimination, North – South unequal development, urban-rural, democracy versus totalitarianism, and so forth. Conceiving this dilemma from within the perspective of a "Butterfly Effect" where everything is connected together around the globe and behaves within the same framework implicating that no one nation can work alone to combat climate change. Therefore, it becomes clear that any environmental injustice anywhere on the planet is an act of aggression against human rights and the wellbeing of the whole. What has become more evident in the past few decades is that humans have been involved in seeking justice from an eco-centric perspective driven by environmental ethics, away from the influence of egoism, pragmatism and self-interest, but rather from feelings of duty based on ethical stances and responsibility that stems from an individual free will. This free will stems from the individual's own freedom and sense of justice within a democratic society. Democratic governance seems to be a corner stone in the political structure which can neutrally monitor, evaluate, and respond to the injustice put upon the environment anywhere in the world – the world that belongs to us all.

It can also be concluded that most achievements in developing countries, such as reaching towards gender and environmental justice have been possible through foreign aid to developing nations. Other issues, such as "food sovereignty", "water

sovereignty", “conscious tourism”, "land rehabilitation", "eco-equity", carbon tax, food and water sovereignty to reduce environmental degradation and boycotting "carbon colonialism" are worthwhile considering as an action in response to injustice. Needless to say, these suggestions are hard to implement due to poverty, corruption and administrative incompetence of the South, yet we have to start from somewhere. The time has come to realize that not only China has become the major pollutant of the planet but it ought to be treated as a developed nation that should compensate developing countries for the damage it is doing to the world as a consequence of the annual consecutive high growth and its accompanying pollution. Other countries such as the US, India, Russia, Japan, Brazil and the Asian Tigers, among others, should bear responsibilities towards reducing their economic and population growth rate, reducing high demand on cheap goods, limiting their extravagant way of life and cutting down on the consumption of natural resources, fuel and water per capita, eventually reducing GHGs. All nations have a duty to promote renewable clean energies, not only for controlling climate change but also to create jobs in rural areas, and because it can gradually replace fossil fuels. This will eventually reduce political tension and animosity between nations.

Promoting renewable energy can avoid a similar consequence to the violence we have seen since the "oil fever that incited invading Iraq”, the conflict over the gas pipelines through Syria and the huge gas explorations in the Easter Mediterranean that have been fueling the Syrian civil war, inciting the stand-off between Greece and Turkey in the Eastern Mediterranean, and the other proxy wars in the region, such as the latest Armenian-Azerbaijan conflict over Nagorno-Karabakh region. Renewable energies are an active means for avoiding wars over traditional energy resources, mitigating the impact of environmental degradation and limiting the numbers of consequent environmental refugees dispersing around the globe. Collectively this would achieve a greater degree of environmental justice between North and South and facilitate planetary health for all sentient and non-sentient partners that share the globe.

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5. Are Human Biological Differences Based on Inequalities in Wealth a Threat for Planetary Health?

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5.1. Abstract

This chapter will delve into the biological determinism, biohacking and synthetic biology policies' roles in the future of planetary health. We'll start knowing more about the possibilities of understanding human gaps through an interactive systems perspective paying special attention to top-down and bottom-up flows' significance.

Both climate change and political trust issues are the unifying thread between biological determinism, biohacking and synthetic biology policies with other key topics in the future of planetary health such as political economy, green apartheid, food, poverty, healthcare and the ethical limitations of algorithmic fairness. But, after this multidisciplinary analysis we'll take an utmost green perspective and inquire into how the volatile communication between plants can help to stop climate change along with biohacking and synthetic biology advances. Then, we'll go further even and consider what we need for planetary health to progress that is beyond science.

Finally, we'll share a geopolitical vision of the Earth in 2060 merging all that we have learned during this chapter with a good dose of engaging, but robust, speculation in order to ease the hard task of making sense of this deep complexity.

Keywords: *planetary health, biological determinism, synthetic biology policies, climate change, political economy, green apartheid, inequity, biohacker*

5.2. Interactive Systems, Human Gaps and Planetary Health

5.2.1. Why interactive systems are important for Planetary Health assessment?

5.2.1.1. On the Top-Down and Bottom-Up Systems

This chapter proposes a speculative but grounded approach on how the wealth gap can endanger the Earth through their / the created biological differences. To answer

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this initial question I will resort to systems thinking since they are holistic, dynamic and complex, which fits like a glove in this quest (Pongsiri et al., 2017). Namely, a systems analysis focuses on rules and, in the case of human groups, in values, moreover, it's compatible with spatial and decision analysis (Pongsiri et al., 2017). Thus, it's a sound method for the analysis of non-reversible and non-linear processes, which the scorching of our Earth is.

Below we'll see that top-down and bottom-up Interactive systems are common and not few disciplines use them to explain all sorts of phenomena. Without going any further, these system theories have proven to be more useful than adaptive ones when it comes to explaining key life choices like moving to a new home (Nakazato et al., 2011). The most blatant example of top-down versus bottom-up systems that we all have very present today in our lives is post-truth during COVID-19. In this interactive system an approved truth goes downstream from politicians eager to maintain power by deceiving the public but also another unapproved one flows back from celebrities and social media (Parmet & Paul, 2020). From the downstream Donald Trump's speculations on how UV and disinfectants remedy coronavirus to the upstream popular *cure* of blowing a hair dryer up one's nose as well as the upstream and downstream Spanish subsidized demonstrations and repressed riots in the verge and during pandemics, there is no doubt that Hannah Arendt and George Orwell's critique of disinformation is, decades later, up to date (Rev, 2020);(Lozano Rodríguez, 2020a);(Orwell, 2013);(Arendt, 1950). It has some similarities with the shifting quotidianity we'll see later in this chapter. not sure what you mean by quotidianity… do you mean quotidian-like changes?

Moving to a scholarly context like psychology, bottom-up refers to the external stimuli while top-down focuses on contextualizing this info and requires recalling past experiences (Shea, 2015). Even if top-down processes are necessary, they are tricky and may lead to plenty of illusory justifications and biases due to pre-existing expectations. The interplay of both bottom-up and top-down processes determine our comprehension (Kintsch, 2005). Obviously, it doesn't exhaust the topic and more complex phenomena, as the self-determined motivation, incorporates reciprocal and horizontal effects to the aforementioned top-down and bottom-up (Guay et al., 2003).

Back to planetary health, the Anthropocene itself is a proof of unauthentic reciprocality / unequal reciprocity? Anthropocene means that "*every Earth system,*

from the deep oceans to the upper atmosphere, has been significantly modified by human activity" and, given that these modifications rarely are for good, the terms for describing it are: ecological footprint, great acceleration, planetary boundaries, tipping points, climate doomsday clock and, unsurprisingly, long term survival of human species (Seltenrich Nate, 2018). Regardless of how unequally distributed the Earth's spoils were, most people have been at least slightly favored from its exploitation, however, pushing this path forward endangers the whole human species (Seltenrich Nate, 2018). Anthropocene, by the way, is coherent with the long standing human gaps as well as both the winter and summer death tolls in spite of the unseen amount of new energies increasingly available in the last 150 years that has turned those deaths into avoidable ones for decades (Heslop et al., 2014);(Gooodwin, 2007); (Foroni et al., 2007);(Rodríguez-Urdaneta, 2020);(Lavelle, 2010). We'll meet the Anthropocene many times throughout this chapter.

5.2.1.2. Interactive Systems and Planetary Health

Planetary health is a multidisciplinary field that focuses on how disruption caused by human action on natural systems bounces back against human health. Therefore, planetary health is at the crossroads between ecology and public health and focuses on the way human impacts to natural systems are adversely affecting human populations. In this section, I'll consider, however, both ways when assessing the lack of wide engagement with co-creating solutions for transformative change as in 2021. Also I will do it from a top-down vs bottom-up interactive systems paradigm.

The interplay of bottom-up and top-down processes shapes our understanding, a similar interaction happens in the building of ecological communities (Hoekman, 2010). For example, each planktonic population is bounded by the bottom up growth and reproduction and by the top-down predation (Gliwicz, 2002). In many cases, the temperature works as the wealth inequality and seemingly it also raises the predatory activity (Hoekman, 2010). But, as happens in psychology, complexity is around the corner. In addition to reciprocal and horizontal flows, spatiality opposes and completes the bottom-up versus top-down paradigm and explains why in some high activity ecologies there are bottom-up effects shaping top-down control (Gripenberg & Roslin, 2007);(Menge et al., 1997). Commonly, bottom-up forces set the stage on which top-down forces may act (Stiling & Rossi, 1997). Nature teaches

us two important lessons that we should apply to this subject. Firstly, that top-down and bottom-up are from different natures. Secondly, in interactive bottom-up and top-down systems in which resources are a main component, parasitism is, very likely, another.

I think that the way ecology can be harmed by the public health gaps and how an anthropogenic stage can harden billions of people's daily lives mainly works is an interactive top-down vs bottom-up system. These dim, but extended and opposed systems have parasitic and predatory economic practices as common elements. As a result, either purposely or not, our individual judgement weakens as we stockpile incentives for taking sides under the belt. This is especially true for easy and copious ones. It's a transcendental flaw when affecting how sustainable infrastructures are designed, because those designs lead either to interactive pathogenic systems characterized by nature-deficit disorder or to salutogenic ones featuring a road to regenerative 5.0 societies (Świątek, 2019). To make things more complex, our planetary health current stage is steadily incorporating the reciprocal effects that biohacking brings today along with the inherited spatiality of geopolitics (we'll delve into this topic in section 3.4).

5.2.2. Shattered Humankind

5.2.2.1. The Cancer of Growth

It's nothing new to say that that fighting poverty without increasing rising resource consumption may require population control and redistribution (Daly, 1990). Of course, those de-growth measures have been unpopular and the best moment to act was stolen by the surge of financiarism and the personal ambitions of politicians who wanted to remain in office (Daly, 1990). Nothing was done to address this in the 1990s, 2000s, 2010s… But it's not a *sustainable* lie. Growth is always exchanged with any other worthy feature. Becoming an adult has its advantages but significantly consumes our lifespan. A country that grows fast will face instability due to rising looseness in their new extended human web and it will meet new foes. Our world of countries and cities remains trapped in a kind of development, progress and growth subdued by a political economy that doesn't lift up the small boats, quite the opposite: it fosters inequality (Mihaela–Claudia, 2020). Growing economically too

fast has been paid for with declining planetary health. So, as a species, we can grow financially and yet in reality become poorer.

Sadly, the many human gaps, especially with regards to political voice, have allowed the ones who publicly talk in the name of Earth to be in the same boat as the ones that concentrate the economic growth benefits. So, there is a minority of people handling planetary health, and they are both judge and jury. They pursue financial growth, that in itself is not bad, however, "*growth for the sake of growth is the ideology of the cancer cell*" (Abbey, 1975, p. 183). The promises of green politics (even of green *democracy*) relies on capital accumulation just like the many others as can be seen in the political economy of oceans, which undermines conservation imperatives instead of rising local involvement in the biosphere reserves (Blewitt, 2014, pp. 131, 173); (Torgerson, 1999);(Mansfield, 2007). In addition to the gaps between human groups there are deeper gaps than ever around every individual. They were drawn by modernity and branded by postmodernity. Nation-states and markets as the most pervasive human organization ever requires unraveling the traditional human groups in irredeemable individuals (J. Cole, 2019, pp. 36–37);(Polanyi, 2001);(Elias, 2001, pp. 6–10, 61). It means to subdue everything, even planetary health, to market calculus and turning everything but the self-referencial individual into an unidimensional, fungible and inert otherness.

5.2.2.2. Lack of Perspectives

Planetary health implies that the health of any living unit exists in relation with the many neighboring others. From that angle, a human being is not so easy to define, maybe she is the set of neighbouring cells sharing the same DNA or maybe this set plus the gut bacteria species (J. Cole, 2019, p. 35). From an Earth perspective living beings are not an exact division, and the same goes with time scales, from the speedy metabolic reactions to the majestic ecological processes (J. Cole, 2019, p. 35). Research in how human well-being and ecosystems services are linked in a global scope would be helpful to raise interest in planetary health. Too much focus is put on the biological processes while provisioning and cultural services are marginal and it may happen, as in the Brazilian case, due to gaps in funding (Pires et al., 2018).

Around the world, poverty and disadvantaged backgrounds remain huge barriers in scientific careers and, unsurprisingly, few countries worry about wasting

the talents of underserved youth.[15] As a result, the opportunities for leading scientific institutions concentrate in the most favored backgrounds, and this is getting worse (Lok, 2016). To cap it all, people in higher social classes have an exaggerated belief that they are better than others which could be interpreted, by people lower in the social hierarchy, as a greater competence (Belmi et al., 2020). It influences how class hierarchies perpetuate from one generation to the next (Belmi et al., 2020). Although the evidence for genetic causation has always been weak, there is a great interest in promoting genetic determinist theories of disease causation by both politicians and medical researchers because it allows the politicians to get rid of their responsibility for people's ill health while helping the medical researchers to raise funds (Joseph, 2014, pp. 212–213);(Latham & Wilson, 2010).

5.2.2.3. Fake Meritocracy

Pugnacity is deeply embedded in both our animal and human nature, likewise, our many civilizations grounded on somatic and sexual competition, so our judgement will be biased in favour of interpreting a situation as a conflict between factions, whether it's true or not (Gat, 2010). Human pugnacity, in turn, favors a meritocratic bias. In a human research experiment led by Alison Ledgerwood, it was found that paradoxical behavior was exhibited by participants who defended the system by working harder when they were told that success on the task was due to luck rather than effort, but only when the task was perceived to be system-relevant (Ledgerwood et al., 2011). Therefore, meritocratic beliefs may promote and defend non-meritocratic systems. Thus, a good way of keeping people contributing to the usual intergenerationally rigid systems everywhere is giving a great relevance to the non-meritocratic aspects of our lives (e.g. genetics), especially while praising the individual. Planetary health (and the whole planet!) is second to oligopolistic financial interests benefited by the human gaps that prevent all of us packing together to survive the Anthropocene. So identifying win-win strategies across societal, environmental, and economic concerns is going to be determinant for integrating human processes in a great system streamlined with planetary health.

[15] https://www.nature.com/news/is-science-only-for-the-rich-1.20650

Now we'll delve into this topic and find in biological determinism's social role the first half of the explanation of why biological differences based on inequalities in wealth are a threat for planetary health.

5.3. Biological Determinism, Climate Change and Politics

5.3.1 What is Biological Determinism?

5.3.1.1 Many People Left Behind

Before introducing flexible and inflexible biological determinism, it is convenient to focus on the core tenets of biological determinism at its widest. According to Phil Gasper, biological determinism wants to convince us that social order is provided by unchanging inheritability on the one hand and that this order can be improved greatly by suppressing the unfit (Gasper, 2004). This hardhat though is, as in pandemic 2021, more affordable now than it has been since the end of WW2. Since the 1970s and 1980s onwards the decadence of Western welfare state, a second wave of Western biological determinism has gained impetus due to the lack of a socially satisfactory and smooth transformation model and today, thanks to an unleashed individualism, is at full swing. There is even an emerging field known as genoeconomics that presumes to be able to partly predict your ability to make smart financial decisions and getting wealthier based on your DNA (Kurtz, 2017). Of course, this path doesn't lack tawdry fallacies. For example, there is a trendy slippery slope argument around determinism that says that different genes create different brains holding different personalities and given that people are "*born that way*" some are unable to cope and doomed to unhappiness (P. Watson, 1981);(McCrae et al., 2000). Thankfully, today is hard to find scholars writing on the dysgenic effects of minimum wage, pensions and interracial marriage, but it doesn't mean that everybody has rejected biological determinism, and so keep enshrining inequity as the way life is meant to be (Joseph, 2014);(Gould, 1977). All this pseudo-scientific stuff has led to self-fulfilled prophecies in unequal societies in which they are boldly lobbied. Let's see why.

To begin with, both staying healthy and healing from a condition cost unaffordable sums of money for the common citizen in most countries -even in the wealthiest ones. The United States is a typical case of study since it mixes a relatively high administrative transparency with the dumbest healthcare policies. The US

healthcare expenditure was over 1 out of 6 dollars produced in 2016 and the average cost of hospital stays for cancer patients in 2015 was $31,390 -about half that year's average or mean (the median is much higher) income for US households (Papanicolas et al., 2018). Worse still, about sixty-two percent of personal bankruptcies in 2007 were reportedly due to medical bills, although almost half of those people had insurance (Himmelstein et al., 2009). As a result, the gap between the wealthiest and poorest Americans is about ten years for women and fifteen for men (Karma, 2019). That's a life divide, which happens broadly and the gap is widening (Marmot, 2015); (Olshansky et al., 2012).

Those unequal biological outcomes can be easily perpetuated since populations segregated in socioeconomic classes show an unequal *re-distribution* of wealth (Pansini et al., 2020). When it happens, some groups get their self-confidence sapped, are pointed out as being less productive and labeled as social antagonists against a society in which only a minority's skills and abilities are truly supported and, as a result, this society gets its overall health and welfare downgraded (Singer et al., 2001). Namely, the hormonal differences between rich and poor in testosterona, cortisol and IGF show how societal factors literally "*get under the skin*" and affect health: weight gain, loss of muscle, osteoporosis, depression, early puberty, infertility, polycystic ovaries, cancer, cardiovascular diseases and insomnia (Henderson et al., 2011);(Robinson et al., 2020). That's the burden of inequality that disempowered people must bear while competing for social raising – not to speak of inherited wealth!

5.3.1.2 Irrational Privilege Praising

According to Scott B. Kaufman research, the grounds for greater chances of success in life are (Kaufman, 2018):

- a stimulating environment rich in opportunities
- a good education
- intensive training
- an efficient strategy for the distribution of funds and resources

Those factors are greatly favored by family money and hardly can be leveled with years or even generations of lag. Inherited from parents and hard to change, both intergenerational poverty and wealth have an excellent camo for hiding within

genetics. To cap it all, as Richard Lewontin highlighted, biological determinism is quite fragile and joins misconception about genes and organisms, poor data, worse methodology and shivering ideological defense (Lewontin, 1983). On the other hand, it's false that genetics has null significance on key milestones across your walk of life. However, the weight of the soundest genetic determinism is (unsurprisingly) meagre. It ranges from 3.2-6.6 percent of the variation in educational attainment depending on the specification in the 2016 US research from Nicholas Papageorge and Kevin Thom and the 1-4 percent according to the research done with the Dunedin (ANZ) population on polygenic scores (Papageorge & Thom, 2016);(Beard, 2017).

It's coherent with the results from a key 2015 research on adoptees' wealth that joined the University of Texas at Austin, the University College Dublin and Lund University in Sweden, it was concluded that the wealth of adoptees is predominantly associated with their adoptive parents (more even if they inherit wealth from them), and that "*innate ability and talent are small factors in this intergenerational relationship*" (Black et al., 2015). Unsurprisingly, children who grow up in a well-served neighborhood (one in which the political economy is not ruthless) may have higher chances of becoming well served adults according to the time living there, and vice versa for the impoverished towns. In a 2015 study by Raj Chetty and Nathaniel Hendren among US counties, it was found that every year living in Baltimore is associated with a reduction in a child's later earnings by 0.7%, but every year living in Dupage County raises a child's household income as an adult by 0.8% (Chetty & Hendren, 2018). In short, the county in which you grew up in determines around a thirty percent of the earnings gap, with the children who grew up in a different one, although the prospect for girls is less so determined and geography plays also a role (Chetty & Hendren, 2018). To sum up, you may find an individual wildly favored by genetics but it's inequity rather than genetics which *biologically* determines people.

Worse still, the Darwinist adaptive evolution of distinct entities backs up not only the biological determinism but it spilled over other disciplines and overshadowed the importance of complex synergies and belittles the importance of fluid engagement during research (Seeberg et al., 2020, pp. 12–13). It could change thanks to a sound interactive systems perspective, but rather than this, we are overburdened with elitist wishful thinking and spread willful ignorance. There are plenty of speeches and papers on biological determinism but there is no solid

knowledge of what human inheritance is. To cap it all, the few times the overrated biological determinism is attacked, another type of determinism is proposed instead: radical environmentalism, behaviorism, economism… Hardly such a controversial topic on human nature would leave planetary health unscathed.

Before ending this section and introducing the new division of determinism in flexible and inflexible classes, I want to make two remarks. Firstly, we are not doomed by elites-driven determinism, from a neo-materialist perspective humans can be trusted to create a so-called 'Good Anthropocene' through massive geo-engineering projects (LeCain, 2015). Secondly, this chapter is not a bold social constructivist defense. Although meagre, controversial and underrated, good insights and research on human biological and psychological differences, and the origin and evolution of those features, can be found in authors such as: David Buss, Simon Baron-Cohen, Robert Trivers and Roxana Kreimer (Buss, 2009);(Baron-Cohen, 2005);(Trivers, 2011);(Kreimer, 2000, pp. 79–81). Biological determinism is the bullshitization of research on human biological differences and its apology of inequity is nothing but a seed of the widest corruption.

5.3.2 Inflexible Biological Determinism

5.3.2.1 Unique features

I define inflexible biological determinism as the one that arises from political economy, shares (or appropriates of) a Western philosophical background and appears after a state endures a military-industrial revolution. The history of ancient and lasting cultures shows the way a tight grip on a colonial narrative can reduce it to disconnected chapters while hiding the biocultural forces and forcible adaptation suffered (Carlson & Gerven, 1979). The same goes for life stories. Indeed, looking at the many walks of life with the biological determinism glasses is often an inflexible position. Quite frequently, it serves to the authors' prejudices and the legitimacy goals of the institutions behind, which commonly aims to aggression, competition and domination of a human group over its otherness (Sociobiology Study Group of Science for the People, 1976). Inflexible biological determinism, as I describe it here, has its first main exponent in Herbert Spencer, who saw poverty and starvation as natural mechanisms to get rid of the genetically unfit (Spencer, 1864, pp. 443–474).

The ideas of the bright spark behind the first paperclips crowded the nazi desks and, in this way, inflexible biological determinism made its name (Stein, 1988).

In addition to the aforementioned mix of historical, classist and civilizational components, the second distinctive trait of inflexible biological determinism is a worthy philosophical background – quite the opposite to flexible biological determinism, which is carried away by opportunism. The link between causation and freedom has interested prominent philosophers, however three geniuses as Laplace, Kant and Hume faced this issue between 1748 and 1812. Those few decades determined the determinism to the current time. Laplace's causality was so exhaustive and ubiquitous that there was no room for freedom, for him the world was subsumed in a sort of mechanical fate (Laplace, 1820). Kant went further when conceding that, even if our bodies and environment are swayed by a cosmic and atomic inertia, as social creatures, we are still responsible for our acts (Kant, 1890, pp. 333–345). Out of the frying pan and into the fire. Thankfully, Hume was smarter (in my opinion) when jumping out of the Laplacian fishbowl. He realized that the nub of the issue was politics (Hume, 1861, sec. VIII).

As Lewontin puts it: "*A theory of human freedom that does not distinguish between a free person's liberty and a prisoner's confinement is a political weapon that can only enslave people*" (Lewontin, 1983). We are relatively free, that is we freer than this or that individual. By the same token, we are enslaved according to how close we live to a black hole of opportunities for doing our will. In many cases, this black hole is embodied into a bossy fellowman who, consciously or unconsciously, is interested in perpetuating this situation. For bureaucratic modern states, the slavery of biological determinism was born as a convenient construct for the bourgeois and party leaders who sent the old regime's determinism to the History vault (Lewontin et al., 1982). However, this does not rule out that communist regimes have also practised their own biological determinism (Bucur, 2010, pp. 47, 86–87);(Zhang, 2012). Just like happened with the faith in medieval rulers, faith in government moved wage levels (Hibbs, 1989, p. 26);(Kerr, 1952) – and the wage levels today are freedom levels! That is being unrestricted, undetermined and free to go. Indeed, biological determinism only replaced old forms of predestination for the new one of determinism, but the function was exactly the same: avoiding the risk and expenses of violence coming from people unwilling to accept plain luck as merit and right to

command over them. It explains why the biological determinism was born as soon as an oligarchy mastered both the military and industrial revolutions.

The third key feature of inflexible biological determinism (and the most important one) is that it mostly grounds on political economy. Political economy means "*the technologies and processes governing the valuation of resources as well as their production, circulation and consumption within a given place and at a specific moment in time*" (Del Percio et al., 2017). Political economy, in turn, has two great parts, the production of wealth and its distribution (Mill, 1965, p. 264). Labour exploitation in global value chains, for whom the system works and how inequalities can be manipulated and created afresh for preserving the status quo are questions that inflexible biological determinism wants to give a response tailored to today's most benefited liking (Phillips, 2017). As a result, the arbitrary, hyper-regulated and captured distribution, which is the part concerning value, has led to a *valueless* wealth boom. But why is this link between political economy and inflexible biological determinism so dangerous for planetary health?

5.3.2.2 The Importance of Political Economy

Political economy, serving market fundamentalism, has turned health care into structural pathogenesis through austerity programs, pharmaceutical and food governance, and the rules that support globalized production and consumption (Sell & Williams, 2020). It's partly backed up by the abusive legacy of historical assumptions littering political economy, which suffers from many blind spots, especially flawed constructions of avoidable inequality sources (Best et al., 2020). So much so that: "*political economy was abandoned by most social scientists in the nineteenth century*" (Clark, 1998, p. 18). A century later, the boundary between public and private life during the Anthropocene was conveniently obsolete for the least materially deprived to face the deterioration of the natural environment, not only because they have no political voice but because they have no *words*. Language, in the Bordieu's sense, decides the possibility or impossibility of a human group to perform this valuation, which can be better seen in large inequality systems (Del Percio et al., 2017);(Bourdieu, 1977);(Gal, 1989);(Philips, 2004). So, the agency of a human group over resources (generally opposing to others) ultimately relies on semiotic technologies and skills, it's earned with an exclusive linguistic capital (Del Percio et

al., 2017);(Canut & Duchêne, 2011);(Heller & Duchêne, 2012);(Gal, 2013). In turn, language as a resource can be traded by other material or symbolic resources (Heller, 2010);(Heller, 2001). It might be a chance for planetary health if we consider that political economy stimulates "*pleasure and pain, happiness and unhappiness, desire and exhaustion*" and stimulated by them in turn (Gallagher, 2009, p. 35). Nevertheless, the symbolic wealth of language that would help with planetary health is squandered in an elitist and disruptive worldwide biological determinism instead. It's a very hazardous leakage considering that in the information age, the political economy distributes more than wealth: it circulates life.

The health of a civil society grounds on a sane political economy, without this prerequisite, a civil society is severely crippled in the path to planetary health. Thus, humankind won't enjoy full planetary health while inflexible biological determinism lasts.

5.3.3 Flexible Biological Determinism

5.3.3.1 Distinctive Traits

The aforementioned fracture between political economy and social science created by the ones like Spencer and Galton turned into a wide gap, in the study of individual *and* community goals, that was filled with this sort of intellectual opportunism that flexible biological determinism is. Although the flexible biological determinism is decimononic too, it always existed in the fringes of the inflexible one, perhaps as an epiphenomena. Émile Zola was perhaps the first author who sensed it in his 1885 work *Germinal* (Zola, 2004). Anyhow, in the last decades (and regardless of social perspectives on political economy) flexible biological determinism has boomed and in 2021 it makes up the bulk of the second wave of Western biological determinism. It has been possible due to three changes that are still running. In the first place, interdependence between human groups grew, especially in the last 40 years, which has marooned social scientists in the atoll of complexity. Secondly, the role of sustainability as a social tool is underrated. Since the 1970s, plenty of sustainability scholars have graduated and the discipline has grown robust and interdisciplinar. However, the relative success of sustainability in academia hasn't led to a major social transformation around the political economy. Therefore, the free markets' deeds against global poverty have been earned with a wild planetary depredation (J.

Cole, 2019, p. 36). And last but not the least, thanks to financiarism, a country's macroeconomics can keep shedding good figures while the poor children's human capital is underinvested. So this country will get poorer and poorer, and it will do so while *growing*. This was already seen in the Interactive Systems section above, giving us a good hint to the next step. We need to embrace new logics and assumptions on economics (coevolution, information-entropy cycle, etc.) to understand our recent past (Oatley, 2019). In other words, we'll need to change our mindset to figure out how we have winded up here. (In a subtle sense this whole chapter is on switching gears!).

Quite the opposite of inflexible biological determinism, the flexible one is not monotonous. There are different stances of flexible biological determinism and we'll learn about the most relevant for planetary health. Let's start by tackling the manowar of flexible biological determinism – the racial one. It's the oldest and almost an hybrid with the inflexible one if it weren't because the poor one label is more universal than any racist slur. The confusion of genes with race is a pretext for excluding consideration of social determinants of disease and epidemics, which especially harm the post-colonial indigenous societies (McDermott, 1998). On the other hand, pseudo-academic racism has flexibly adapted to many political landscapes and it is a white patrimony no more (Goad, 1998, pp. 213–214);(Taguieff, 2020).

The opportunist prejudice behind biological determinism that has endured since ancient times naked of scientific jargon, but racialist understanding of human genetic variation today is cutting-edge and relies on human algorithmic classifications (Graves, 2015). As a result, the progress in genomic and neuroscience that fosters interest in racism studies also has a spooky inverse in pseudoscientific racism (Roberts & Rollins, 2020). Thus, sociologists should be wise when designing biosocial models and focus in racial inequities without providing a normative framework for xenophobia to endure. For example, in 1992, the United States government's Department of Health and Human Services, including the National Institutes of Health undertook the "Violence Initiative", a $400 million (in 1992 USD!) program designed to apply the tools of biology (particularly organic psychiatry and behavior genetics) to "*potential criminals, especially black and Latino youth in America's inner cities*" (Allen, 1999). Even if, allegedly, the goal was identifying at-risk kids at a very

early age before they became criminalized, actually the screened children were those in low income and with low educational level, or female-headed households, which led to an overrepresentation of African-American and Hispanic-American with consequent premature labelling (Allen, 1999).

A postmodern form of flexible biological determinism linked with planetary health is the green apartheid. Eugenic colonialism spread spatial discrimination and used nature conservation as a segregational tool, providing exclusive hunting and leisure areas, which was repeated by notable black lobbies when colonialism was over (Guyot, 2007, pp. 88–113). Away from African nature reserves, we ~~neither lack~~ have further examples; how urban green infrastructure, which provides ecosystem services that are essential to human wellbeing, remains unequally distributed across income and race geographies (Venter et al., 2020);(Baka & Mabon, 2020);(Pitt, 2019). It will hardly improve since communality and contestations involved in the deployment of green urban spaces are marred by socioeconomic inequalities and the exclusion of some stakeholders (Lukas-Sithole, 2020). At its widest, the strategic restriction on trade by the developed economies alleging environmental concerns but aimed at their personal gain is a sort of worldwide green apartheid that doesn't lack of rancid racism (Hasnain, 2014).

5.3.3.2 Fluidity and Epigenetics

Although determinist reasoning is always present, flexible and inflexible determinism are not monadic airtight entities across epochs. The best example of this is the role of inherent and inborn differences between women and men in the West, which for a long time has overfeed inflexible biological determinism. Anyhow, the change abroad is slow and sexual determinism remains unbent in most non-Western nations, which paradoxically rely on more than two centuries of colonized scientific sexism (Miller & Costello, 2001);(Greene, 2020). On the other hand, this major shift in a core inflexible biological determinism topic has open interesting discussions on other than the aforementioned traditional binary sexual identities. Here we found, for example, the US dichotomy between pro-gay biological determinism against anti-gay constructionism which has a cultural echo that gets louder or quieter according partisan politics' winds (Weber, 2012). In addition to this, some social stages as the way we eat and how we receive healthcare interest

both flexible and inflexible biological determinism and they will be described in their own sections.

The social turmoil produced between the fall of the Berlin Wall and the fall of Lehman brothers along with the radical global geopolitics hegemonic change has raised a conscience of complexity. It has led many people to shelter in few and first-hand variables, which explains the experimental reductionism of life hacking. Life hacking is a branch of biohacking focused on obtaining thorough data of their daily lives in order to improve productivity or performance (Wexler, 2017). Wearables are only the beginning. The DIYbio applied to brain stimulation frames in a life-hackers' subculture, the neurohackers. Neurohacking started in 2011 when lay individuals created DIY electrical stimulation devices and used them in their heads for self-improvement goals, too (Wexler, 2017). Later in this chapter we'll delve more into the nexus of biotech with planetary health.

To understand flexible biological determinism better, let's see it from a different perspective. Inheritance doesn't limit to genetics but also epigenetics that can be studied from social science. An individual, epigenetically, can inherit (Müller, 2020):

- a history of eugenics
- determinist reasoning
- experimental reductionism

This inheritance matches with the aforementioned main flexible biological determinism traits. Without going any further, human growth itself is the result of the specific relationship between genetic susceptibility to environmental factors and the regulation of growth by epigenetic factors, which is a clear example of how the mechanisms responsible for biological differences between social classes work (Kaczmarek, 1996). Inheriting a flawed DNA information or a difficult history hinders the development of an individual while she eventually becomes *response-able* before her circumstances (or not), nevertheless, how to disentangle both legacies is under-researched (Müller, 2020).

Before discussing climate change, the most concerning topic that links planetary health and biological determinism, I want to summarize the contents of the biological determinism sections till now in order to keep an overall perspective. The features of different classes of biological determinism are shown in Table 1.

Table 5.1: Main Features of Biological Determinism Classes

Class	Grounds on…	Boomed with…	Academically leads to…	Politically leads to…	Affects planetary health…
Biological Determinism	Social engineering	Bureaucratic elites	Pseudoscience	Society of modern castes	Climate change
Inflexible Biological Determinism	Political economy	Inequities from industrial societies	Biased papers	Winners / Party cult	Over-explotation
Flexible Biological Determinism	Epigenetics	Postmodern weakened civil societies	Under / Over researched topics	Indentitarian cults	Post-truth

5.3.4 Climate Change and Biological Determinism

The major global health gains that happened in the second half of the 20th century have happened along with environmental change manifested in large-scale biodiversity loss, climate change, deforestation and land degradation, resource scarcity, changing biogeochemical flows, and pollution – all of them factors affecting planetary health and related with climate change (Veidis et al., 2019). As a result, the Earth is bouncing back and we are not ready for it. For example, the sea-level rise led (due to the saltwater intrusion into coastal aquifers) to an increased risk of preeclampsia and gestational hypertension among Bangladeshi women, which was something hard to predict and harder even to avoid (Frumkin & Myers, 2020, p. 253). Likewise, every slight loss in planetary health will deliver its own healthcare serious issues being the sense of detachment and mental illness that climate change brings one of the most worrisome (Frumkin & Myers, 2020, p. 253).

From this little introduction we can see that climate change is a sort of hub that connect some of the main topics in this chapter:

- Food insecurity, global food corporations and the way food determines us (section 2.5)
- Comprehensive systems and planetary health related diseases (section 3.2)
- Biological diversity and synthetic biology (section 3.3)
- Bioart (sections 3.3 and 3.6)

However, in this section we'll focus mainly on the link between climate change and biological determinism. To begin with, as we have seen in birds and other animals affected by climate change, evolutionary psychology discloses the social Darwinism implicit in biological determinism (Rose & Rose, 2010). In addition to this, art may unveil the nature v culture dialectic implicit in climate change: art is the way considering the set of objective experienced political phenomena around human-induced global warming (Schultz, 2020). The nexus between climate change and biological determinism is the inability to tell ourselves about adaptation, to miss or to be cheated about the biological forces that make us fit for social in-stability and resource scarcity at every scenario.

5.3.5 Food and Biological Determinism

5.3.5.1 Planetary Unhealthy Diets

Global food markets are very efficient providing food but also when it comes to separating the many who eat poorly and badly from the few who have access to all the food they desire according to their purchasing power. However, global food markets have clumsily satisfied the needs beyond individualistic ethos and social Darwinism such as civilizational ones, which were considered by Babylonian, Ancient Hindus, Roman Empire, Mayan, Medieval Europe and Early Modern Japan (Leonard, 2009);(Renger, 1995);(Gopal, 1961);(Jones, 1986);(Linebaugh, 2007);(Brown, 2011); (Schuftan, 2015). Even the British Empire trusted the commons till the flexible biological determinism rose and its trust faded away (Kent, 2015). Not by chance, Garrett Hardin presented his famous paper *The Tragedy of Commons* in 1968 (Garrett, 1968). However, the true tragedy of the commons may be that current forms of risk governance create obstacles for community-based sharing (Morrow, 2019b). Come what may, reducing food to nothing but an opportunity to extract private value leads to an industrial production and global distribution of food that pushes the environment beyond its planetary and ecological boundaries (Vivero-Pol et al., 2018). Doing so, the livelihood of future generations gets mortgaged, so determined.

One in three people in the world suffer from at least one form of malnutrition, however the ones who suffer from the dual burden of malnutrition (underweight and obesity throughout the life cycle) are concentrated in developing countries (Weisstaub et al., 2020). The dual burden of malnutrition is a symptom of an

inadequate supply of food that includes environmentally unsustainable production, marketing and distribution. However, malnutrition prevention programs focus most of the responsibility for food on the individual, which depoliticize a political economy's outcome (Weisstaub et al., 2020). But underweight and obesity are a common feature in vulnerable populations working as a syndemic while, ironically, planetary health begs for a diet (Candib, 2007);(Semba et al., 2020).[16]

The brunches available in the future rely on planetary health today and planetary health tomorrow relies on the brunches we graze on in the present day. It's well-known that current dietary patterns, rich in animal products and excessive in calories, are detrimental to both population and planetary health, quite the opposite than environmental sustainability of healthy vegetarian diets (Abubakar et al., 2015); (Pan et al., 2012). However, although the environmental sustainability benefits of vegetarian diets includes a reduction in global warming, degradation of land, water use, and, in the long run, food insecurity, it's unclear now how the political will for reaching meat-free diets as the social norm is going to act (Fresán & Sabaté, 2019). On the other hand, even if surpassing a food caloric consumption threshold harms planetary health, the countries booming in population and parity purchasing power are unlikely to resist the trillionaires top global food corporations' marketing (Fresán & Sabaté, 2019).

Only ten companies produce almost all food we can find in groceries around the world, furthermore, in some products such as beer, a single giant enjoys a planetary quasi-monopoly (K. Taylor, 2017). This concentration of food and drink production in a very few corporations is significant because diet modifies personality not only in humans but also in birds and squirrels, especially in the young age (K.-O. Lee & Cho, 2013);(Richardson et al., 2019);(Boon et al., 2007);(Carere et al., 2005). Not by chance the "*junk food"* was coined by Michael Jacobson in 1972, during the flexible biological determinism boom as has become more and more relevant till then, too (O'Neill, 2006). Very specifically, the unhealthy abundance of sugar and additives as an essential part of the food industry is linked with sadness, guilt and further overconsumption, which results in a loop of convenience and profit (Szulc, 2016); (Bhaskar, 2012);(Lefebvre et al., 2019);(Hassan et al., 2017). The global food barons' sugar lobbies and alike only evidence the moral vice of manipulativeness by those for

[16] Syndemic is a complex and widespread phenomenon in population health produced by multiple reinforcing conditions

whom the good customer is the infantilized one and how much extended regulatory capture is -just like NYC Mayor Michael Bloomberg defeat in his War on Soda highlights (Lalvani, 2008);(Alvarez, 2005);(Bernardini, 2013);(Grynbaum, 2014). Planetary health needs people who willingly learn to believe, who aim for epistemic maturity, but, seemingly, it also takes learning to eat.

5.3.5.2 A Buffet of Serfdom

In parallel with the rise of modern and biological determinism, people's minds got more and more entangled as new energy sources allowed a few oligarchies to shape the world, which worsened with every new energy resource discovered (LeCain, 2015). So much so that Nikolai Kardashev in 1964 presented the scale that bears his name and relates the amount of energy a civilization has and its information and communication level (Kardashev, 1964). However, the closest energy we use everyday, I mean the food, shouldn't be understood in the same way. Food is more than a market commodity, it has subsumed its own meaning and moral values (environmental caring, e.g.) and influences the way we articulate our own political position in relation with the rest of society (Mestres & Lien, 2017). From an overall perspective, the way contemporary structures of global governance are ruled is manifested in the management of such a fundamental blocks of human life as water and food are and also in how they have been commodified and employed as domination tools (Vivero-Pol et al., 2018);(Harvey, 2007, pp. 60–100, 169–182).

Slaves or not, to feed a projected population of 9.6 billion people by 2050 without ruining the planet requires a revolution as deep as the one that happened at the end of the last Ice Age, the one which led to the birth of agriculture (Hoffman, 2016). Genome edited crops and synthetic biology may be the solution but new light must be shed upon their global governance (Srinivas, 2020). For example, C4 photosynthesis engineering of rice and wheat and nitrogen fixation engineering of rice, wheat, and maize would be a game-changer for crop productivity, environmental remediation, and land, soil, and water conservation (Hoffman, 2016). Innovative food crop bioscience and healthy ecosystems constitute a symbiosis for dealing with the Anthropocene (Hoffman, 2016). But, instead of plenty of hope and real changes for good, it is easier to find colonization winners grabbing environmental knowledge through exclusive patents and biopiracy while messing with planetary health and

extreme poverty from a sole market perspective (ten Have, 2020);(Aoki, 1998); (Shiva, 2001).

Almost all global improvement in extreme poverty (the one related with starvation and stunting) concentrates on the East and Southeast Asia, mainly in the Chinese demographic giant, while Africa has only slightly improved since in the last decades (Hickel, 2019a);(UN Economic Commission for Africa, 2014). Global extreme poverty reduction is so unequal that Africa is in the path of accumulating the 90% of people living below $1.90 on Earth before 2030.[17] According to senior Oxfam economist Muheed Jamaldeen calculations on Lakner and Milanovic data, the poorest 10% will need about 250 years to reach the present 2021 equivalent income of USD 11 / day (PPA) (Jamaldeen, 2016);(Lakner & Milanovic, 2013). David Woodward, from the UN Conference on Trade and Development estimates, in turn, 200 years to eradicate poverty at a USD 5 / day (PPA) and 100 years if considered an extreme threshold of USD 1.90 / day (PPA) -and this considering that no major crisis are going to happen, which is hard to believe during a pandemic (Woodward, 2015). Just thinking that there is the slightest chance of seeing the end of poverty in the next 250 years after hundreds of centuries of plain human survivalism is a great new. But there are more chances of our natural habitats and cities getting blown away, scorched or dried out before and, bluntly, becoming google eyed with a *whimsical* poverty line won't reduce the risks (Gaulkin, 2021);(Xu et al., 2018);(Pogge & Reddy, 2005).[18] Take it as you like, but it is not that onward and upward human progress sold at Davos. Rather than this, it's a bit hopeful, quite modest and very unequal progress happening along with animal overexploitation and a rising share of oversizing people with undersizing political voices even in the most socially advanced countries that may erase it (Elliott, 2007).[19] So much so that the number of people in poverty below the USD 7.40 (PPA), which is the minimum threshold for avoiding serious health issues related with poverty, raised in 1 billion between 1981 and 2013 (Woodward, 2015). Therefore, demographic control, even when not in accordance with human rights, may result tempting for some states, especially in a context of pressing climate change and food shortage, which means that, sooner or

[17] https://www.worldbank.org/en/region/afr/publication/accelerating-poverty-reduction-in-africa-in-five-charts

[18] https://www.af-info.or.jp/en/ed_clock/

[19] http://www.fao.org/3/a0701e/a0701e05.pdf

later, actions will need to be undertaken to prevent coercion and killing (Waller, 2019);(Xu et al., 2018).

The SARS-CoV-2 outbreak has been a sobering lesson on food that shouldn't be forgotten. According to the UN State of Food Security and Nutrition in the World (SOFI) report, COVID-19 pandemic could have increased the total number of undernourished people in the world by between 83 and 132 million only in 2020 (Food and Agriculture Organization of the United Nations, 2020). In the light of this terrible news, empirical research from members of the Community Economies Research Network from Australia, New Zealand, India and Finland points to reevaluating traditional shared agricultural systems as a planetary food commons (Healy et al., 2020);(Sitrin & Sembrar, 2020).

Food mirrors the flaws of political economy on what biological determinism grounds. The food landscapes, or foodscapes, are not alien to the Anthropocene or bio-art and the way it reflects gastropolitics will give interesting hints on sustainability (Fargione, 2019). The over-production and over-consumption of meat and dairy products is a three-folded danger for the planetary health: in addition to the aforementioned unsustainable energy use, unbound commercial activity raises the chances of superbugs and antimicrobial resistance appearance and also extends the injustice against animals to the humans who work in the sector (Parker et al., 2020). Labelling meat in order to warn about those issues is a paradigmatic example of the present 2021 inefficacy (Parker et al., 2020).

Table 5.2: Biological Determinism, Food and Labelling

Class	Inefficacious Food Labelling	Efficacious People Labelling
Inflexible Biological Determinism	Don't finger point the food systems dominant actors' power	Don't finger point the money-making
Flexible Biological Determinism	Don't be suspicious about greenwashing or reductionist labeling	Don't be suspicious about dissident or terrorist mass accusations, *fatwas* and alike
Biological Determinism	Don't join collective political action to overtook a flawed food regulation -retweet it and keep posing	Don't join to any collective political action going upstream -be content with cancellations once in a while
Bio-*meh!*	Keep bittering on social media while piggin out with Oreos	

Labelling, when continuously applied against human groups, leads to social neurosis and contributes to stigma (Lozano Rodríguez, 2020b, pp. 106–112). Likewise, the epigenetic effects of eating junk food goes through generations and nests on the inherited inequality, as research on Black People in the US exemplifies (M. D. S. Scott & Stern, 1985);(Ver Ploeg, 2010). Thus, the way we eat grounds biological determinism in many ways, which, in turn, hampers the Earth's well-being. In sum, planetary health marches on the stomachs of each and every one of us.

5.3.6 Healthcare Trends and Its Role on Planetary Health

5.3.6.1 Digital Healthcare, Caretaking and Nursing

Digital healthcare is the provision of resources needed to treat ailments and diseases as well as maintaining body and mind balance through binary computable systems. Thus, digital healthcare is close to innovative biocentrism and ergonomic design, which is an opportunity for planetary health. Synergies and co-evolution between culture and nature in the design of biophilic applications may raise the social and natural capitals alike, which could help to mitigate the negative impacts of the anthropocene (Świątek, 2018). If that were not enough, digital care programs and apps have plenty of potential for diverse healthcare issues and healthcare management offering a more economic first-line architecture of attention. It has been yet a reality for many health issues as low back pain, early psychosis, epilepsy, and long-term chronic conditions among children and young people (Shebib et al., 2019); (Torous et al., 2019);(Nightingale et al., 2017);(Page et al., 2018). Anyhow, it opens some questions. On the one hand there is the question of how to turn a cost-effective alternative for providing clinical effect and distributional impact in healthcare into an equitable one. On the other one, there lies the question of how to turn this equitable alternative into a new primary public health system (Wilkens et al., 2020).

In Susanna Trnka words: "*digital care technologies recast the spatiality and temporality of healthcare, enabling new ways of constituting and tracking health, expanding possibilities of interactive exchanges with others, and redistributing a sense of agency and control*" (Trnka, 2016). Consequently, digital care technologies are not only streamlined with the market liberalism, but also with its wider philosophy of self-governance and individual responsibility. This individualism along with care as a feminized and usually precariously waged work leads us to the most genuine

postmodern caretaking. I mean the Autonomous Sensory Meridian Response, popularized as ASMR, and usually consumed through YouTube and similar platforms (Bjelić, 2016). An ASMR typical video shows a well-groomed sexually appealing woman whispering and realizing a menial task with a luring sound centered in the single person she's talking to through the screen: the individual (O'Connell, 2013). However, for many people those new opportunities don't pay for an inescapable and disrupted healthcare context in which the desires of giving and receiving care is preceded by technological demands (Trnka, 2016).

Thanks to this immediacy of care, nursing will have a greater role in planetary health since it can make more resilient health systems when it comes to face and anticipate new disease patterns and health needs, stresses on air quality, food production and water systems, and equity concerns (Kurth, 2017). But, along with environmental and health profession education, nursing can also improve the generation of sustainable energy through reducing healthcare carbon footprint (Barna et al., 2020); (Kurth, 2017). In addition to this, a 2020 study led by Omnia El Omrani on respondents originated from 2817 medical schools in 112 countries, which found that less than one of six medical schools have incorporated climate change and health into the curriculum or have students leading climate-related activities (Omrani et al., 2020). So we can conclude that present-day and future healthcare professionals need a curricular shift in order to be a decisive force for planetary health. In the disfavored echelons, and just like happens with some strands of biological determinism, digital care futures also deploys in geographies of care as waged work. The rise of labour agencies that facilitate the transnational recruitment of care workers sustain global chains of value that fills care deficits in destination countries, although they open care gaps in sending ones (Schwiter & Steiner, 2020). Thus, the way digital transformations are reshaping and commodifying care work and what the outcomes are has an echo in planetary health.

5.3.6.2 Systems Perspective on Care and Algorithmic Fairness

Coronavirus has imposed a systems perspective as this pandemic unveiled the interconnectedness between health inequity and climate crisis decision making. Just like it did with food redistribution, COVID-19 gives us a sobering lesson on how the lack of critical thinking has led to a collective trauma. Although the US is the most

notorious exponent of messing with health inequity, climate change denialism and pandemic, is not the only one (M. F. Watson et al., 2020);(Hess & Maki, 2019);(Braun, 2019). In addition to this, telehealth and digital care solutions, just like any good information system in a key position, would have set a difference in the present crisis, which highlights swift legislative capabilities as a decisive factor for saving lives (Jnr, 2021). Unfortunately, swiftness and wise risk management are not so common as social climbing and opportunism, so limiting available care doesn't ground on democratic processes after a public deliberation between clinicians and patients over accountable markets and reasonable management. Health market accountability requires empowered consumers and transparent rationales to know the limits in the healthcare access (Daniels & Sabin, 1998).

Users feel attached to systems which they trust, find useful and affordable, so businesses have an incentive for creating beneficial systems that respect users' privacy, values and autonomy (Bartneck et al., 2021). In the case of a morally responsive robot, it could refuse some wrongs petitions from the user and most people would be happy with robots acting in a clearly regulated and legal framework. In this case, the human-robot relation would be an interactive system of top-down human orders and bottom-up robot responses. However, we have witnessed how unpunishable this is to use a cutting-edge AI to badly cheat and betray trust and privacy grants when it comes to a giant like Facebook (Cadwalladr & Graham-Harrison, 2018);(Lozano Rodríguez, 2018). In addition to the beneficence and autonomy granted, people trust first in the systems, moral agents and machines they can explain to themselves (Bartneck et al., 2021). Explicability is not exactly transparency, but intelligibility and accountability (Floridi et al., 2018).

The EU's GDPR says that when a decision is made by an algorithm, the involved people have the right to this algorithm to be explained to them, so it's a right to sense-making (Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016, 2016). It's fine with explainable AI as Machine Learning but not for unexplainable cutting-edge AI like neural-networks (Bartneck et al., 2021); (Wachter et al., 2017). Given this, accountability appears as the last resort of trust among people and institutions and firms because without accountability there is nobody (or nothing) to blame and all the incentives fall on the side of betrayal. It doesn't mean that accountability is the only principle to consider according Eduardo

Magrani, who addresses other ethical principles not mentioned above as fairness, reliability and inclusivity, especially during the design phase (Magrani, 2019). Those ethical principles are needed in order for the law to keep up with the pace of technological innovation in the dawn of artificial moral agents since legal channels around electronic personality, especially when it comes to repairing the harm *e-persons* will do – the Dystopian's touchstone (Magrani et al., 2019);(Hayes et al., 2020). Regardless, the greatest danger in algorithmic fairness is not negligent robots but the lack of critical reasoning and healthy mistrust we enjoy today in data gathering and handling since, if accepted blindly, it can shape entirely our values more than a human one (Hayes et al., 2020);(K. S. Gill, 2020);(Araujo et al., 2020).

5.3.7 Political Trust

Trust is the reliance with a pinch of salt and, along with climate change, is the other axis across this chapter. Trust links planetary health with food, political economy, international relations and even with the fall of the West.

Trust is commonly used in international relations and a basic assumption for partnerships. As we can see from examples such as the Forum on China–Africa Cooperation, trust is built, in the first place, from acquiring information about the interests of the possible partners and the expected outcomes they want to achieve and, in second place, from understanding and sharing them (Herman, 2021). It's similar to how trust encroaches on a whole country's economy. In Ukraine for example, it was empirically proven a close relationship between devaluation expectations of business and trust in the government and the Parliament of Ukraine (Kryvych et al., 2019). The economic policies pushed by central banks are not that scientific, rather than this, they are biased by political emotions and enjoy, in turn, a similar degree of trust to most governments. Just like what happened with faith in medieval kingdoms, trust in governments can move the wages and vice versa. Objective economic performance influences political trust through an asymmetric bias: if the economy is bad, trust shrinks; if the economy is good then trust doesn't change (Vries, 2012). In the Eurozone, for example, the decline in trust during the sovereign debt crisis showed barely differences between the EU and the members' government, which was mainly driven by unemployment (Vries, 2012).

Of course, trust doesn't lack a political spooky reverse. Ying Liang's research on earthquake survivors in five counties of Sichuan found that a relatively higher trust in governmental work was associated with better scores in the WHO's quality of life questionnaire around body and social relations, but the same didn't go for mental resilience (Liang, 2016). If it comes to be a general rule, what would prevent governments with meagre concerns for individual rights to label every person that gets mentally broken during a crisis as a dissident? Rightly or wrongly, the bulk of people would *trust* this label. It would be very convenient for an authoritarian ruler to equate sanity with obedience.

Likewise, trust in growth has led to the overexploitation of natural resources (Krall et al., 2003, p. 183);(V. Thomas et al., 1999). In turn, this overexploitation has brought a growing non-communicable disease burden, expanding nutritional vulnerability, new infectious disease exposures, susceptibility to displacement, injury, and mental health risks, all of which disproportionately threaten the poor, the young, the elderly, and future generations (Veidis et al., 2019). Put it bluntly, blind trust in power and prosperity is the fuel for biological determinism.

On the other hand, citizens' trust in their public institutions generates social capital (S. Lee, 2021);(Putnam et al., 1993);(Veenstra & Lomas, 1999). A government whose responses to challenges, such as the Coronavirus pandemic, have been transparent, consistent and fast have built trust and obtained further compliance – and vice versa (S. Lee, 2021);(Lozano Rodríguez, 2020a). As the French case shows, political trust is neither detached from the topology of power (the different logics of institutional orders) nor the growing foggy complexity of governance arrangements (A. Cole et al., 2018). Quite the opposite, the citizen's institutional mistrust reduces social capital. Across the West, and due to the weakening of civil society, the void left by welfarism is being occupied by two strands of (in Umberto Eco's words) ur-fascism: identitarianism and neoliberalism (Eco, 1995).[20] Both of them shape in different ways globalization, climate change, global communities and, of course, planetary health (Mocombe, 2019). As of 2021, the best-known ur-fascism exponent is the former US president Donald Trump, whose tenure exposed how key political agents (usually winners of biological determinism) have "*favored polluting industries and their lobbying firms; eviscerated some key government agencies; and diluted or*

[20] A neoliberal is a person who staunchly defends free markets but whines for banks' bailout.

overturned environmental regulations" while harming health-care delivery at a national level (Frumkin & Myers, 2020). On the other hand, in geopolitical regions such as Europe, people relying on news websites usually have a higher trust in political parties than those who prefer social media (Ceron, 2015). Regardless, the penetration and impact of social media is more and more present in party political conferences. The presidency goes for the candidate with the last re-tweet.

So, to sail across waves of populism, political trust is not enough: distributional fairness, revenue salience, policy stability, accountability and to really know where things are going are also imperatives. Amongst those needs, knowing the direction things are heading is the most important because, as in the AI case, mistrust grows with inexplicability. As seen in Table 1, this sort of obscurantism goes hand by hand with biological determinism and the politicization of human life. In turn, the amount of politicization within and beyond science is leading to a new obscurantism through science skepticism, which is increasingly not only among lay citizens but also within the scientific community itself (Druckman, 2017). This is evidenced in the Flat-Earth movement, books like *The Secret*, demonstrations during pandemics, scientific denialism and measuring *civility* through a sort of Orwellian video-game you must play against millions whether you want to or not.

Collectively this is so foolish that simply pointing out that humanity is not in the right path seems clever. Yes, a change is needed and a change is within arm's reach. I mean through synthetic biology and the rise of biohacking. But, beware changes are not always for the good, so we'll delve into it in the next part of this chapter.

5.4. Synthetic biology, Biohacking and Planetary Health

5.4.1 New Roots

5.4.1.1 Synthetic biology and Biohacking

Synthetic biology is the scientific field focused in the redesign and creation of new biological systems, especially to produce new useful parts, entities and devices. Since its beginning in the 2000s, synthetic biology merges and handles networks of relevant biological entities as chipsets giving access to new functionalities, which brings new opportunities and risks for the environment. On the bright side, synthetic biology and cutting-edge computation have gone further in the amino acids writing the genetic code and gone back into life's story than ever (Malyshev et al., 2014);

(Attwater & Holliger, 2014). However, according to Adam Erickson: "*A combination of next-generation sequencing, CRISPR-Cas9, MCR gene drives, and targeted DNA degradation may facilitate the characterization and control of population genetics*" (Erickson, 2015). In addition to this, neuroscience and immunology will be key fields to bring new solutions for the new biosocial models made up from human and non-human assemblages (Ticktin, 2019). Prenatal population control, neuroscience and immunology is all that is needed to bring to reality *a brave new world* (Huxley, 2020). Therefore, what direction is best for synthetic biology should be chosen in reflexive and socially robust ways (Delgado & Porcar, 2013).

In turn, biohacking is a do-it-yourself citizen science originated from the synthetic biology advances that merges body modification with technological devices (Yetisen, 2018). Due to the influence of hacking culture in which it was inspired, biohacking shares the bioethical and legal issues of synthetic biology and other controversies of its own. To start with, biohacking is focused on cost-effective lab tools and indie science, especially open-source medicine. Biohackers, in turn, want to delve into cybernetic self-knowledge and expand privacy rights (Yetisen, 2018). Given that biohacking is open to everyone, happens out of traditional institutions and strongly advocates for an inviolable privacy, it has raised serious concerns from public authorities due to its uncontrollable nature (Lapworth, 2020). This is partly true since amateur molecular biology laboratories do not sound secure or safe. However, the media have mixed politicians' fears and popular opinions in a whirlwind of "*hope, hype, and horror*" (Seyfried et al., 2014a, p. 549).

Yet, biohacking is not the craziness as described in the media. It is a tinkering art, but it relies on firms, registries, gene banks and even international meetings providing services, visibility and *biobricks* to the DIYbio communities (Nash, 2010). All those junior biologists and other scientific tinkerers perhaps are a threat for well -stablished synthetic biology firms and they may suffer lobbyists foul play, but biohacking is a movement unlikely to be stopped (Ledford, 2010);(Delfanti, 2012). Biohacking is not only a grassroot movement, but new roots.

5.4.1.2 Biohackers!

Innovative digital users, e.g indie game developers, who challenge cultural practices and organizational forms are toxic to those ubiquitous platforms that want

precarious individuals that are at the same time empowered to consume and exploitable (Centre for Digital Cultures & Institute for Culture and Society, 2018). Even if profitable in the short term, innovative digital users may overcome present-day determinism, creating networks of human and non-human morally relevant actors (Centre for Digital Cultures & Institute for Culture and Society, 2018). Specifically, Radical Leveling Technologies are disruptive social levelling tools created in online open-source collaborative communities without the need of an extensive infrastructure (Snow, 2015). Given that the enforcement against Radical Leveling Technologies is pressing, it has resorted to unconventional means in order to survive counterproliferation: cyber bounties, cyber privateering, hybrid fusion centers, and decentralized autonomous technology teams (Snow, 2015).

Among those innovative digital users, biohackers are the ones who have raised the biggest controversy. And not in vain: biohackers might get into a loop of mutual enhancement with organic robots able to modify their own genetic source code in ways that improve, in turn, their AI and the user one (Pearce, 2012). Those genetically extended biohackers and affluent buyers "*can potentially abolish aging and disease; recalibrate the hedonic treadmill to enjoy gradients of lifelong bliss, and phase out the biology of suffering throughout the living world*" (Pearce, 2012). Namely, amongst the biohackers exist the grinders. Grinders make up a biohacking subculture in which their members place enhancements in their bodies through experiments and surgeries. They go with the DIYbio because they believe their individual agency may be engulfed by research institutions and market-driven private industry if opting for traditional enhancement ways (Doerksen, 2018). Grinders understand their bodies in a social context that mixes positivism and *constructionism* and try to adapt themselves to social uncertainty through techno-biological solutions such as magnetic implants, RFID tags, body-computer interfaces and suchlike (Doerksen, 2018). This tension, however, reinforces hegemonic current hierarchies since they cannot escape from the digital economy of information (Doerksen, 2018). Biohacking is hardly going to get close to its elevated emancipatory goals.

But regardless of *hope, hype and horror*, it's undeniable that before the movement of DIYbio it was not possible for most people to realize genetics and molecular biology experiments (either dangerous or not) directly at home (Landrain et al., 2013). But now in 2021, it is even possible to get a low budget self-PCR

machine and other devices (Bagnolini, 2015). For good *and* evil, the next step for biohackers is mastering the mutagenic chain reaction gene techs, which would allow them to skip Mendelian inheritance's bounds (Getz & Dellaire, 2018);(Charo & Greely, 2015).

In spite of those very real dangers, the success of DIYbio may lead to more affordable solutions for environmental and health issues as influences "*discussions of cultural values, medical ethics, safety, and consent in transhumanist technology*" and, first and foremost, turns into an unheard educational opportunity for all the people (Yetisen, 2018);(Ahteensuu & Blockus, 2016). For example, in 2012 Copenhagen's Medical Museion relied on a biohacking initiative for empowering citizens to understand and carry out scientific research (Davies et al., 2015). In turn, BIOCHAM and alike environments for modeling biological systems make more accessible the task of formalizing experimental knowledge (Calzone et al., 2006);(Fages et al., 2004);(Regev et al., 2004). It will influence the interaction between deference to scientific authority and religiosity, which may be unique to synthetic biology since it often triggers images of scientists overstepping moral boundaries or playing god (Akin et al., 2017). And vice versa, societies that are very deferent towards scientific authority and, allegedly, more ready for synthetic biology, might be also less participative in concerning social issues related with science (Brossard & Shanahan, 2003). Amidst this paradoxical attitude towards synthetic biology, biohacking communities have created their own ethical codes to enable safer, affordable, participatory and democratic science with which everybody can get personally involved (Bagnolini, 2015);(Shore, 2006). Till now, biohacking has helped to make malaria treatment more affordable, but hasn't led to any new disastrous biological leakage (Ferguson, 2013). That's a real risk to the status quo: biohackers pose again our relationship with science and technology. We'll examine thoroughly the true measure of the dangers from biohacking danger in the section on governance.

5.4.2. A Planetary Health Mindset

5.4.2.1. Planetary Health from a Systems Perspective

Before merging planetary health with biotechnologies, I want to sketch the planetary health's main features in relation with some of this chapter's main topics. To start with, planetary health is not a new discipline, quite the opposite, it's an ancient one,

for example, Hipocrates' work *On airs, waters and places* was written around the 5th century BCE (Hippocrates, 2004).

Yet, the modern face of planetary health emerged half a century ago and crystalized in movements such as Friends of the Earth and the Ottawa Charter and in statements like the Canmore Declaration, which highlighted that the previous health definition was not enough because personal health requires of planetary health (Prescott et al., 2018). As time went by, it became more evident that planetary health needs a global language about health and ecosystem externalities in order for comitigation of policies (progressive pricing mechanisms, protecting freshwater resources, tackle, reducing food waste, etc.) to be successful (Demaio & Rockström, 2015). In the Anthropocene, the window of opportunity and deadline for completing these tasks is not ample (Folke et al., 2011).[21] So, great events such as the 2015 Conference of the Parties to the UN Framework Convention on Climate Change held in Paris or the 2015 World EXPO on Feeding the Planet, Energy for Life in Milano were organized and ambitious initiatives such as the Global Action Plan for the Prevention and Control of NCDs and the Sustainable Development Goals were undertook in the last decade (Steffen et al., 2015);(World Health Organization, 2013). By the same token, this movement framed worth reading papers and reports such as *2013 Global Burden of Disease Study* and *The Rockefeller Foundation–Lancet Commission on Planetary Health* (Mokdad et al., 2016);(Whitmee et al., 2015).

Planetary health, in short, emphasizes connections between human health and environmental changes and describes how the worldwide vitality network is shaped by human-driven and natural systems clashes (Pongsiri et al., 2017). That's one of the reasons why interactive systems theory is a good methodological framework for approaching many aspects of it. So much so that planetary health links human health with more comprehensive systems, for example, deforestation and climate change cycle raises the risks of zoonotic disease because it gets closer to people and wildlife, on this basis Ebola might have been a planetary health disease (Horton & Lo, 2015). Given that it's an *interactive* system public health shouldn't keep being smaller than the other sustainability threats every civilization faces at many levels, neither belittling the link between the life we coexist with and the life we rely on, for this reason "*planetary health is the health of human civilisation and the state of the natural*

[21] https://www.eea.europa.eu/data-and-maps/indicators/heating-degree-days-2/ipcc-2007-contribution-of-working

systems on which it depends" (Whitmee et al., 2015);(Horton et al., 2014);(Horton & Lo, 2015).

5.4.2.2 Survival

The COVID-19 pandemic might be the reality check the Earth's nations required to realize the urgent need for heightened mitigation (and co-mitigation!) awareness and the start of a new generation of children and young educated in the paramount importance of sustainability and planetary health (Borries et al., 2020);(Lutz et al., 2014);(S. R. Gill & Benatar, 2020). However, it could also be a chance for some authorities to censor public participation and to wither the kind of education that teaches to break barriers (Zeinali et al., 2020).

Planetary health is about feeding ten billion healthy people within nonnegotiable Earth's boundaries (Demaio & Rockström, 2015);(Steffen et al., 2015). Such complexity meams that planetary health doesn't grow strong between thick disciplinary silos' walls (Myers, 2017). For example, due to the profligate use of antimicrobials, the soil biota's resistome is so hardened that it constitutes a problem for planetary health (Zhu et al., 2019). From a One Health perspective it's clear that the soil is a pathway through which humans are exposed to antimicrobial resistance determinants (Zhu et al., 2019). However, political economy rarely is fair and conflicts between the public and the private and between the industrialized and the emergent countries arise. This harms efficiency to the point that the science policy gets soaked in incoherence (Moran, 2018). Sadly, a planetary health framework only can ameliorate the problem but not solve it (Moran, 2018).

There are three co-s that planetary health needs: co-mitigation, co-benefits and coherence. Within this trio, coherence is, by far, the most difficult to reach. Let's see it in a double example. The Viet Nam statism flaws expose how silo mentalities within the administration and among international organizations result in poorly integrated environmental strategies (Dorband et al., 2020). On the other hand, from an alleged liberal perspective, "*the role of integrated socio-technical aspects of provision, the opportunistic use of contradictory economic arguments serving industrial agendas, the creation of an apolitical façade*" has led to governmental regulatory capture and carbon lock-in around car dependence (Mattioli et al., 2020). Coherence should not be blamed for not being profitable but the ones in charge for being so greedy. It's not

global warming but vested interests and partisan silos mindset corrupting an overall perspective which endangers planetary health the most.

5.4.3 Synthetic Biology Governance and Politics

5.4.3.1 Tying Up the Dots

Green initiatives and biodiversity conservation have grown more dependent on efficiency as the Anthropocene was unleashed. So, the metrics and produced knowledge have become more and more pressing for synthetic biology when applied to these fields (Valk & Marloes, 2020). As a result, "*governance of synthetic biology with the aim of biodiversity conservation is fraught with uncertainty, risk, uncertainty, and contrasting values*" (Valk & Marloes, 2020). In turn, knowledge creation is aimed at being relevant for policy-makers and granting measurability when applied to ecosystems' diversity (Valk & Marloes, 2020). Sadly a kind of diversity may be left behind, the diversity in knowledge and accountability, which becomes more trivial as the political power becomes more unequal (Valk & Marloes, 2020). In order not to get engulfed by an incoming molecular biopolitics, education needs a shift to data science to understand life and network governance computationally (Gulson & Webb, 2018). Sadly, data science literacy is not the norm, as of 2021, especially if compared with state-sponsored views of national history that (unlike data science) brings no life-skills (Pasek, 2018);(Deoras, 2020);(Carretero, 2011, pp. xxvi–xxvii).

Planetary health's governance and stewardship crises may pass to synthetic biology and vice versa in a political landscape of international healthcare insecurity and meagre institutional value (Stawicki et al., 2021);(Wu, 2020). How COVID-19 scorched the West represents this creepy political landscape and sees the decline of former liberal commitment in favour of populism and opportunist redistribution between globalization's winners and losers (see Table 1);(Bisbee et al., 2020). On the other hand, China has increased in power. but has also betrayed some values. Xi Jinping abandoned the "harmonious society" value in favour of a rising authoritarianism and power grabbing (He & Warren, 2017);(Jackson, 2018);(Wo-Lap Lam, 2019). Just like in the eve of WW2, history's clock strikes again the hour of the traitors.

As a result of this governance and stewardship crisis, the state as a political body has faded away as the postmodern era progressed and today seems closer to the

biospheric and the microbial (Fishel, 2017, p. 2). So, the analogy of the individual in liberal political theory and the state in international theory is today a biopolitical byproduct with a fixation for autonomy and autarky (Chandler, 2018);(Fishel, 2017, p. 15). The bright reversal of this necropolitics, as Stephen Fishel exposes in his book *The Microbial State*, is focusing on vitality connection and entangled responsibility, although present politics seems allergic to responsibility (Fishel, 2017, p. 21);(Cai, 2004);(Kocaqi, 2019);(Harari, 2020). To survive the Anthropocene there is a need to get rid of politics that is dirty and stained by metaphors of war and accept political bodies as an assemblage of human and non-human beings composed by different species that, in turn, makes up different biosocial entities (Fishel, 2017, pp. 49–69). The One Health approach and humanitarian care for non-human may unlock a new imaginary of non-moralistic politics (Ticktin, 2019). But what would mainstream politics be without its moral pretext, without so much do-gooding lectures? Nothing but a naked struggle to reap pastoral power and a raw trade with the financial one.

5.4.3.2 Biodiversity

Let's stop now on the biodiversity topic since there exists a link between biodiversity, synthetic biology governance and planetary health, or, in other words, between ecosystems, societies and life (Pesic et al., 2020);(Singh et al., 2019). In 1992, the UN celebrated the Convention on Biological Diversity, which in 2014 noted concerns with synthetic biology activities in one country harming another's environment or nations without strong biotechnology industries being economically bullied by the ones able to create a new agriculture (United Nations, 1992).[22] Although the 2014 UNEP declaration was signed by most countries, there is hardly any global initiative on governance despite concerns and, in the light of climate change negotiations, synthetic biology is unlikely to be ruled, in the near future, under international laws shared by most countries (Kirksey, 2016);(Srinivas, 2020). Thankfully, biohacking and bioartist communities are opening the floor to dispel fears and achieving a critical and constructive cultural change (Kirksey, 2016).

[22] https://www.cbd.int/doc/decisions/cop-12/cop-12-dec-24-en.pdf

The UN Convention on Biological Diversity affects synthetic biology with two protocols: the Cartagena and the Nagoya ones.[23,24] The first, adopted in 2000, is about GMO regulation and development and the second, adopted ten years later, is about fair redistribution of profits from genetic resources linked with a community. In both cases, they would benefit from more thorough application of the precautionary principle (Eggers & Mackenzie, 2000);(Tagliabue, 2016). Considering not only profits but also harms, the geneticization of aboriginal communities imposes a sort of determinism on them (obesity, alcoholism and so forth) and gambles with the economy of hope, so it is important to bear it in mind (Poudrier, 2007); (Munsterhjelm, 2013).

5.4.3.3 The Fair Measure of Biohacking Danger

As discussed in section 3.1.2 above, biohacking involves research that is away from mainstream scientific settings conducted by researchers who believe in their right to do science and that may not have a homologated curricula (Zettler et al., 2020). More significantly, many biohackers are not exaggerating when boldly stating that traditional scientific institutions and regulations have systematically overpromise and under-deliver about benefiting society, just as the COVID-19 evidenced (Zettler et al., 2020);(Colglazier, 2020);(Wynne, 2006). However, some of those institutional science blunders have splashed biohacking, too. From the first CRISPR babies announcement in 2018, concerns of biohacking have surged and overshadowed the fact that it is subject to numerous oversight mechanisms, both public and private. So before going all out with restrictions it should be evaluated (Zettler et al., 2020). CRISPR and gene drive gene editing technologies open a future in which any affluent or appropriately skilled individual will have the capacity to rapidly design and redesign life-forms (Yee, 2019). However, amidst a colonized or politicized science, evolutionary design is dangerous regardless of biohacking and biohackers (Yee, 2019).

Traditionally, it has been politics and not citizen-scientists who dictate the questions that science must answer. A good example of this is how European dictatorships did it from an extensive multidisciplinary perspective that ranges from

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[23] https://bch.cbd.int/protocol/

[24] https://www.cbd.int/abs/doc/protocol/nagoya-protocol-en.pdf

breast-feeding to getting detached from mother Earth (Valencia-García, 2019); (Whitaker, 2000);(Siddiqi, 2010). Against such boundless assertiveness, biohacking allows a participatory turn and upstream involvement in science and becomes more inclusive as it gets more radical (Kera, 2014). It's true that DIYbio is open, democratic and not centered in profits but other views overlap here (Seyfried et al., 2014b); (Ahteensuu & Blockus, 2016). In spite of its freethinking spirit and the critical thinking against politicized-monetized research, the obscurantist side of biohacking is that it doesn't create an exit from the grey and fake nature 4.0 but gives us incentives to flow with. In addition to this, a biohacker can be equally financially predatory as anyone else (Bromwich, 2018).

As of 2021, bioart is nothing new and, perhaps, CRISPR Art is coming soon (Dowd, 2005);(Charo & Greely, 2015). However, some forms of bioart (and biohacking), if reduced to close groups, might reinforce gender, class and race stereotypes (Thompson, 2013). Stereotypes that political stakeholders have no qualm in profiting, by the way (Cassese & Holman, 2018);(Hjorth, 2016).

G20 synthetic biology policies have a significant weight in the 2030 Agenda for Sustainable Development, especially when it comes to risks and the precautionary principle (Kolodziejczyk & Kagansky, 2017). G20's influence also paints biohacking with the same brush as bioterrorism (Kolodziejczyk & Kagansky, 2017). The most important countries have been practising plenty of cherry-picking when it comes to biohacking. Social and cultural awareness of biohacking help not only to enact better policies but also to safer products since the customers-citizens' demands will be clearer for both business neuroethicists and policy-makers (Wexler, 2017). However, as the neurohacking example highlights, heavy-handed regulatory approaches to biohacking might provoke opposed reactions such as the Streissand effect[25], "*compliance without effect*" and strengthen the target's inner motivation (Wexler, 2017);(Bryans, 2015);(Frey & Jegen, 2001). Before the broad range of dangers and risks involved in biohacking we need more maturity (Bennett et al., 2009). However, exactly the same awareness, maturity and inner motivation insights we need to prevent future biohacking excesses are needed far more to deal with the present ones from public managers, partisan politics and propaganda. The dark irony here is that the main representatives of the most important countries have so wildly raised

[25] Named for the actress and singer Barbra Streisand's attempt to restrict online views of her residence on a public website, which had the paradoxical effect of leading to many more views than if she had done nothing.

the moral bar and have so badly lowered the terrorism one in order to tailor their biohacking strawman that, if measured with the same standard, they would qualify as terrorists, too!

5.4.4 The Alienation of Human Species

Sailing away from synthetic biology governance and before arriving at an utmost green perspective and jumping then beyond science we'll remain in the fringe to meditate on the incoming changes. The most significant advances in synthetic biology that may lead to groundbreaking changes in both biohacking and planetary health perspectives to date are:

- Biochemical machinery (Exley et al., 2019);(Tucker, 2011)
- Quantum biology (Goldman, 1969);(Lambert et al., 2013);(Du Toit, 2019);(D. Thomas, 2019)

Very specially, the Turing biocircuits (programmable biological network pathways for partitioning and cycling energy and matter) might allow to neutralize disease vectors, guide evolution towards biological conservation, increase agricultural production, and unlock climate biogeoengineering technologies (Erickson, 2015). Bioinspired computing has just started to shed light on the depths of biological networks in which life weaves itself.

However, this cutting-edge gospel ends as soon as we look at the alienation of the human species. Our quotidianity seems to be shifting into a more globalist citizenship seemingly with plenty of options but really lacking criteria. A daily life in which the bulk of people with no real power grow more homogeneous across geopolitical regions adopting green and digital apartheids as we see in the global poor today (Muthuri et al., 2020);(Hickel, 2019b);(Kates, 2000). Trapped in those siloes, planetary health gets strained as the question of what an individual is morally obligated to do about environmental issues is being engulfed by the question of which leader, influencer or identity should be heard speaking in the name of the land or in the name of the whole planet.

The top-down system with the aforementioned parasitic and predatory features is becoming more pathogenic as the biological determinism chasm reduces the bottom-up counterpart as it is reflected in the inequality life expectancy seen in the last generations (McDade & Harris, 2020);(Garafola, 2015). As a whole, this human

world of finances and the interventions of those finances seem clumsily prepared for the rising life expectancy that a more affordable basic healthcare may bring. Just like what happened with the poor for centuries and third-world diseases for decades, there is a global trend in concentrating the healthcare resources and research disproportionately in the more affluent people (Laufert, 2008);(Watts, 2003, pp. 88, 130–131);(Balasegaram, 2014).

When the technological prowess of many of the present 2021 prototypes, especially quantum computers, is unleashed during this decade we are going to enjoy impressive and unseen discoveries about the nature of life on Earth and, therefore, about human life. Bioethics understood as "*the love of life*" must be paramount in how we approach these scientific advances or otherwise homo sapiens will become the alienated species, the Medea of animal kingdom (Macer, 1998);(Smith & Morowitz, 2016, pp. 539–543);(Ward, 2009, pp. 34–38).

5.4.5. An Utmost Green Perspective

5.4.5.1 On the shores of an ocean of odours

We are on the shores of an ocean of odours, the language in which our planet (as far as we know) communicates with the immensity of living beings. We are awash in Earth's whisperings. In order to face the difficult coexistence with their neighbours, volatile organic compounds are used in sophisticated chemical systems of communication among plants in order to alter their physiological activity to wage quiet chemical communication warfare sometimes and also to altruistically help their neighbours in some other situations (Ninkovic et al., 2019). Plants as the sagebrush produce damage-induced volatile cues that make beetles disperse and produce a more even distribution of damage, which also produces a positive response by the beetle (Karban & Yang, 2020). Airborne plant emissions may lead to immunity to herbivory and allelopathy, so they are key in living readiness and communal fitness (Arimura et al., 2010). Furthermore, communication between plants not only helps to prevent allelopathy but also to resist cold stress thanks to volatiles such as nerolidol, geraniol, linalool, and methyl salicylate (Arimura et al., 2010).

Volatile communication happens not only between different plants but also even between different branches of the same plant and across diverse taxonomic affinities and ecological conditions, it allows plants to resist herbivorism, suppresses the

germination of competitors and can help neighbours (Karban et al., 2014);(Karban et al., 2010);(Karban et al., 2011). For hundreds of millions years the olfactory appendages and plants essential oil glands alike have been part in this context of competition and collaboration, and this also includes animals (Raguso, 2009); (Labandeira, 2002);(Krings et al., 2002);(Fahn, 2002). Other resources are combined to enhance volatile communication between plants such as trigger information sharing with a touch that can activate the same set of defence genes in neighbouring plants as were up-regulated in the touched plant (Douma & Anten, 2019). Of course, microorganisms are not behind in the field of volatile organic compounds producing volatiles themselves in order to affect endosymbiosis of herbivorous insects and even to change the plant's volatiles, nectar and even architecture (Lemfack et al., 2018); (Schenkel et al., 2018);(Schenkel et al., 2019);(Frago et al., 2017);(Vannette & Fukami, 2016);(Rering et al., 2018).

The evolution of organismal metabolic, ecological trophic relations and chemical signaling, among others basic life aspects, presents them as systems (Erickson, 2015). It's a question of perspective. Learning about the cues that plants use may allow agronomists to grow seedlings with better vegetal defenses without sacrificing desirable traits (Karban, 2017). Therefore, the path towards a more sustainable agriculture goes across the depths of plant communication with both beneficial and harmful organisms (Lemfack et al., 2018).

5.4.5.2 What do the plants teach?

#1 Don't spoil yourself

This utmost green perspective may seem detached from practical and immediate utility, but both human ICT and the plants' communications may suffer pathogenic interferences (Moreira et al., 2020). How the US information ecosystem failed during the COVID-19 pandemic can be explained in terms of host, parasite, and failure at the colony level (Cohen, 2021). Specifically, parasitory politics both previous to and during pandemic, along with the role played by social media, infected the US with disinformation that led to a flawed social evolution that ended with its global hegemony (Cohen, 2021).

Former president Trump should have learnt from the Mediterranean rear-edge forests and their site-induced adaptations prevail overtaking biological-determinism

principles (Dorado Liñán et al., 2018). So adapting an ecophysiological differences approach would have been more useful than keeping delving into a rancid and vulnerable to political bias one.

#2 Don't be prejudiced

Other cultures than Western such as Native American and African ones don't prefer visual information since, unlike the Western languages and music, they don't rely on binary systems but on tonal ones (Rosas, 2019). It means that Native American and African cultures have a more fluid engagement process of symbolization in which the meaning is closer to the act of speaking (Rosas, 2019). Those cultures' acoustic ecology opens an expanded collection of social phenomena, alternative modes of exchange, production, and post-production such as listening and sound making and different kinds of perspectives (Rosas, 2019).

As a result of this epistemic monotony, technologies governing synthetic life, sadly, suffer from a big burden of colonization and enjoy little oversight and constructive consensus upon governance structures, so we will be hardly granted a good use (Yee, 2019). Namely, ethical frameworks from Indigenous peoples and spiritual ecologists are being put aside in favour of privileged alternatives (Yee, 2019).

#3 Don't Look Down on Others

Drive your mind-body through ecocritical thinking of medicine to prevent the suicidal tendency of modern society (Chang, 2017). As the research led by Ashley Cunsolo Willox on how climatic and environmental change and affect to emotional health and well-being in Nunatsiavut (Canada) concludes: "*The land enriches the soul*" (Cunsolo Willox et al., 2013). Perhaps it happens because a one-way scale of moral superiority with the humans in the apex and plants in the bottom down doesn't work (Wolfmeyer & Lupinacci, 2017). Our brains are not a fertile circle in the Eden garden surrounded by barren lands – it never was, not even in the Torah (Jewish Publication Society Version, 2010, Chapters 2-ט). We made up an interactive system in which the rest of living beings have a say.

5.4.6. Beyond Science

Science is an incomplete source of knowledge before the universe of experience, it's not the only intellectual search for unity and order, which is a pre-human quest

(Whyte, 2017, Chapter 2);(Fukuyama, 2011, pp. 31–43);(Heard, 1950). There is no clear boundary between philosophy and science or between science and the rest of culture; not an univocal trait of scientific methods or scientists separating them from the rest and not even a unique meaning for measurement fitting in every scientific field (Whyte, 2017, Chapter 2). Due to its unfathomable temporal scale, such a key idea for biology as evolution is, lies outside the realm of human perception and, to make things harder, the tool we have to deal with it, the idea of adaptation is, in turn, strongly mediated by feelings, which a-scientifically guide the variation, selection and retention of knowledge (Simonet, 2010);(Davidson, 2018).

On the other hand, although science is a slightly fuzzy quest for truth in a human context just like many others, it shouldn't be put at the same level as any gobbledygook. Therefore, if we want science to keep being a lighthouse against obscurantism, its meaning must change with the times. For example, yoga, which is a luring discipline from a biohacking perspective, is potentially closer to science than ever thanks to a combination of yogis' scientific knowledge, new devices and the daring thinking out of the box that implies studying nonphysical forces effects in physics (Deshpande, 2019). The plant of science always grew in daring grounds.

However, in spite of this love for learning as well as the knack for perplexity and the thirst for discoveries that is so strong and bold in the good scientists, nobody lives as if science were all that they need (Polkinghorne, 1998, p. 2). The thing we need the most to do good science on planetary health is beyond science, that's thinking of what and who we love and wishing them to endure (Reitan, 2005);(Macer, 1998, pp. 8–20). By the same token, good science is not about stockpiling information over the truth we want to unearth later. From the carcinogenic glyphosate controversy and the real chances for disturbing repression against biohacking communities we learn that what is needed for turning science into a preach in the wilderness is also beyond science itself (Url, 2018);(Tallman, 2019). I mean going with the crowd and giving up – while heavy handed biopolitics attacks both science agencies and citizen scientists for political gain – to resign ourselves with green whims once in a while. Also we can suffer from the vertigo of our own freedom and devote time to study disciplines such as bioethics and planetary health or attending biohacking and bioart events. Of course, there is plenty of middle ground, but our

individual choice, our rebellious attitude, matters far more than most people believe (Lozano Rodríguez, 2020b, pp. 147–150).

As art in its broadest sense unconventional science practices, and particularly bioart, can help citizens to engage with environmental sciences, overcome stratified education and think critically about climate change denialism (Lerum, 2019). Bioart has a say within the Anthropocene since it explores the question of life or the ethical and political issues surrounding bioengineering (Jagodzinski, 2020). Given that, bioart shares grounds with planetary health.

In order to enjoy a decent level of planetary health is needed the civic engagement with a sustainable future. But this commitment should be cultivated with new and diverse ways of imagining civil society's role in this world to come through spaces for reflexivity and out-of-the-box thinking, just like indigenous traditional talking circles (Poland et al., 2020). (The fluid engagement discussed in #2). Unlike most sustainability solutions today, we need to recover the ancient lore's focus on realising humanity's inner spiritual potential (Jeanrenaud & Jeanrenaud, 2018). Perhaps, we need more soul-searching around the utter question beyond science: should we stop doing it? If a-technogenesis would be the only cosmic path of evolution, how would we know it? (Brooks, 2017);(Last, 2017)

5.4.7 Concluding with a vision: what will the world of tomorrow be like in 2060?

First things go first and the first one now is assuming I have no prophetic skills. I can't predict with certainty what will happen tomorrow, let alone in 2060! The climatological, pathogenic and human interactions that will shape our path are simply beyond calculation. Future scenarios are nothing but tales and organized daydreaming but, nevertheless, they are also the best tool I know for considering and making sense of present-day alternatives (Schwartz, 2012);(Lombardi et al., 2012).

All this genuine lucubration won't be completed if we don't consider that a feasible solution for planetary health might not be an option (perhaps it never was) due to the major drives that operate in our real world politics and our adversarial and gregarious nature. Very likely, things like democratic participation, agreements on mutual coercion, universal education and, very specially, accountability are going to decide the continuity of our species (Horton & Lo, 2015);(Hauser et al., 2014);

(Lutz et al., 2014);(Levin, 2014). In this case, our chances are very low and perhaps we are a few generations away from the Great Filter. Yes, I mean the Great Filter of cosmic civilizations that explains the null proven extraterrestrial contact (in spite of the unimaginable number of suitable planets in which an advanced civilisation could raise) due to cosmic and recurrent tech-driven self-destruction (Hanson, 1998). Regardless, I won't consider apocalyptic scenarios, instead of this, the three future glimpses below will tell us about the lesser Dystopia in the undesirable half of future outcomes for the Earth. Yes, I believe that future rulers are going to piss on John Rawls' grave but not to destroy our species – at least not before 2060.

Regardless of godsents and bright sparks, civilisations come and civilisations go and the Atlantic one, represented by the empires of Portugal, Spain, Netherland, France, the UK and the US, is seemingly over in favour of an Asia-Pacific one pioneered by China (Butzer, 2012);(K. B. Taylor, 2020);(D. Scott, 2008);(Buzan, 2012). As the Chinese dominion extends during the next 20 years two main differences with the US single hegemony will be evident. In the first place, the UK and the US present-day fake-liberal political economy cannot be understood without their own different colonialism brands. In the same way it will go for the Chinese hegemon's political economy (Bhambra, 2020). It's transcendental since, as we discussed in the inflexible biological determinism section it grounds on political economy, therefore a new type will appear and will be imposed. In the second place, the Chinese pioneering on the new energies and its dominion *de facto* on plenty of non-renewable resources will outshine the liberal-realist view from a big share of the scholar research on the topic – it just started today in many fields. Moving a theoretical framework on energy usually goes hand in hand with moving power relations, too (Kuzemko et al., 2019). Just like we discussed above, it means that our whole mindset, including the way we understand biological determinism, is going to shift from the US industrial-militarism view to a Chinese national-socialism one as the civilizational change happens. *Such a relief…*[26]

But, besides the global scope, what are going to be the differences when compared with the transition from the Roman, Islamic, Dynastic China or Western worlds? My bet is on Big-7-differences:

[26] Anyhow, the US and China welfare states' proposals (?) are more similar than most people may believe and million people hardly will note the difference. Old wine in new bottles everywhere!

1. The identitarian leaders, elites and ideologies might play a greater role in this civilizational change (Butzer, 2012);(Castells, 2011). It will, in turn, set the scenario for techno-military micro-conflicts everywhere backed up by narratives of resentment and adversarialism spurred by the aforementioned pugnacity (section 1.2.3).
2. At some point, the Anthropocene might lead to a globalized more-than-human identity in which political demos binds planetary health (Machin, 2019). However, I assume that this paradoxical opportunity for a lively democratic politics in which the demos assume a relevant role during and thanks to the Anthropocene will be lost. According to Yuval Noah Harari, it will happen when dependency on billions of people's human effort and skills to generate profit will be put out to pasture (Harari, 2016). The main activity of those billions will be to see another day as subjects of the state reduced to a *be-there* behind and below the statistics.
3. While we spend more and more hours in an "*Austistic Metaverse*" of "*IT landscapes*" and other "*fake nature conversions*", new political economies for the oceans and the green spaces will get blurred before a miopic perception of social inequalities (Świątek, 2019);(Blewitt, 2014, pp. 131, 173);(Dryzek, 2013);(Mansfield, 2007). Rather than witness the end of green apartheid, the impoverished people will meet, in addition, AR-reservations.
4. Institutional synthetic biology and biohacking have swiped a question whose reply has been the patrimony of political movements across human History: "*what can life be*?". The partisan politics reaction will be confiscatory, hyperregulatory, nationalizing, punitive and inefficient, which will create a strong biosynths and biohacks black market that will reinforce, in turn, the state powers' role as the *good guys*.
5. The civilizational struggle for matching an unleashed tech development with the perpetuation of oppression as ever, might be seen for the first time from the perspective of posthumanity (Braidotti, 2016);(Thweatt-Bates, 2016, p. 3).
6. We will full-fledge enter the age of biological computing, an age in which DNA will be completely programmable. It will unlock impossible interplanetary travels moving human life as DNA strands code as we do on the Internet today (Yee, 2015).

7. What today is a life expectancy gap will turn into a biological chasm with the commercialization of direct-to-consumer big pharma genetics first and digital tattoos, new senses and new limbs then.

Of course, not all countries will see the Big-7 and likely they will be deeper in countries like China than in the ones like Uzbekistan. Other countries such as Nauru perhaps will have disappeared by then due to climate change and others, for whatever reasons, won't face some of the Big-7 at all. The geopolitical aftermath of this civilizational change will be a great determinant, too. Now we'll see three theoretical scenarios from the most to the least likely to happen. The first is a civilizational change as ever -with China as a new hegemon and the global power axis shifting from the Atlantic to the East and Southeast of Asia. The second one is a US-China encysted Cold War lasting for decades, which would take a major reform (a revolution perhaps) in the West. The third, and least likely to happen scenario, is one with the regional hegemons and global middle fishes acquiring a major relevance after some groundbreaking tech (likely one that modifies human nature). This tech would make the China and US controlocracy not a good idea and it will lead to a more anarchic hinterland around a megapolis-centered and multipolar world also ruled by Russia, India, Turkey, Brazil, Germany, Japan, Iran and Indonesia along with some African hegemons and perhaps (only perhaps) AI and private corporations owned-countries still to rise. Those three future scenarios suppose that no national leader will suffer a nuke 'em all rampage and no AI is going to overtake us totally -likely due to the global devaluation of human effort and individual rights in the next 25 years that will make keep feeding an AI a less profitable (even dangerous) task. Before switching off the crystal ball, I want to highlight how unlikely it is that any of these scenarios will happen in a straight line from our present or that a perfect match happens. Rather than this, the ones who live in 2060 will have faced a good dose of political turmoil swaying them between these three smart cut scenarios before seeing the futurist incoherence to come.

Insomuch as planetary health is linked with biological determinism and considering the political conveniences that the last one offers, planetary health will hardly improve through common people's goodwill if other illusory political options are not successfully conquered. From the Earth's perspective, empires have gone hand by hand with intensive exploitation, empires with growth as a core value has

led to overexploitation and empires wishing and needing to grow in order not to be subdued by other one have used to raise the bar. As the 1972 UN environmental conference exposed, during the Cold War, Earth remained mostly muted (Pickering & Owen, 1997, p. 439). On the other hand, natural disasters are a catalyst for political actions and governments enjoying a strong legitimacy may carry the banner for progressive environmental policies aimed to improve public health. However, it's up to see if those initiatives are limited to their own territory or, even worse, done at the expenses of puppet states. In addition to this, the use of futurist computation may make a short work of hazard mitigation and vulnerability analysis, although we cannot ignore how weaponizable this information is and how much more it will be. To cap it all, and regardless of UN conventions, biodiversity is bleeding out even by the most optimistic counting and, to cap it all, climate change driven-extinction has just started (C. D. Thomas et al., 2004). The fifth edition of the UN's Global Biodiversity Outlook report states that, as nature degrades, the environment is increasing the likelihood of diseases spreading from animals to humans (Secretariat of the Convention on Biological Diversity, 2020, p. 176). In the face of this danger, the people who are in charge of fulfilling the goals of biodiversity agreements have "*failed miserably*" (Zimmer, 2020). The lion's share of the time that should have been invested in biodiversity and innovative approaches like One Health and alike since the 2010 Nagoya Protocol seems to have been leaked out to make the most of social media surges and to polish muddy governance practices about data collecting (Schneier, 2015).

This is the most coherent and streamlined with social scores, fake meritocracy and tons of incoming biological determinism (sections 1.2.3 and 2.7). The top-down approach is something like: 'people facing reality is the origin of every unrest, control their reality and you'll rule forever'. While the *enlightened now* find (or not) their brave new world route, the knowledge leading to the disruptive change that will raise most people's survival chances before an unseen natural disaster might be disappearing today along with the species that do so everyday. Maybe it is a species that biologists have not named yet, just like the most of the existing ones are (Costello et al., 2013). Human societies are looking down Life too often. Even synthetic biology as a possible solution is being swayed by short-term political and monetary interests of the ones who profit either from biohacking hype or horror.

Some of those vested interests around life sciences include (sic) genetizing human populations and overfeeding biological determinism as a node in the network that this chapter describes. A web of inequities that beat in a frenzy, whilst the cravings of the ones calling the shots in the incoming civilizational change. Ironically, Earth might become more inhospitable whilst an elite only see sunshine and flowers. But this also will end.

Civilizations, indeed, present biological features since cultures, just like our bodies, are both the ground of life and the path to ageing and death (Boyden, 2004). Understanding a civilization or an epoch means to know how power inequality becomes different, which implies to understand why it keeps being the same. I believe that in the present age, one of the main new inequality drivers is going to ground in a hopeless techno-optimist agenda on the side of politically overpowered. In this future, the tailored manipulation from cells to society in favor of the ones which can afford will *make true* biological determinism for the first time. Not too long after this commercial genetic *inheritance*, the DNA-techs that expanded the galactic exploration might be used for a *final solution* on shortages of energy, food, water, social goodwill, and political equality. The wettest dream of every big cat ever: a tailored populace to rule over that never will try to snatch the power from their hands (hands, limbs, prongs, whatever); a herd, in sum, that will *see no evil*. Well, if it happens, this really will be the end of History -of human history, I mean. To this never happen, the today voiceless majority must resist as they were plants or microbes so as not to keep being food for parasites.

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6. Citizen Science for Planetary Health

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6.1. Abstract

Citizen science has increased during recent decades from participatory data collection, to developing research questions and methodologies, analyzing results, reporting outcomes and recommending actions. Projects cover a very wide range including; simple species observations and ecological and biodiversity assessments, environmental monitoring such as air and water quality, epidemiological surveys, food consumption and agricultural process evaluations. The findings from citizen science has been used to inform nature conservation practices urban planning decisions, agricultural and health policies. This paper reviews the major benefits and pitfalls of citizen science, with particular reference to some ethical issues. It draws some comparisons to community education and proposes some recommendations for promoting more citizen engaged research in bioethics projects to promote planetary health.

Keywords: *Citizen science, collaboration, engagement, social learning, participatory, recording scheme*

6.2. Introduction

Participatory projects in the social and environmental sciences have been promoted for decades, with the recognition that promoting community engagement early on often leads to greater acceptance of and compliance to recommended actions. Many of these are straightforward recording schemes for phenological studies, e.g. BBC nature recording or a variety of projects promoted by the USA National Phenology Network, Rivers (2017). The coordination office of this latter network published over sixty academic papers with data gathered by volunteers in the decade 2006-2017, Crimmins (2020).

·pp. 156-176 in *Planetary Health and Bioethics,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

Citizen science extends, beyond the academic institution or researcher seeking community engagement or data collection volunteers, to projects initiated and driven by non-academic researchers, English *et al.* (2018). The growth of such "non-expert" research has risen in recent decades. It can aid the speed of discoveries, reduce costs, and may influence stakeholder decision making or behaviour, Ryan *et al.* (2018). It has even lead to new species being discovered in nature, such as Sheryl Holliday's discovery of a new spider, *Maratus Nemo* in South Australia.[27]

Public engagement in large scale data gathering often receives more media attention for flagship species such as turtle conservation projects, butterfly counts or large mammal observations. These can link with ecotourism and conservation projects; such tours in northern Thailand documented by Gale and Hammer (2019), who report a wealth of data gathered during a one-week ecotourism trek of elephant encounters that has been used to increase the welfare and conservation of these magnificent beasts. There are also examples of research that has subsequently been used to change government policy and legislation, (Kennedy, 2016; English *et al.* 2018). Indeed the potential for increasing data collection and recording by the involvement of an army of citizen scientists has not escaped the UNEP who are struggling to monitor progress towards the SDGs.[28] Indeed West and Pateman (2017) table a host of suggestions from Stockholm Environment Institute staff of how the engagement of this army citizen could progress towards achieving a number of SDG specific targets, particularly with respect to monitoring and implementing activities.

These warriors will not likely be surrounded by photogenic Lepidoptera, delightful birdsong, fresh mountain air, warm tropical dive waters or cool shady woodlands waiting to catch glimpses of rare or exotic creatures. They will be getting their hands dirty, possibly working in difficult conditions, frequently collecting numerical data and seemingly repetitive data, but this may have very practical outcomes. Baalbaki *et al* (2019) for example, report how 26 citizen scientists contributed to groundwater quality monitoring in a case study from Lebanon, that

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[27] This discovery was reported in *Australian Geographic* in March 2021, it is available online at https://www.australiangeographic.com.au/news/2021/03/meet-nemo-a-new-species-of-peacock-spider/

[28] The potential of citizen science is outlined as a roadmap in *Aligning Citizen Science and the United Nations Sustainable Development Goals* published in *Nature* as reported by the UNEP. Links to the material are available from: https://www.unep.org/news-and-stories/story/untapped-potential-citizen-science-track-progress-sustainable-development. Several organisations are employing citizen scientists to help meet SDG targets, such as Eidgenössische Technische Hochschule Zürich who report having established a Citizen Science Center https://bioethics.ethz.ch/research/CitizenScience.html.

ultimately lead to improved local water quality testing facilities. In some circumstances volunteers are willing to expose themselves to health risks for the greater good. Freshwater snails are an intermediate host for the parasite that causes schistosomiasis, by monitoring the snail populations at sites in Uganda 25 citizen scientists were putting themselves at risk of the disease, Brees *et al* (2021).

Heiss and Matthes (2017) propose that there is greatest potential by employing lay participants in social science research in projects that relate to health, equity or social institutions as these are of particular interest to many people. Ogden *et al* (2019) illustrate the value of citizen science in planetary health saying that: "Passive citizen science methods of collecting information on species distributions are used both in public health and in ecology. In ecology, the object is monitoring of biogeography and global biodiversity information (e.g. eButterfly—http://www.e-butterfly.org/ and iSpot—https://www.ispotnature.org/). However, in public health, these methods have been developed to the point where data are systematically collected and analysed in national surveillance programmes to provide early warning of emerging vector-borne diseases allowing rapid responses."

A recent example from ethics research of the limitation of citizen science to data collection is the BBC and Sussex University Kindness Test[29]. This requests that participants complete a thirty minute self-assessment online survey. The data will, no doubt, be most informative, and participants will be informed of some conclusions before the results are broadcasted, but it can hardly claim to be fully engaging citizens with the project overall. This is, perhaps a missed opportunity, as afterall everyone is a stakeholder when it comes to kindness and bioethics in general. With respect to bioethics, Callaghan (2016) puts it this way: "Arguably, rapidly developing fields of citizen science such as informing science and others seeking to maximise stakeholder involvement in both research and bioethical engagement have emerged as a response to these types of issues; radically enhanced stakeholder engagement in science may herald a new maximally inclusive and transparent paradigm in bioethics based on lessons gained from exposure to increasingly uncertain ethical contexts of biomedical research."

[29] Full details of The Kindness Test including when the BBC will broadcast results of this UK national survey can be found online at: https://universityofsussex.eu.qualtrics.com/jfe/form/SV_1RYvaR5UA1czYvs

6.3. What is citizen science?

In their book *The rightful place of science: Citizen Science* Kennedy and Cavalier (2016) summarise the essays by saying that: *"In its richest form, citizen science has the power to transform science and society. Rather than simply recruiting volunteers or producing cool new tools, citizen science reshapes central notions of science and power: the roles of experts and the public, the accessibility of tools and data, and the kinds of questions that are worth asking."*

McCulloch (2021) points out that anyone can collect data, although this may require verification, which can contribute to nature conservation and lead to breakthrough discoveries. He cites his own discovery of the first record of *Konitikia ventrolineata* in the UK county of Surrey and the Big Wasp Survey as examples valuable contributions using methods of citizen science. However, there is more to citizen science than just expanding data collection. Wehn *et al* (2020) note that citizen science can include:

- Multidisciplinary research across many fields including health and the environment
- Application of a variety of research methods
- Involves participants in at least one but potentially all stages of the research process
- Should adhere to the protocols and principles including ethics of the scientific method
- Can open up the roles, responsibilities and leadership opportunities to all stakeholders

6.4. The benefits of citizen science

Collaboration and radical listening are two key factors that Duff *et al* (2020) emphasize in many of their case studies. These include a variety of studies from around the word such as: the reduction in annual haze from Indonesian peatland fires; different teams working together in the Senegal River Basin to trial biological control of snails that carrying schistosomiasis; watershed management improvements in Santiago; the Ministry of Public Health, Catholic Relief Services, and the Dharma Platform to pilot a community-based health surveillance programme in Madagascar. This collaboration and radical listening increases community

engagement, volunteer retention (English, 2018) and prompts further action and behaviour change as reported by authors such as Gabrys (2020). Hecker et al. (2018) surveyed 174 European co-ordinators of citizen science, the majority of whom were involved in ecological or environmental projects. They found that the biggest impacts of citizen science were in community interaction with science and education with less, but still significant, contributions to science policy and behaviour change. Furthermore with citizens being fully involved in research it opens doors for greater transparency and institutional accountability, Chari, Blumenthal and Matthews (2019).

The impact of citizen-driven initiatives has been instrumental to the launch of a science and technology office to advise the Spanish parliament, Gomollon-Bel (2021). In some countries the power of integrating citizen science in research is also garnering government funding support; Motion (2021) reports of five such projects receiving nearly £1.5 million from UK Research and Innovation. As citizen scientists are not employed on professional salaries, participatory research also reduces the costs of research – this is particularly relevant in resource-limited settings such as low income countries, Brees *et al.* (2021). However, this should not be seen as the raison d'etre. Indeed the main motivation for many people to contribute, being able to give benefit to wider society, should remain at the forefront of the minds of project managers, Bowser *et al.* (2020).

Young *et al* (2018) also note that in some circumstances there is a need to collect data over very wide geographical areas such as records of migratory birds, fish or turtles. The ability to engage the support of citizens to widespread recording is essential to get an accurate picture.

Most significantly, with the potentially large pool of workers involved in these projects there is the possibility to increase the rate of discoveries. This is all important in present times as the Earth and bulging human populations are experiencing increasing stressors on health and wellbeing. Waldispühl *et al* (2020) for example say that science discovery games tapping into the potential of gamers contributions have the ability to rapidly assess the power of track and trace technologies for Covid-19.

6.5. Pitfalls to avoid with citizen science

Trejo et al. (2021) interviewed 35 biomedical citizen scientists and found that: *"regardless of who participates in citizen science or for what reasons, it was important to many interviewees that the work constitute good science. Operationalized as robust documentation, rigorous methods, and transparent results, good science was viewed as an ethical priority because it facilitates safe, valid, and reproducible research.*"

The requirements of validity, reliability, and accuracy are essential for good science. McCulloch reports that in the UK there are recording schemes including the National Biodiversity Network and the Biological Records Centre that have measures in place to omit poor data. Inconclusive photographs are excluded, misidentified specimens are corrected and information is available to improve identification of specific taxa. Even experienced researchers may find difficulty in distinguishing between morphologically similar or closely related species.

The use of digital technologies has helped dramatically in many citizen science projects. For example, Heiss, and Matthes (2017) report the benefits of using mobile apps in the Young Adults' Political Experience Sampling (YAPES): *"YAPES was designed as just a small pilot project, the participating 254 students collected a total of 1,768 observations. In this participatory research context, the young participants have evolved from a mere subject role to an active scientific role, as they actively screened and reported information about their political environment. Selected results were published on the project blog in order to provide the participating students the social sciences, show that there are spaces where citizens can add value to Social Science Research by engaging in tasks which have traditionally been implemented by scientists."*

The use of buckets, badges and dust wipes are being replaced with low-cost and increasingly accurate and precise digital technologies, Gabrys (2020). Ryan *et al.* (2018) refer to several geographical mapping systems that use apps to generate detailed records of soil moisture and mineral contents that have subsequently helped farmers restrict their fertilizer applications. Indeed, digital technologies help in many aspects of citizen science, communication, data recording and analysis and presentations. Furthermore, the use of such technologies may be an encouragement for younger people and school students to participate. But as discussed in the ethics section below these technologies do raise some questions.

The density, diversity and design of urban environments can influence chronic disease in humans; Pinter-Wolman, Jelic and Wells (2018). In Udon Thani, in northeastern Thailand, Adelina and Archer (2021) taught participants to record digital data on photovoice and mental mapping systems that enabled visually impaired citizens to make valuable contributions to research aimed to improve urban planning with health and wellbeing in mind.

In the Preface to *The Ages of Gaia: A Biography of Our Living Earth*, Lovelock (1989) asserts that nearly all scientists are employed by large organisations and not free to fully express their own thoughts. Therefore he suggests that there will be inherent bias in much science reporting. However, as citizen scientists may not be subject to the same enforced regulatory standards or have the same degree training then misreporting could also result from personal bias. Brees *et al.* (2021) found that recording bias could be reduced by limiting input parameter ranges on questionnaires and giving tailored feedback to participants. Rigorous examples of citizen science research detail how well participant data recording corroborates with "expert" values. For example Baalbaki *et al* (2019) conducted statistical analysis on both academic and volunteer researcher data values to show which of the nine different water testing methods produced concordant values. Cooper and Lewenstein (2016) refer to how the ebird project sought to improve engagement and accuracy of reporting: *"In the early years, 2002-2005, with the slogan "Birding For a Purpose," the project failed to engage a sufficient number of birders. In 2006, project managers changed their strategy, and introduced the tagline "Birding in the 21st Century." The shift in philosophy, as illustrated by the shift in slogans, made the project successful. eBird moved away from appealing to a birder's sense of duty, succeeding instead by helping birders embrace the excitement of getting better at their hobby while simultaneously impacting the future."*

This nicely illustrates the benefits of not trying to use moral persuasion to engage people in socially beneficial behavior, but rather offering to support them in doing things a better way: rather than "you should do" but "we can help". In a similar way, building a community and fully involving volunteers in as many stages of the research along with regular communication tends to favour high levels of volunteer retention to programmes, which is desirable for consistency, Goad *et al.* (2020).

6.6. Ethical issues of citizen science

There are numerous ethical considerations relating to citizen science projects, some are common to all research ethics and working with volunteers in research, others are more specific. It is firstly most important to consider all citizen scientists as valued and respected members of the research team, whether their input project is mainly contractual, co-creative, contributory, collaborative or collegiate[30].

With increasing use of social media and electronic data then data security and protection is a potential weak point in citizen science, Crowell (2019). Additionally, there are questions of coercion and the extent of fully informed consent, Tauginienė *et al* (2021). These research ethics issues may be more likely arise in the collegiate citizen science model where the primary researcher is not necessarily working within institutional policies or requirements. Furthermore, as citizen science increasingly involves citizens collaborating to develop and explore the research questions, design methodology and results analysis rather than mere data collection, then new ethical concerns arise beyond that of traditional research ethics, Resnik (2019) and Lepczyk *et al*. (2020). These include resolving conflict over research questions, possible intrusion of privacy during surveillance, and intellectual property rights.

There is also a possibility of intentional bias when researchers select volunteers to contribute towards projects, Franzen *et al* (2021). The use of transparent selection procedures is likely to involve sensitive data collection such as biometrics, political persuasion and gender identity. Therefore, ethical principles of justice, equity, non-maleficence, confidentiality, and privacy should all be considered. Many of these issues are raised in *When Citizens Do Science: Stories from Labs, Garages, and Beyond*,[31] that describes several citizen science projects from healthcare and ecology fields. The journal *Citizen Science: Theory and Practice* devoted one issue to ethical issues arising in citizen science. In the editorial Rasmussen and Cooper (2019) recommend some ways to promote ethical standards in participatory research, such as:

- asking conference presenters to mention any ethical challenges they faced in their work;

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[30] These input variations in citizen science projects are outlined in Shirk *et al* (2012).

[31] This was Volume 9 Number 1 Spring Issue of the journal *Narrative Inquiry in Bioethics.*

- establishing awards to recognize research following rigorous ethical practices;
- and building training tools for citizen science collaborators.

Tauginienė *et al.* (2021) propose the use of dynamic informed consent, improvements to ethical literacy education, the use of hyperlinks to increase communication efficiency, and the use of standard data protection protocols, so that: *"Such factors help promote the veracity and truthfulness of (citizen) science through responsibility, accountability, transparency, respect, and integrity, not only when drafting dynamic informed consent but also through the entire citizen science research process."*

For Wiggins and Wilbanks (2019) a serious concern with citizen science is the unregulated dissemination of findings, which may not be grounded on data from sound scientific processes, to wide audiences who have little expertise in distinguishing between reliable and unreliable sources. They point out that: *"The peer review process of scientific publishing combined with the slow pace and high cost of clinical study has limited broader participation in science, it also often blocked the spread of misinformation. From vaccine denialism to Goop's pseudoscience, there is a real health risk from the spread of faulty information emerging from bad science, regardless of where it originates."*

These points raised above are research ethics issues rather than bioethics per se, yet need to be considered and addressed when planning or engaging in citizen science projects. Demuth-Labouze (2017) points out that as patients and care givers are involved in treatment decision making then bioethical training in a culture of ethical reflection will democratize ethical thinking and enable more people to be aware of and anticipate vulnerability – ultimately increasing autonomy and responsibility beyond the health sector.

6.7. Citizen science for human health

According to the European Citizen Science Association[32]: *"Health is relatively under-represented in citizen science, despite the fact that it is a diverse and promising domain. Citizen science has great potential to contribute to innovative health research, as well as to society. Traditionally, patients are often included in health research programming; however, they are hardly or not at all engaged in decision-making on specific research*

[32] This quote is taken from the ECSA website: https://ecsa.citizen-science.net/

questions, in methodology development, data collection, analysis and the development of conclusions and recommendations, nor in new role definitions. In public health research, citizens are sometimes included in participatory action research, leading to responsive policies and interventions, as well as to citizen empowerment."

The research in Udon Thani by Adelina and Archer already referred to above is a good example of the latter. Broeder *et al.* (2018) list the benefits of several different Health Impact Assessments that involved the communities at different levels, especially in the data collection role.

1. Involvement of citizens
2. Inclusion of lay and local knowledge
3. Increased research capacity
4. Health literacy
5. Empowerment
6. Community building and social capital
7. Changes in attitudes, norms, values

Some examples from medical science research involve citizens tackling data analysis rather than data collection. These include puzzle-based projects in proteomics and neurology based on gamification and sophisticated bespoke systems for complex problem-solving tasks such as *Foldit* and *Eyewire* to explore protein folding and neural mapping respectively, Wiggins and Wilbank (2019). Scientists at Cornell university discovered links between clogged blood vessels in the brain (stalls) and Alzheimer's Disease. They set up a game called Stall Catchers to find blogged blood vessels in mice brains, reducing the time for data analysis by a significant factor. With the potential to reach millions of participants, the use of science discovery games in citizen science has grown over the last decade, with some researchers partnering with game developers, Waldispühl *et al* (2020).

6.8. Citizen science environmental research

There are thousands of examples of environmental citizen science projects that can be easily found on the internet. In the UK many of the nature based ones are frequently referred to as "recording schemes". The United States Environmental Protection Agency alone lists several citizen science projects including: cyanobacteria monitoring; underwater videos; hurricane preparedness; crowdsourcing to

understand wildfire smoke health effects or violations of environmental law. Added to these there are innumerable participatory action research and mapping projects around the world in areas of ecology, rural development, and conservation. There are clear advantages from employing volunteers with a wealth of indigenous and local knowledge, Zanotti *et al* (2010); not least being community engagement and project support, Hambler, and Canney (2014). The benefits, successes and lessons to learn from these are well documented already, with further recommended links to resources provided at the end of this paper. The next step is to see how to link and develop these types of projects with human health projects so that citizen science can become integral for all planetary health.

6.9. Combining environmental and human health with citizen science

Ogden *et al* (2019) use the term "One Health" to link human health with the fitness of the environment. They demonstrate how citizen science can contribute to planetary health as such similar methods and common situations are found in both the natural and human environment:

"Methods for monitoring invasive species, including active field surveillance and citizen science-based passive surveillance, have much in common with methods used to monitor risks from emerging zoonoses and vector-borne diseases in the environment. Similar sampling designs are used and their implementation in target regions or sentinel sites is often determined by similar criteria, such as likely spread patterns predicted by species distribution and spread models, and occurrence of locations where impact may be greatest.

As mechanisms, principles and norms currently guiding global health governance are found wanting, new ones will be redefined and reinvented to adapt to this instantaneously interconnected, complex world. They will be needed in the realm of institutions, where new rules, decision-making procedures, resources, and participants are required if the expectations and behaviour of the world's countries and citizens are to realise the reality, rather than just the ideal, of health for all."

This illustrates how merely establishing links between the state of the environment and human wellbeing is only the initial step in the process of change. Gabrys (2020) links inequalities in power to environmental quality and people's wellbeing: *"Environments have developed as expressions of unhealthiness through*

inequality and injustice. They further reproduce and reinforce injustice through entrenched material conditions of inequality. Health in this sense is less a matter of becoming healthy through changes in lifestyle or individual betterment, and more about addressing the social and political conditions that form unequal and unhealthy environments."

Therefore, engaging citizens and empowering private individuals to conduct primary research themselves can help to redress this imbalance of power. The use of social media and the internet to publicise and publish results also gives independent researchers a voice. This has the potential to address both social and political imbalances in power at the same time as sharing information and advice founded on empirical data that could be beneficial for health and wellbeing. As Gabrys notes, participants in air quality monitoring research were not satisfied with just measuring pollution levels – they wanted to show how the data could benefit urban improvement projects. Lo *et al*. (2018) noted that a report investigating healthy cities stated:

"the environmental and social determinants of health and identified the importance of aligning with the national campaign Healthy China 2030. Health in all policies and cross-industry collaboration were recommended. A unique aspect of the process followed by this Commission was the use of crowd sourcing as a method of involving community participation online to imagine the cities people want."

6.10. Citizen education: for the people by the people

Involving a wider group of participants in research brings more skills and networking to the team and the project as a whole. These may include leadership or communication skills, access to wider social media followers for sharing results or possible crowd funding. It is not unlikely for example that some school aged students could have well developed creative or new technology skills to share whilst they benefit from learning botanical taxonomy or identification skills from experienced amateur naturalists in a form of mutualism. The Soil Doctors programme around the world supports farmers educating each other, using scientific tools but in language and authentic contexts relevant to them, Waller (2019).

In relation to agricultural citizen science, Ryan *et al.* suggest three main reasons for promoting the participatory approach: cost reduction of primary research, the

increasing spread of pests in globalised food production requires closer monitoring for food security reasons, and significantly citizen science has possibly greater potential for sharing information for solutions at a local level. They also note that it has been regularly reported that school-based gardening projects and many aspects of outdoor environmental education have been correlated with improvements in academic performance; details of several such reports are in Makuch and Aczel (2018). Even without the academic benefits participatory research undoubtedly increases scientific literacy , Rivers (2017) and environmental awareness, Brouwer (2018), Hambler and Canney (2013). There are additional developmental benefits for school aged children including physical, emotional, interpersonal and social development as they experience purposeful activities within a wider group than their usual educational, family or social settings.

Dunn and Menninger (2016) report how the *Students Discover* programme in North Carolina has brought early-year researchers together with secondary school students to conduct authentic novel research on a range of projects including soil microbiology, facial mites, urban faunal biodiversity, and ant pathogens. However, Roche *et al.* (2020) similarly caution that:

> *"tension may arise between the traditional role of the learner in some learning environments, acquiring pre-determined knowledge and values, and the process of learning continuously through active citizenship, which may result in social transformation. Educators may feel uncomfortable in sharing decision-making power with other participants in citizen-led activities and may feel uncertainty as to the value of that learning process (Mueller and Tippins, 2015). In citizen science activities, practitioners, and participants may not be able to retain their usual roles in some learning environments (Fazio and Karrow, 2015) and significant changes may need to be made in order to enable and facilitate social activism."*

Dunn and Menninger acknowledge that forging links and blending different educational practices was not straightforward, but that with persistence there were very worthwhile outcomes for students, teachers and researchers alike. Collectively this can benefit wider society and potentially the health of environment too.

The authenticity of research is another significant factor in success. For example, mangroves grow through many coastal waters in tropical countries around the

world. They provide sustainable livelihoods for thousands of people, provide sea defense and protection from tsunamis such the 2004 event that hit Thailand and Sri Lanka and are also the habitat for a range of endemic species that could not survive elsewhere. Additionally mangroves are sources for some traditional medicines and potential sources for new ones, Saranraj and Sujitha (2015). However, they are often subject to stressors such as deforestation for "development" into shrimp farms as well as some species specific diseases, which could well be increasing due to climate change and rising sea-levels. The Khaled bin Sultan Living Oceans Foundation has developed a Mangrove Ecology Curriculum with its unique Mangrove Detective citizen science project to help students apply learning of plant diseases and discovery how diseases spread in natural communities. Evaluating the benefits of participation in such activities Jacobson *et al.* (2006) note that pre-test post-test mind mapping analyses of high school interns at the Great Smoky Mountains National Park found a shift from general knowledge to a deeper understanding of networks and resource groups. This could be interpreted as increases in what Howard Gardner terms interpersonal and naturalistic intelligences, Waller (2018).

Education is a core component for many environmental projects, but these are not always linked to health – similarly many health programmes require significant community education, but these are not necessarily linked with the environment. A good example of the advantages of linking all three is by a Pathfinder International programme in the Lake Victoria region in central Africa, Duff *et al.* (2020). They follow an integrated approach of Population, Health and Environment to improve family planning practices, reduce sexually transmitted diseases and simultaneously support sustainable fishing and agriculture.

Even in this internet age access to, and the ability to interpret, reliable knowledge is limited by various socio-political factors. In *The Social Production of Toxic Uncertainty* Auyero (2008) refers to the limits of what people see and know as risk frames. For example, Parviainen *et al.* (2019) found that information disseminated by governments regarding the Barents Sea oil spill pollution was ambiguous at best, restricting the development and adherence to clear risk management policies and practices. They identified that social learning and collaborative knowledge production were the best transparent and sustainable way forward. This underlines the need for, what Callaghan *et al.* (2020) refer to as,

authentic research aiming to answer meaningful and valid questions. Lovelock (19950 proposes that to be able to ask and explore important questions scientists should aim to be self-funded; the ultimate self-funded researchers are surely the tens of thousands un-cited contributors around the world.

Finally, planetary health education is comparable to what Macer (1990) writes in the Preface to *Bioethics for the People by the People* regarding bioethics: "It is the concept of love, balancing benefits and risks of choices and decisions." Those choices and decisions cannot be left to scientists, academics, politicians or bureaucrats alone: we all need to make informed decisions and by being fully involved in primary research can provide insightful opportunities for this. Social learning of more than just technology skills was proved successful in the hole-in-the-wall experiment by Sugata Mitra in 1999 and proved his hypothesis that:

> *"The acquisition of basic computing skills by any set of children can be achieved through incidental learning provided the learners are given access to a suitable computing facility, with entertaining and motivating content and some minimal (human) guidance."*

The recommendations of building citizen science communities, engaging activities and tasks through purposeful, meaningful and credited roles to answer authentic research questions can likewise lead, through social learning and community education, to improvements in health and a greater engagement in nature conservation.

6.11. Conclusions

Citizen science is often part of multidisciplinary research, using a variety of methods that can include both human health and the environment. There is increasing potential for new research involving an army of citizen scientists to accelerate our understanding of how both the fitness of nature and human wellbeing are mutually interrelated. Participants from non-academic backgrounds can bring their skills, enthusiasm and take on roles and share responsibilities within a project. There are many tens of thousands of volunteer researchers around the world, who are motivated to freely work for the greater good of nature or their communities, and are increasingly being recognized as valued contributors in the voyage of scientific discovery.

Some of the benefits of citizen science include being able to gather wide arrays of data, speeding up research, and reducing costs. Yet, there are more fundamental benefits of opening science to wider participants: raising awareness of health and environmental issues, and increasing scientific literacy. Thereby, through combining the power of more collective minds this can open up new avenues from asking authentic, relevant or more specifically refined research questions to finding answers and resolving problems. This has proven to be the case in many ecological studies and conservation projects. With the development of digital technologies and growing numbers of online gamers there is the possibility for an expansion of this army of volunteer helpers along with more reliable data recording and rapid computational analysis.

There are potential risks from citizen science data being less reliable, recruiting unbiased volunteers and retaining active membership in the team. To combat this it is recommended that good training is provided, building a community and maintaining good communication within the whole research team to fully include volunteer members. As with charities who rely on both volunteers and salaried staff, leaders of research teams must have a good insight what motivates citizen scientists and not merely see them as means to an end.

This paper has touched on several research ethics issues that should be considered, including fully informed consent, data protection and the requirement for “good science”. These are not specifically bioethical but are relevant to all environmental and human health research that involves working with people. Supporting researchers with ethical literacy training and tools, establishing awards or credibility recognition tokens for ethical research and making requirements presenters and publishers to make comments or answer questions regarding ethical aspects of the work are just three ways to promote ethical research standards if work is conducted outside a regulated institution.

The very nature of volunteerism and citizen science means that participants are most receptive to and often willing to offer support for social learning, and community or non-formal education programmes. These are shown to have academic and social capital building benefits. Though awareness raising and public engagement this could well lead to behavior and policy changes. The potential for citizen science to serve and benefit planetary health is vast and largely untapped. So,

let us ensure that this resource is treasured, allowed to flourish and not taken for granted, under-valued, abused or misused. Indeed, as Williamson (2014) succinctly puts it: *"Citizen and patient participation must have a significant influence on the way we do health ethics if its potential is to be fulfilled."*

6.12. Notes

Ethics. Approval and consent for this work was provided by the IRB of American University of Sovereign Nations.

Data accessibility. No data was recorded for the production of this review article.

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<u>Useful additional resources and links</u>

SciStarter for Educators

https://scistarter.com/page/Educators.html

Toolkit for Educators

https://www.calacademy.org/educators/citizen-science-toolkit

The Ten Principles of Citizen Science

https://ecsa.citizen-science.net/engage-us/10-principles-citizen-science

Khaled bin Sultan Living Oceans Foundation

https://www.livingoceansfoundation.org/education/mangrove-education-and-restoration/mangrove-detectives/

Community Citizen Science; From Promise to Action by Chari, R., Blumenthal, M.S. and Matthews, L.J. (2019)

https://www.rand.org/t/RR2763

7. Responsible research and peaceful life

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"Dual-Use in the context of science describes the potential of knowledge or technologies to be used by third parties with benevolent and malevolent intention."
(European Commission, 2018)

7.1. Abstract

Export control includes sets of measures ensuring the regulatory implementation of the procedure for carrying out foreign economic activity, including "sensitive" products and technology. Some difficulties arise during the export control of intangible technology, i.e. knowledge related to controlled goods and technologies. The development of global computer networks has made it easier to exchange goods and information. The widespread use of low-cost computers and communication devices increases the flow of information transmitted, the control of which poses the most severe problems in export control, especially intangible assets. In this context, universities and research institutes are so-called frontmen, as universities and research institutes are open for new collaborations, new research projects, sharing information with other stakeholders, and student exchange programmes. However, at the same time, they have been targeted by illicit technology transfer efforts from threat actors, and each time theft or problematic transfer takes place, it places the university at risk and endangers the host nation's security. Dual-use dilemmas come out when the same result of the research can be used “dual”: for peaceful aims or military ones. Basic research, as well as more applied technologies, fall within the

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category of dual-use. Therefore, the topic of technology control mechanisms in research settings is rising on government agendas worldwide.

Keywords*: intangible technology transfer, research institutes, scientists, weapons of mass destruction, awareness, dual-use*

7.2. Current situation

On December 13, 2018, within the framework of the 2018 Export Control Forum of the European Commission, the legislative processes of trade control taking place in EU member states, the directions of effective cooperation between public, scientific and industrial spheres of each state in this field were discussed. As a result, it became clear that the most effective mechanisms for trade control shall operate at the national level as the main guarantee for security assurance. In other words, domestic legal regulations on strategic trade control and its effective application are among the pillars of domestic, interstate and international security. Export control is a set of measures ensuring the regulatory implementation of the procedure for carrying out foreign economic activity, including "sensitive" products and technology and dual-use items. The concept of dual-use refers to the misuse of civilian technology for military purposes. In this context, it is essential to understand that basic research is more than anything else applied technologies fall within the category of dual-use.

In the age of scientific and technological globalisation, when such projects as "scientists without borders" are more than relevant and welcome, interstate research projects are encouraged and funded, controlling "sensitive", and dual-use products and technologies is almost not regulated. Transferring intangible or sensitive items concerns so institutes, students, researchers as scientific and technical cooperation, which includes:

- distribution of scientific and technical information through scientific, technical and educational literature, reference books and reviews, technical standards and instructions, patent descriptions, conference materials, certain types of technical documentation;
- joint research projects and sharing of results;
- training in higher education, student exchanges and internships for young scientists and specialists;

- exchange of information during international scientific conferences and symposia; exchange of information during specialised international exhibitions, among others.

The export control of the intangible technology, i.e. knowledge related to controlled goods and technologies, difficulties arise, as the development of global computer networks has made it easier to exchange goods and information, and the widespread use increases the flow of information, the control of which poses the most severe problems in export control. Currently, in this segment of export control, the issue is what to control and how to control it and how to balance the free exchange of research results with security concerns.

There are some attempts to publish open articles on fundamental research, while these studies are not as such. Delicate questions also arise when teaching sensitive specialities to international students, and a need to restrict the publication of textbooks on sensitive specialities because unclear regulations in this area cause an uncertain landscape and a grey area for those involved in teaching.

In the current situation, due to the lack of clear criteria and in order to avoid the "unconscious" transfer of possible dual-use information, the government mainly uses the practice of total control, which causes frequent misunderstandings and discontent of the scientific community, which is forced to limit its communication.

It is undeniable that research and military developments overlap in many areas of science - fundamental and applied. Some information considered secret in one country is published in open sources in another country. Although the "fundamental research" is defined in the Lists[33] quite unambiguously, nevertheless, there are attempts to publish open articles on fundamental research, while these studies are not as such (sometimes this is done to avoid the stage of obtaining a licence, and sometimes because of lack of awareness of whether the research is fundamental or not). Also, the control procedures for obtaining an education in the field of science that relates to the creation of weapons of mass destruction (WMD) are not regulated. Delicate questions also arise: should it be prohibited to teach sensitive specialities to international students? Moreover, is there a need to restrict the publication of textbooks on sensitive specialities because if teaching international students is prohibited at several technical universities? Consequently, they will study illegally, or

[33] Dual-use control list, more- https://trade.ec.europa.eu/doclib/docs/2020/december/tradoc_159198.pdf

the teaching staff of technical universities will look for "work on the side", creating an uncontrolled "brain drain."

Thus, the lack of precise criteria and developed provisions and low efficiency of the control of intangible technology transfer make many experts and governments of world-leading states improve this type of export control. However, the lack of a perfect system does not imply there should be no legal and technical restrictions on transferring sensitive technologies. So nowadays, one of the best ways to solve some of the mentioned problems is raising awareness among the target groups involved in the seminars.

It is evident that all this is connected and intersects with universities and research institutes, which are welcoming environments for open inquiry and advancing knowledge for the greater good, but they are also hosting to a range of sensitive technologies and knowledge of interest to foreign governments for WMD and military purposes.

7.3. Project: Responsible conduct of research: STEM scientist and peaceful life

Protecting the scientific community has become one of the main challenges of our time. Under the International Science and Technology Center (ISTC) and with the financial support of the EU, the "National Bureau of Expertise" State Non-Profit Organisation has started the research work about the responsible research for the students, researchers and scientists, universities, research institutes. This proposal's main objective is to raise awareness of stakeholders and create a more "responsible and safe" environment for the scientific community, a sustainable foundation for further legislative progress.

The project has specific stakeholders: students, lecturers, researchers and scientists, universities, research institutes. Furthermore, the precise aims are: to raise awareness, create a more "responsible and safe" environment for the scientific community and prepare a sustainable foundation for further legislative progress. So the significant impacts of this project are awareness, understanding of the ITT risks and sustainability of the results. Therefore outreach to the scientific community and awareness-raising within the community is critical to the proper implementation of any technology control. This is widely recognised and frequently demanded; however, sustained outreach and awareness-raising activity are rare.

The seminars have been held with two categories of participants: researchers from scientific research institutes of the National Academy of Sciences of the Republic of Armenia (RA) and students from leading universities of the RA, including masters, PhD applicants, and lecturers.

It is planned to involve scientists from 24 scientific research institutes of the National Academy of Sciences of the Republic of Armenia (at least ten scientists in each group). Also, we are planning to involve masters, PhD applicants, and lecturers from six universities. For each group it is planned to have two seminars /4 academic hours/ about the following topics:

- *The meaning, essence, and significance of sensitive products, technologies և information, including dual-use products and technologies for the scientific community;*
- *How can the misuse of sensitive products, technologies and information be dangerous and destabilising in the field of WMD? Threats and risks for the scientific community, universities and research institutes;*
- *Why does the scientific community need this knowledge? Discussion of practical case. Rules of domestic and international conduct;*
- *How to find balance? Benefits and risks in the context of global best practice analysis;*
- *What is the Internal Compliance Programme? How will this help to make it happen?*
- *Implementation of risk management: Red flags and vetting. (only for the lecturers);*
- *How and Why does the international community seek to prevent the proliferation of WMD:*
    - *International export control regimes;*
    - *UN Security Council Resolution 1540;*
    - *International agreements, organisations prohibiting the use of nuclear, chemical, biological;*
    - *Efforts to strengthen the global system of control of dual-use goods at the international (EU, US) and national level (RA);*
    - *Problems of export control in the EEU environment, Russia's experience; and*

- *The commitments of the Republic of Armenia: the legislative field, current situation, plans, the experience, the international cooperation.*

To assess the effectiveness of the results of the seminars, the working group prepared several questionnaires that have been handed over to the seminar participants with a request to fill them in before the start of the seminar and after the end of the seminar. Questionnaires consist of such questions as

-“Have you ever heard about intangible technology transfer or Internal Compliance Programme in University?”;

-"What do you think about this seminar?"; and

-“How can you describe the meaning of intangible technology transfer?”.

Using the comparative method, a working group will compare all answers to have a “picture” before and after.

To provide the project's sustainability, it is planned to provide materials and tasks, seminars videos. Furthermore, participants are provided with the opportunity to publish their works in export control, ITT, ICP, trade control for free in the "Armenian Journal of Forensic Expertise and Criminalistics" of the National Bureau of Expertises where it is planned to create a separate section for this field. It is worth mentioning that this journal is a scientific publication, which will contribute to publishing the works conducted by students. Thus, sustainability of the process of education of this field will be ensured by the contacts with governmental bodies, particularly, with the Ministry of Economy and Ministry of Science and Education of RA, and also by step by step implementation lessons about these topics in the leading higher educational institutions of the Republic of Armenia.

7.4. Conclusions

On 1st December 2021 the working group finished seminars with the Group of students and with the group of lecturers. Although all participants answered that they had heard nothing about ITT, dual-use items, ICP in their universities, 70 per cent answered this knowledge is essential for them. These results show the need to implement a project like this one to cope with the scientific community's needs.

Considering the survey results, we are planning to:

- Generate interest in technology control frameworks and promote understanding of the broader legislative backdrop and its application in research settings.
- Raise awareness of the proliferation threat environment and pathways illicit actors seek to use to gain illicit access to strategic technologies in research settings.
- Advance understanding of the risks students, researchers and scientists face resulting from illicit technology transfers.
- Develop knowledge of how to implement risk management strategies in the scientific field.

7.5. Ethics

Data accessibility. No data was recorded for the production of this review article.

Authors' contributions. Two authors have been contributors to the composition of this paper.

Competing interests. The authors declare no competing interests.

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6. Export Control and Academia Manual BAFA - Export Control and Academia

8. The happy marriage of Planetary Health and Bioprospecting Bioethics: A Concepirical (conceptual+empirical) Reflection from Bangladesh

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> *If the land is sick, you are sick* (Patrick, Grewal, Chelagat, Shannon, 2020, p. 308).
> *Why the grassroots matter* (The Rockefeller Foundation–Lancet Commission on planetary health, in Whitmee et al. 2015, p.42).
> "Nature is calling. How will you respond?"

8.1. Abstract

This paper explores similarities in the debates on planetary health and bioprospecting, proposing a conceptual and empirical reflecrtion on these issues form Bangladesh,

8.2. Introduction

The global Covid-19 catastrophe profoundly demonstrates, people's existence with wellbeing reflects on planetary health. Planetary Health (PH) refers to human wellbeing as well as the status of the natural systems it relies on.

What PH means to us is indeed a simple definition.

> *"achievement of the highest attainable standard of health, wellbeing, and equity worldwide through judicious attention to the human systems …that shape the future of humanity and the Earth's natural systems that define the safe environmental limits within which humanity can flourish"* (Whitmee et al. 2015 in Parsons, 2020, p. 225)."

·pp. 184-215 in *Planetary Health,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

A little differently, Niankara & Niankara (2020, p.2) said that planetary health (PH) is,

> *"[T]he health of human civilisation and the state of the natural systems on which it depends*"

Conceptually PH relates some terminologies, Seltenrich (2018, p. 2).

> *"Many of the concepts central to planetary health have been around for decades in fields including global health, conservation medicine, One health, and EcoHealth. Similar dynamics play a role within the evolving field of climate change and health. But the framework of planetary health gives these ideas cohesion."*

Again, as the novel coronavirus looks increasingly like a product of man's impact on nature, including an expression of our inability to understand this relation, as illustrated by our environment disturbance, rural and urban, hill and plain land. So it is time to be all-inclusive, including the excluded, vulnerable and marginal. That being said, after the 1970s, we can map the origin of planetary wellbeing. In 1980, Earth's Friends first voiced the need to expand the concept of wellbeing of the World Health Organisation, arguing that "personal health involves planetary health." In brief, Norwegian physician Per Fugelli in 1993 cautioned: "The patient earth is sick. Global environmental disruptions can have serious consequences on human health. It's time for doctors to give a world diagnosis and advice on treatment." Following the 2015 collective pledge of the Rockefeller Foundation-Lancet Commission on Global Health, the Global Health revolution progressed unprecedented in the 21st century and provided space for improved health outcomes for hundred of millions of community members, albeit at negligible cost — a serious burden on surrounding ecosystems mechanisms. Bringing the perspective deeper, it should be important to remember how global health is also not strictly an illness-containing mission; the World Health Organisation stresses that wellness is the realisation of human capacity, not merely the absence of disease. Indigenous communities have gained considerable coverage in this trend. This is a Lancet Planetary Health call (Anderson, 2020), and rightly or wrongly, calling for united south (Eve & Tuck, 2012); PH is practical.

In this chapter, I intend to explore the planetary health problem in the context of indigenous Bangladeshis. We ask if anyone is independently healthy (Davidson, 2016; Patton, 2016) and seek if there is an explanation behind personal health and our surroundings. How is climate justice and health justice linked in the global south? This paper discusses the foundations of planetary health's academic goals and offers evidence from indigenous cultures of how this might be a potential research policy. (Pongsiri et al. , 2015; Pongsiri et al., 2019). A planetary health campaign is as far-reaching as deep, in the conceptual framework at least, and this structure encompasses global change, legal problems, political problems. Studies, for instance, Ruger (2009), suggests that PH acknowledges that human intervention on ecology is not a partial, regional reality. One health and one planet is almost a PH mission.

Health equity supports people's ability to understand health and wellbeing across a variety of government safety guidance, laws and regulations, and judicial process. PH provides a system-based strategy to climate issues by understanding the multi-scalar and interrelated existence of people's wellbeing and our world (Horton, 2018). For several years, even before the Lancet Commission, ecofeminist researchers (Gaard & Gruen 1993; Cuomo, 2011; Mickey & Carfore, 2012; Tanyag, 2020) have associated equality concerns surrounding the unfair attitudes towards women and ecology with planetary health. The PH movement did not deny the indigenous people their land and biodiversity (Prescott, et., 2018). Research, from various contexts (Charlier et al., , 2020; Ratima, Martin, Castleden & Delormier, 2019; Redvers, 2020a, 2020b; Ghebreyesus, 2018; Curtice & Choo, 2020; Prescott & Logan, 2018; Van den Broucke, 2020) show that PH has and can play a role in formative Indigenous health and their historical oppression (Smith, 2013) and the future. Many studies demonstrated methods to address the planetary health discipline's challenge of deciphering research into action (see Ratima et al., 2019; Redvers, 2020a, 2020b; Prescott & Logan, 2018). We pick a particular community and a spatial context from the comprehensive ocean of planetary health movement: This paper explores only the grassroots (Epigraph) and indigenous Bangladeshi communities.

Our central proposition is that indigenous communities' excellent health / fitness / wellbeing is deeply rooted in a state's socio-economic and political conditions and its institutions or agencies. Agencies provide support, protection, and nurturing for indigenous people to flourish from birth into old age. Such foundations

for indigenous community wellbeing are laid on the concepts of recognition, human rights, preservation of indigenous knowledge, forest, justice and equity and implication of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), and human rights. We are trying to focus on one element that is biodiversity, and more specifically, bioprospecting. Robin Sharma said everything is created twice. One is in mind, then reality. This chapter is in the first step; the second step is the reality; some future researchers may anchor it.

In so doing, we do not condone both the paradigm of planetary health and the indigenous biodiversity aims for protecting bioprospecting. Instead, this chapter is honing with the reality in the indigenous land of Bangladesh. We see a caveat. We affirm that neither the West nor the industrialist nations, the wealthy, the fortunate, nor all human species are liable for inequality or injustice. Establishing such an argument necessitates an investigation of the intra- and inter- relationships within the research in an ethical rubric, political sphere, and historically set ontologies of state.

Part two is 'the Conscious connection / the Happy marriage of Planetary Health and Bioprospecting.' To pursue these aims, we discuss some of the prevailing perspectives on some treaties that addressed biodiversity and rights of indigenous peoples. It stands with some factual data and global indigenous inequalities and offers a substitute, often complementary, conceptualisation in grasping the people's view, instead of imposing something. This section introduces a broader discussion of relations between contemporary capitalism and the indigenous situation.

Section three is an account of some history of both PH and bioprospecting. This section is vital as many significant texts inform us of the preservation biodiversity that has progressed since 1992, the Rio Earth Summit. However, PH can be traced back to the 1970's. well before the Lancet Commission, largely seen as ideas in academia. This small section reveals our argument in linking the conscious connectivity of both paradigms.

Section four strains conceptual turmoil in PH and bioprospecting. It implies that capitalism's dominance in consumer society depends on centralised, ambiguous moral and environmental structures that have significant, accelerating impacts on the Earth and its inhabitants, as capital turns life-worlds according to product theory into daily micro-practices. Similarly, biopropsepecting has seen some criticism.

The fifth section is a brief conversation of our metaphysical framework, adopted and introduced as a possible methodological proposal. It rejects capitalist economics. Spending and identity-forming, and political sector elements are sketched to illustrate parallels between neoliberalism and the socialised post-World War II 'Health for Everyone' strategy.

Section six is the strongest potential depth and viewpoint within this chapter's theme. Methodology matters. We give important reflections (following Saadia Gaon and Al Farabi's essential method) on emerging indigenous research activities in Bangladesh. It represents and arranges the constitutional refection of CBD and ABS along with Bangladesh's constitutional provision for indigenous peoples. Ultimately, if paradigms, objectives, and dominant mentalities reject aboriginal social justice, privileges, and self-determination, then freedoms cannot thrive. We deem it important to maintain flourishing lives and lifestyles. While doing so, we make a crucial interference from some of the public health literature's progressive assumptions. Secondly, it seems that connecting and focusing on this subject is a simple land of practicality: the cultural , social and economic motivating factors of modern capitalism and its global scale are essential to our interpretation. We consider its consequences in terms of exploring the central position of over-expanded private property rights, and particular intellectual property rights, in Bangladesh's capitalist-governed social research practises. Ultimately, this chapter is an aid to global knowledge democracy, not knowledge production as laid out in the first segment within section six. We briefly outline ways to think of the direction and how to proceed ahead across a conceptual change to 'planetary wellbeing.' We need to be 'practical' and critical together whether it be in legislative or academic reserves.

8.3. The conscious connection of Planetary Health and Bioprospecting = what PH is

Section two is 'Planetary Wellbeing and Bioprospecting Mindful Connection / Happy Union.' To accomplish these objectives, we examine some of the prevalent views in certain treaties that discuss biodiversity and aboriginal rights. It stands with specific objective evidence and global indigenous differences and provides a conceptualisation alternative, sometimes complimentary, of understanding people's

opinions instead of forcing anything. This segment offers a broader examination of the interaction between current capitalism and the indigenous condition.

As we revealed, the Lancet Commission gives attention to indigenous people. Our discussion revives this importance, nothing new — instead, a it is a poignant reminder. This paper aims to aid the indigenous methodology as a philosophical guideline for PH and provides some examples from Bangladesh, which can inform future research. We will demonstrate this with a few facts, that resonate the justification for picking bioprospecting from the indigenous people of Bangladesh as a scenario for planetary health.

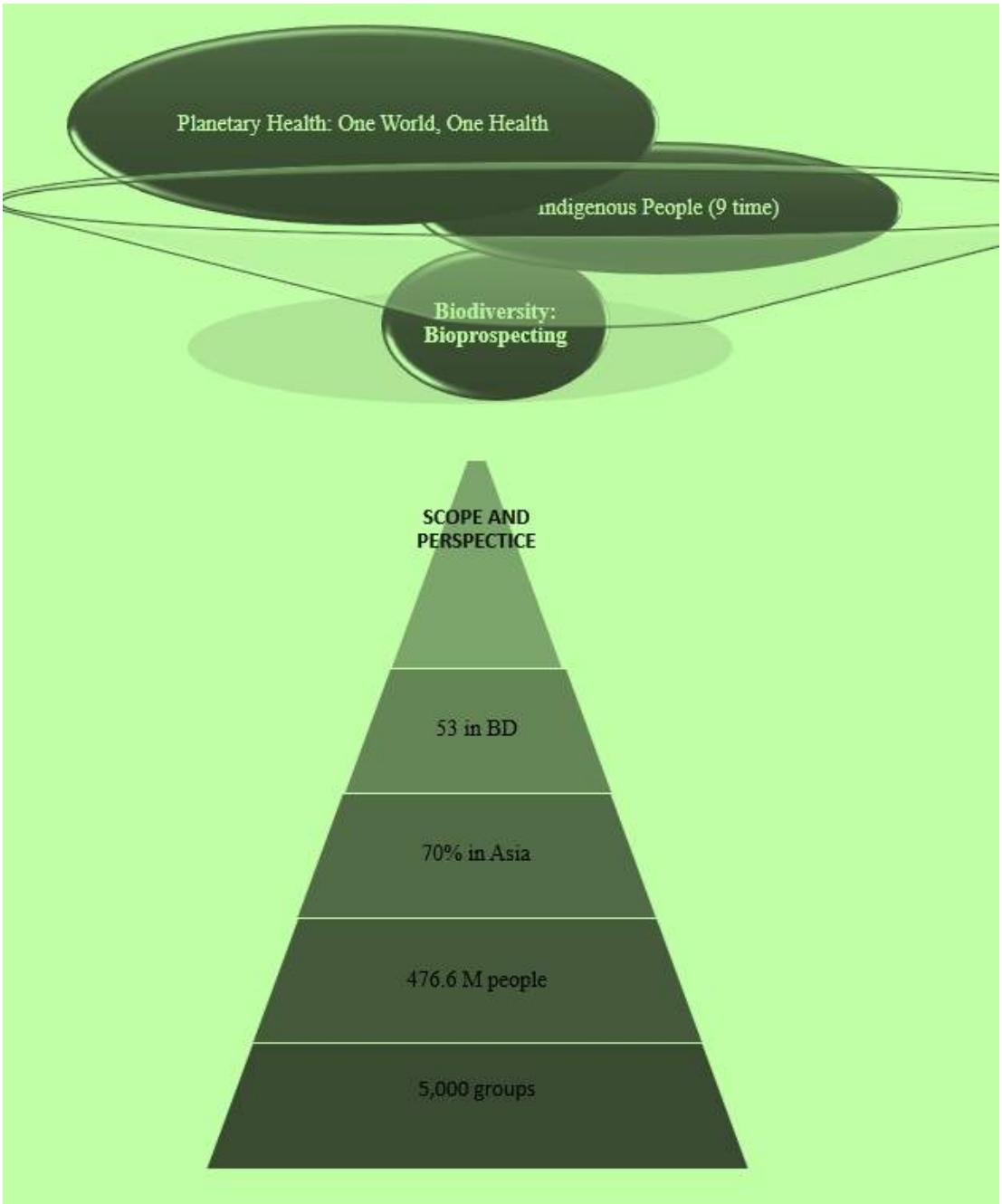

Figure 8.1: Bioprospecting and the Planetary Health

Figure 8.1 relates the bioprospecting from the indigenous people of Bangladesh and PH. This illustration demonstrates that seventy percent of indigenous people live in the Asia-Pacific region with fifty-three communities being in Bangladesh. If we refer back to the Lancet commission definition of PH, Whitmee et al., (2015, p.286) we can see that:

> [P]lanetary health is the achievement of the highest attainable standard of *health, wellbeing*, and equity worldwide through judicious attention to the human systems—political, economic, and social—that shape the future of humanity and the earth's natural systems that define the safe environmental limits within which humanity can flourish. Put simply, planetary health is the health of human civilisation and the state of the natural systems on which it depends [emphasis ours].

In short the Commission says that:

- Health and wellbeing: that means we have to ensure people's wellbeing not just their physical health.
- Judicious attention is not for the political system and policies only, instead it asserts the 'human system' of a given state and constitutional provision.
- Humanity: regarded at its widest tells us about ethics in a humane relationship within and beyond the community.

Figure 8.1 reveals that indigenous people and their lives illustrate a typical challenge of achieving planetary health. If we see the situation of indigenous Bangladeshi communities, perhaps, undoubtedly, we can conclude that these people are in a vulnerable condition. For instance, Barkat (2016) says that rape, kidnapping, murder are synonymous with the Rakhain people. In general, Dutch anthropologist William Van Schendel (2020) eloquently said that the oppression Indigenous communities is linked with the history of Bangladesh, their vulnerability has existed for decades, even before the birth of Bangladesh. We also refer to some recent works related to this (see Firoz & Dahlström, 2018; Faruque, 2018; Hasan, 2015; Partha, 2016; Rashid & Hasan, 2020; Chowdhory, 2018).

If we look back on figure 1, it gives a clear demonstration of why Indigenous communities are important. On the other hand, Bioprospecting treaty, the CBD and

other related international Convention took intiative for biodiversity and Indigenous people. Looking back to Figure 1, it clearly shows the significance of indigenous peoples. Biodiversity and aboriginal communities are subject to rules of bioprospecting conventions, the Convention on Biological Diversity (CBD), and other relevant international agreements.

If genetic resources or indigenous knowledge of territory is valued without realistic prices they can be unethically appropriated or economically used, through bioprospecting (Shiva, 2016) or biopiracy (Pat Mooney). Multiple international treaties were signed to give legal redress to countries for biopiracy and grant legal protection for investment to commercial actors. The first accepted protocol, formally regarded as the CBD is a multilateral and international arrangement. There are three key aims of this convention,

1. Biological (or biodiversity) conservation; sustainability, preservation.
2. the efficient use of its ingredients;
3. Equal and equitable distribution of parental capital assets.

The CBD intends to establish national protection policies and land use plans for the protection of biodiversity and is also regarded as a primary treaty for sustainable development. It was available for signature on 5 June 1992 and came into effect on 29 December 1993 at the Earth summit in Rio de Janeiro. It contains two additional agreements, the Protocol of Cartagena and the Protocol of Nagoya. The Cartagena Protocol is an international treaty for transferring LCOs from one country to the next. It was implemented as an additional CBD resolution on 29 January 2000 and came into effect on 11 September 2003. If the Access to Benefit Sharing (ABS) is chosen, the Nagoya approach refers to and gains from genetic capital protected by CBD. The procedure also includes standard information relevant to CBD genetic capital and the implications of their use. It aims to accomplish one of the CBD's goals: *"An equal and equitable share of advantages resulting from genetic capital leads to the protection and efficient use of biodiversity."*

An additional agreement to the CBD is the Nagoya Protocol on ABS. This offers an exact legislative mechanism to fulfill one of the three aims of the CBD: to distribute equally and equitably the advantages of genetic capital usage. On 29

October 2010, in Nagoya, Japan, the Nagoya Protocol was introduced and came into effect on 12 October 2014.

2010 was also the World Biodiversity Year, and its primary emphasis was the CBD Secretariat. In December 2010 the UN proclaimed 2011-2020 as the United Nations Decade on Biodiversity following a proposal from the CBD signatories at Nagoya. In 2015 the campaign for environmental wellbeing arrived first. The primary tools for national adoption of the Convention are National Biodiversity Policies and Action Plans (NBSAP). The Convention needs countries to create national biodiversity policies and to make sure it is incorporated in the preparation of operations in all fields that may affect diversity. 173 Parties had formed NBSAPs by the beginning of 2012. In order to protect individual animals and unique ecosystems, the UK, New Zealand and Tanzania have established nuanced methods. One of the most comprehensive implementation projects through species recovery initiatives and other frameworks long developed in the USA for biodiversity restoration, the United States of America, a signatory that still had not ratified the Treaty by 2010. At least conceptually, ABS has several important dimensions that correspond with the nature of planetary wellbeing. See a crucial point regarding ABS: effective implementation of the Nagoya Protocol would involve productive domestic use. Establishment of National Focal Points (NFPs) and national competent bodies (CNAs) for information service, granting access or collaborating on enforcement issues-an access and benefit-sharing clearing house to exchange details, such as national regulations ABS specifications. This would assist the contracting parties in applying a variety of resources and procedures offered by the Nagoya Protocol. Capacity building will be supported on the basis of a country's self-assessment of national requirements and priorities:

- Establish regulations on domestic ABS to enforce the Reciprocal Negotiating Procedure of Nagoya
- Build infrastructure and institutions for study within the nation
- Sensitising technology transitions
- Budgetary assistance goal for GEF-related capacity-building and growth initiatives

A national biodiversity policy and action plan were drawn up in Singapore, for example, developed with the Singapore National Biodiversity Center. The United

Nations Convention on Sea Law (UNCLOS) is an international document that was set up by the Third United Nations Sea Law Conference (UNCLOS III), which is recognised as the Sea Convention or the Law of the Sea Treaty. In the 1990s, several major pharmaceutical and drug-detection firms reacted to biopiracy charges by stopping work on natural goods and focused on creating new compounds through combinatorial chemistry. To protect individual animals and unique ecosystems, the UK, New Zealand and Tanzania have established nuanced methods.

If we avoid the facts, we can miss the reality of how this impacts on indigenous people. For us, as researchers, we need to determine whether we will be part of the community's problem or a part of the solution. Bear in mind that:

- Indigenous territories contain eighty percent of the Earth's biodiversity.
- Indigenous lands also hold unquantified megatons of sequestered carbon as eleven percent of the planet's forests are under their guardianship.

Indigenous peoples have diverse notions of resilience grounded in culturally distinctive concepts that bridge person, community, and the environment Kirmayer, Dandeneau, Marshall, Phillips & Williamson, 2011; Ford, 2020; Redvers et al., 2020a, 2020b). Some studies (Gill & Benatar, 2020;) indicate that the political economy of PH is related to indigenous peoples.

The above discussion, indeed, further links could be forged between the bioethics movement and human rights with groups of concerned professionals, trades unions, social movements, scientists, physicians, and lawyers, linkages that are, Gill & Benatar (2020), said, it is in an "embryonic but are increasingly widely shared (p. 13)" and this study does not simply condone but aids holistic thinking of planetary health in the global call (Harvie & Guarneri, 2020). The theories of common culture, the heritage of aboriginal languages and cultures and their in-depth awareness are of considerable significance.

There is a desire for a stable citizen and public organisation and advocacy to become a national forum for needed reform. Indigenous peoples have, sadly, been described as a particularly endangered category in the global climate change debate as a product of residing in fast-growing regions and the overwhelming pressure of morbidity and mortality that this community already faces. With indigenous peoples

still experiencing continued and increasing economic and social marginalisation, higher incidences of chronic diseases and structural inequality, the need for indigenous self-determination and institutional acknowledgment of indigenous expertise as a base for environment and health solutions are especially important.

The reason we are unable to pursue a cure to nature has to do with the greed of the big chemical corporations, un-engineered and unwashed and with the ability of the almost incredibly tiny number of citizens at the top of the earth. One wellbeing on one planet is no longer a utopia well within our grasp. It will be for the future to tell if we can reach that.

The debate ended with two themes, one of which is that we ought to have an ethics of love, since this caring partnership with land-human-health is based on one body, one world and one future (Lueddeke, 2018). The definition of PH describes the interaction between health and environment. Low-resourced and marginalised communities, will be impacted to greater degrees by events such as the effect of drought on agricultural livelihoods and related mental health problems. They face the inequities that connect these two realms. Climate justice and wellness justice are organised by skill development and combined with eco-feminist methods. Spatial justice is introduced as the opportunity to conceptualise how certain intertwined injustices are expressed through the world. The convergence of these perspectives would offer a justice-based solution to global health that may address a variety of obstacles. Design and spatial practise provide frameworks and resources for identifying the dynamics of PH through scales, structures and partnerships, and for designing design methods that foster transparency and justice. Practical examples of Global South architecture initiatives connecting health and environment are provided. An overview of a maternal health initiative in rural Kenya illustrates how a philosophical paradigm for justice-based planetary development will lead to planetary development. Introduction and background: Sustainable Development Goals (SDGs) decided by all 193 Member States of the United Nations in September 2015. The key purpose of the UN Global Goals is to build a 'more just, prosperous and healthy environment.' The OHWB viewpoint ought to educate and inspire decision-makers at all levels – particularly civil society – to get behind the UN global initiative, regardless of ideological affiliation or division. The question is how to bring states, corporations and civil society behind the OHWB and the SDGs in all nations – some

that are more highly stable and those that are emerging and, of course, those that are in disarray – often for purposes that transcend rationality. Focusing on local requirements, led by global / national goals that are aligned with sustainable principles and policies, is certainly the right path forward.

Let us consider a summary of population facts. There are around 7.7 billion inhabitants on the earth, and it is projected that there will be more than 9.8 billion by 2050 and 11.2 billion by 2100. Climate change, urbanisation, pandemics, wars (we invest more than $7 trillion worldwide on fighting and just $3 per cent on peace-around $6 billion!) and food protection are crucial concerns that need to be tackled now and featured in the book along with health care – perhaps triggering a reconsideration of the word "Public Health" and broadening its remit to a more comprehensive "Economic Health and Well-Being" as a focus point. Changing our way of thought and behaving may no longer be a matter of why, but how-although our key problems remain political and economic rather than the maintenance of the earth. Populism, colonialism and isolationism represent the antithesis to the directions on which we should be aspiring. One could say that "Planetary Health" looks very much like the already developed area of Global Health from where I sit. Why the need for a new fancy name for the same tired, well-known discipline, I wonder? The largest refugee population is Rohynga and is in Bangladesh, a major issue from all viewpoints, health is one (White, 2017) This essay offers key words and reflections on decolonial practises, building on observations from the Indigenous Land and Refinery initiative, which relates to the past of Canada's Chemical Valley. The Social Sciences Schope is important (Behera, Behera & Satpathy, 2020). This project is crucially structured as indigenous people co-investigating the Imperial Oil Refinery, not as academics researching Aamjiwnaang, and asks how indigenous and decolonial approaches could guide the use of archives to other futures. Some recent work on health and other social problems is ongoing (see Xie, de Barros, Abelsohn, Stein & Haines, 2018; Redvers, Yellow Eagle, Quinn, Yunkaporta & Arabena, 2020). Together, keywords begin to illustrate a basic, place-based philosophy of transformation within the framework of decolonial historical experience. In 'Bioethics ofr Planetary Health' in the *Tenth International Public Health and Bioethics Ambassador Conference (*2nd October 2020), Alex Waller concentrated on bioethical considerations, it is not incorrect to add the indigenous approach, which is site-based, all-encompassing,

culrurally adaptive and, to a certain degree, represents the priorities of the SDG, the Declaration on Human Rights and the United Nations Resolution on Indigenous Peoples. During and after this current Covid pandemic, human biodiversity became more fragile (Jenkins, Jupiter, Capon, Horwitz & Negin, 2020). Tait (2018) said that the diversity was 'positive' to the overall environment (Reed & Stock, 2019) in either in (Myers, 2020) or remote rural indigenous lands (Lerner & Berg, 2017)

With a view to development, we are asked to create a profound change in mind – to follow a modern paradigm – that is an indigenous approach to ensure that our desires as human beings are aligned with the needs in our modern environment – our environment, our own means of life. Education is crucial in this regard — education that could teach us to be humane, attentive to a unified global / national / local policies and plans that are underpinned by human rights, indigenous rights and justice. Our debate is not overstated, the scale is of great importance to policy makers, multi-professionals, scholars, students in all fields, and interested members of the general population – particularly the younger generation – in both developed and developing nations.

This section has specifically demonstrated that aboriginal peoples are in a role to make immeasurable contributions to the climate. For all our wealth and technologies, it is often difficult to face the facts from information founded on practise and conviction. It is also important to spend more time and energy in collaborations with indigenous communities and respond towards whatever they suggest when researchers wish to protect natural capital or promote sustainability.

8.4. Some History

Section three is some history of both PH and bioprospecting. This section is vital as many significant texts inform, consertive preservation of biodiversity was begun following the 1992 Rio Earth Summit. This small section reveals our argument in linking the conscious connectivity of both the paradigms of human health and the natural environment. Indeed, a 2013 paper outlined the core connections and concepts behind planetary health without ever using the term.

Year	Major Works
The 1970s	The Enviromental movement (Dubos,1969)
1970-80s	Holistic health movements of the 1970–the 80s (Prescott & Logan, 2018; Ullman, 1979)
1972	Physician ecologist Frederick Sargent II, MD, wrote an extensive article in the *American Journal of Public Health* concerning the interrelations between the 'planetary life-support systems' (Sargent, 1972)
1974	Soviet bio-philosopher Gennady Tsaregorodtsev called for a new integrative hub of science which he called 'planetary public health' (Tsaregorodtsev, 1974)
1981	Theodore Roszak, wrote in Bauman, E. (Ed.). (1981). *The Holistic Health Lifebook: A Guide to Personal and Planetary Well-being*. And/or Press. Under the Holistic Helath paradigm , a famous book published, *The Holistic Health Lifebook: A Guide to Personal and Planetary Well-being*.
1988	Goldman, (1988) introduced Music therapy as all minclusive way to treat human body and ecology. Using sound and music for personal and planetary health and transformation
1990s	By the 1990s, the concept of planetary health was part of the fabric of integrative medicine
1991	Stohl, C. (1991) wrote lanetary health: Are you part of the solution is considered a major milestone in PH Movement.
1993	Per Fugelli (7 December 1943 – 13 September 2017). "The patient Earth is sick", physician Per Fugelli wrote in 1993. "Global environmental disruptions can have serious consequences for human health. It's time for doctors to give a world diagnosis and advise on treatment Casassus, 2017, p1)."
1993 March	Parker, (1993)Professor Judith Parker set forth a 'nursing ethic for planetary health.'
1996	Kahn Jr, & Friedman, (1998) moved for Native American Peace Village tradition as a path to "maintaining individual, clan, national and planetary health". 2
1999	First Nazajo Indigenous medical Surgeon Lori Alvord & Van Pelt, (1999) came with an Indigenous treatment in Planetaru Helath. *"I cannot think of a single thing that would be more important to us [North American indigenous peoples] than to have a pure environment for our health...human health is dependent upon planetary health and everything must exist in a delicate web of balanced relationships (Presscot & Logan, 2018, p. 98, emphasis original)."*

2013	Myers et al., (2013) outlined the core connections and concepts behind planetary health without ever using the term
2013	Wildlife Conservation Society came to support under the Health and Ecosystems: Analysis of Linkag HEAL project, the founder of HEAL and Cornell University professor Steven Osofsky.
2014	Horton et al (2014) the Manifesto, the Lancet Editor Richard Horton, coined the term "planetary health" in a "From Public to Planetary Health: A Manifesto.
2015	Whitmee et al., (2015) published in the Lancet with theRockefeller Foundation. he Lancet launched the concept as the *Rockefeller Foundation–Lancet Commission on Planetary Health'.*
2017	Later still, at a 2017 conference organised by the Planetary Health Alliance,12 Howard Frumkin of the University of Washington further rallied the students and researchers in attendance. "This is not just an academic exercise (Seltenrich, 2018, p.4).
2017	*Lancet Planetary Health* came in fore
2017-2020	*The debate is on going…*

Pongsiri et al. (2019) and Belesova et al. (2020) show that the field of PH is itself not settled. The debate is not only the practical viewpoint, instead the model, conceptuality and analytical way of thinking also in the stake (Lerner & Berg, 2017; Holst, 2020; Parsons, 2020; Niankara & Niankara, 2020). Pongsiri et al. (2015) clearly stated about the uncertainty. Culturally, the anthropocene is generally recognised to be an era in which human activity has grossly disturbed the natural environment. Deem, Lane-deGraaf, & Rayhel (2019) and Capon, Talley Ac & Horton, (2018) show that human activities (e.g., energy consumption, water use, urbanisation, and land transformation leading to the degradation of natural environments) in the anthropocene have brought about dire consequences, including alarming increases in greenhouse gas levels, climate change, ocean acidification, deforestation, human-manufactured toxins in air/water/land, encroachment by invasive species, and biodiversity losses. Although the origins of the anthropocene can be traced to our ancient ancestors, but there has been a great acceleration since the end of WWII.

Conceptual challenges, including the pressing need for genuine measures of progress which go beyond gross domestic product to measure human development and the state of the environment; governance challenges, such as how governments and other institutions recognise and respond to threats, especially when faced with

high degrees of uncertainty and the need to pool resources; and research challenges, such as understanding the social and environmental context of human health and linking crossdisciplinary research to address pressing environmental health threats.

In regard to bioprospecting, we see similar matters. When the biological resource or cultural information of a nation is inappropriately appropriated or illegally used without receiving equal compensation, it is recognised as biopiracy. Pat Mooney coined the word biopiracy to define a system in which indigenous awareness of nature, originating with indigenous communities, is exploited by others for benefit, without permission or reimbursement to indigenous peoples themselves. For example if bioprospectors rely on indigenous knowledge of traditional medicines, which is subsequently licenced by medical firms without understanding the reality that the knowledge is not fresh or created by the patenter, this deprives the indigenous community of their future rights to the consumer product extracted from the technologies they themselves produced. Critics of Pat Mooney and Vandana Shiva claimed the activities, such as Greenpeace, add to disparity between biodiversity-rich emerging countries and industrialised countries hosting biotech firms.

In the 1990s, several major pharmaceutical and drug development firms responded to biopiracy charges by ceasing to operate on natural materials, shifting to combinatorial chemistry to produce new compounds. Numerous international treaties were signed to provide countries with legal redress in the event of biopiracy and give commercial actors legal certainty for investment. This include UN Biological Diversity Convention and Nagoya Protocol. The CBD began in 1993. It obtained privileges to monitor access to genetic products for countries where they are based. One of CBD's goals is to help less-developed countries to further profit from their wealth and conventional expertise. Under the CBD guidelines, bioprospectors are expected to seek informed consent to exploit certain tools and must share their gains with the biodiversity-rich country. However, some opponents claim that the CBD has neglected to create sufficient legislation to deter biopiracy. Others suggest that the biggest challenge is the inability of national governments to enact appropriate legislation.

8.5. Conceptual framework: Indigenous persons, Bangladesh place and our planet

Let us take the inner essence of the PH movement (PHM) "The planetary health movement conceptualises a *holistic view* of the world incorporating an *ecofeminist perspective*(Patrick, et al., p.308, emphasis ours)." If PHM talks about the holistic view, then we may align, conceptually and practically with Indigenous Paradigm. Ambelin Kwaymullina's (2018) Indigenous insights are blended with Vabdana Shiva's (2016) ecofeminist thesis. In this tradition, few more works are motivated in adopting this framework (Redvers et al., 2020; Perkins, 2017; Morand & Lajaunie, 2019). Further, The concept of planetary health blurs the artificial lines between health at scales of person, place and planet. At the same time, it emphasises the integration of biological, psychological, social and cultural aspects of health in the modern environment

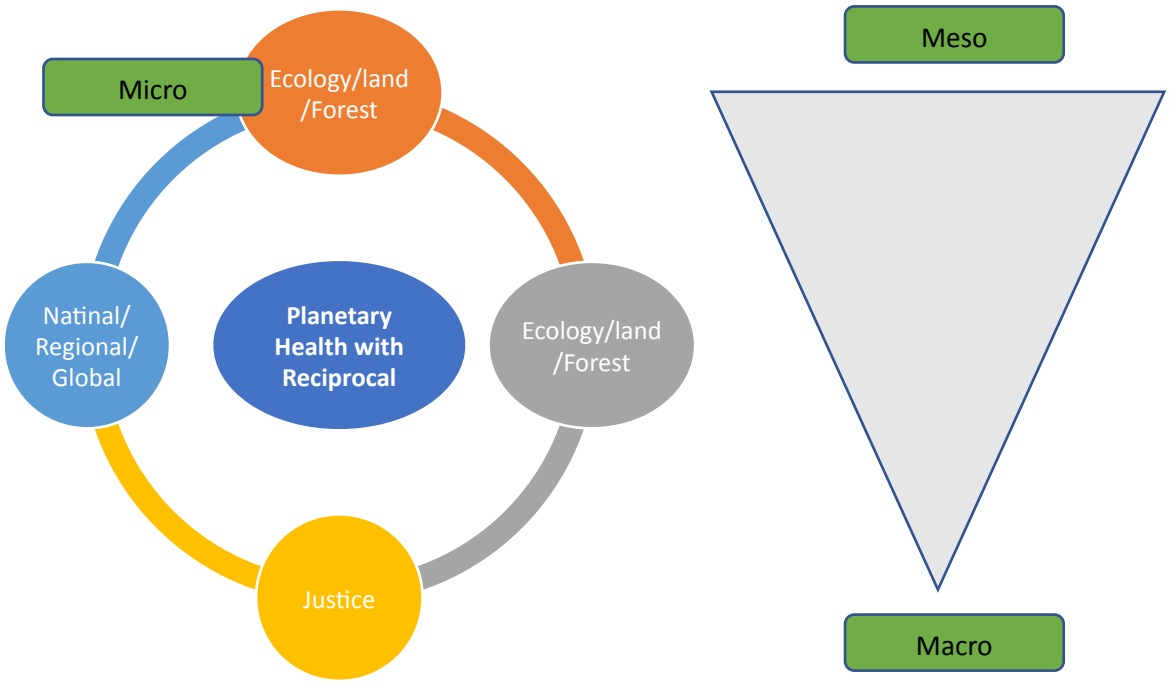

Figure 8.2: Conceptual Model of Planetary Health; Source: Lerner & Berg (2017), Shiva (2016), 5 Reports from panoramaglobal.org/planetary-health, Pongiri et al (2015), Redverse et al, (2020a, p 3) micro, meso, and macro scalesand authors' perception.

This conceptual model represents the individual person, land-based community and the glocal plnet, where a reciprocal relation centers the planet.(Logan, Berman, Berman & Prescott (2020, p. 3).

Lancet Editor-in-Chief Richard Horton, expressed concern that planetary health might slip into a cubbyhole as a retooled environmental health

> discipline, rather than its true enterprise, which in his words is "an inquiry into our total world. The unity of life and the forces that shape those lives". He opined recently that planetary health is "a capacious interdisciplinary inquiry [that] is neither capacious not.

Inequality and inequity are both place based and gendered. Women, children and the elderly in low-resource settings are considered the most vulnerable to health challenges and ecological crisis (WHO 2014; Shiva 2016; Benevolenza & DeRigne 2019). There is a need for conceptual and practical mechanisms to improve health and wellbeing, but which do not reinforce existing structural power imbalances (Shiva 2016; Redvers et al., 2020). Despite challenges experienced by such vulnerable communities in low-resource settings, the conditions of resource scarcity can drive creativity (Goodbun, Till, & Iossifova 2012). Grassroots participatory practices led by vulnerable groups can offer equitable solutions for planetary health. It is proposed this can be framed through an ecofeminist approach to design practice. This paper synthesises the capability approach, ecofeminism, ethics of care and critical spatial practice into a conceptual framework of planetary health. This conceptual framework maps out an approach to design processes that takes into account contextual and structural factors (Aranda-Jan, Jagtap, & Moultrie 2016). Redvers et al. (2020) is vital here.

> *“Regardless, planetary health as a field is primarily a Western construct with indigenous traditional knowledge (TK) systems having no clear separation between the health of the planet and the health of self or that of the community and ecosystem at large” (p.2).*

Its application to the fields of architecture, global health and development practice is considered through an exploration of some ecofeminist projects in the Global South. Details are presented of a multidisciplinary collaboration project to co-design a maternal health space in rural Kenya. The context, process of participatory design and outcomes of this project will connect the theories described in the conceptual framework and reflect on our position as 'planetary health designers and practitioners'.

8.5. Methdology Matters

SANTAL

Ethnographic methods and anthropological works	Hossain (2000); O'Malley (1916); Ali (1998); Debnath (2010, 2020); Karim (2012); Shamsuddoha & Jahan (2016); Somers, 1985); Toppo, A., Rahman, M. R., Ali, M. Y., & Javed, A. (2016); Bodding (1887;1925); Troisi (1978); Culshaw (1949); Hembram, R., Ghosh, A., Nair, S., & Murmu, D. (2016); Somers (1985); Mahapatra (1986); Shafie & Kilby (2003); Sur (1977); Anny, N. Z. (2019); Day, A. (2015); Sarker (2015)
Socilogical perspective	Uddin (2011, 2009); Shariff (2013); Troisi, J. (1978); Schulte-Droesch, L. (2018); Toru (2007); Murmu, (2004); Tripura, (2016); Ahmed, (2017). Elahee, (2013); Nasrin (2019); Anny (2019); Henry (1976); Barkat, (2016); Mohsin (2001); Rahman (2002); Guhathakurta (2004).
Rakhain	Van Schendel(2020); Partha (2018).; Tun.(2015); Siraz,., Abd Wahab., Saad,, & Roy,.(2020) ;Khan, Islam,, Siraj, Saha, Barman,Awang,Rahmatullah(2015);. Das,(2019); Ahammed (2015); Saxena, Mowla,Chowdhury (2020); Myat,(2018).; Ahmed, (2017). Jhala (2019).; Rahman(2020).; Myat,(2018)
Chakma	Chaklader (2018,2019); Rashid & Shafie (2017).; Afreen (2020). Nayak (2015,2019); Mahmud,(2015); Uddin & Gerharz (2017).; Rahman & Debnath (2015); Chaklader, (2018); Alamgir (2017);. Ahmed,(2017). Partha(2016); Faruque (2018).
Others	Nasrin(2019);. Rahman,(2019;) Tuhin & Ameen,(2015); Ahmad,& Naeem (2020); Rahman & Zaman (2015);. Chowdhory(2018); Tania, Zaman, , Morium, Akter, & Rashid (2020); Rahman& Ali (2019); Uddin (2020); Hasan (2015); Firoz & Dahlström(2018);

Among them who are alive did not even bother to know how the Santals survive in this pandemic

To comment on the table as stated contains many known names (some are my teachers), I am (Jahid) a little biased, uncomfortable, or, what Derrida said to his teacher Michel Foucault, is 'unhappy consciousness in the famous lecture, 'To Do Justice.....' Derrida became conscious by his teacher's paper, however, was unhappy. Or, what Cicero, as an orator, did with his student-friend Brutus, I am doing with the first author Professor Saifur Rashid, I have the inherited right, to do so. Plausibly, this attempt will make us think originally with a reflexiveness. In doing that, In writing, I followed followed Benjaminian tradition where the abstract discussion comes by images, texts and narratives.

First, whatever, the methodology adopted in this paper not literally mentioned, perhaps explicit to a 'conscious' reader, a replica, mimic and inheritance of classic positivism. If I can hear the inner tune of the paper, I can see and hear some anthropological ancestors' presence: very descriptive, detailed account, engagement of researchers, again, this engagement does not reflect the current time of April 2020. Neither it attains the Vietnamese voice, where it was presented. This nation gave a

lesson to Robert McNamara, who advocated bombing, and these people made, using indigenous knowledge, underground shelter, market, ponds everything. This paper, since explored the Rakhain's knowledge, could recommend how this knowledge can be utilised against state exploitation (Biopolitics), apparatus (Althusser) with Vine Deloria's Indigenous metaphysics and/or Shawn Wilson's relationality beyond the academia. The authors may find themselves either with state-supported agencies who implies the Biopolicies of state, or with the coastal people. Again, I became insightful from this reading, concomitantly, unhappy. But I believe, the debate in academia is beauty.

A logical reason for being lack of performance is the reality that work has concentrated on western methods to learn that indigenous communities do not fully reflect the community's preferences. In reality, expertise such this two anthropologists appear to be structured around professional fields based on Western-dominated philosophy. As both are non-indigenous scientists, even Iidigenous too, and professionals, the goal is to find appropriate research approaches that could contribute to safe, practical and effective strategies in indigenous communities. Some instances, I may cite for my teachers. Non-indigenous scientists internationally, particularly in Canada (Jeff Corntassel, Marry Battisti, Gregory Cajete), in Australia (Yin Paradise, Martin Nakata), In New Zealand (Linda Smith) have developed groundbreaking work methods. So as, if we [including me, my surroundings, the authors] take this stand to be with and by the Rakhain indigenous metaphysics, in this paper then could reflect something reverse than now. The paper, then could be the flag-ship in DU, SUST, RU, CU, for now , for future. And I dared to comment as I do and to be tailored intellectual (Edward Said). Yet, two reasons are here, following decolonial sociologist Farid Alatas, who is the son of pioneer anti-colonial sociologist, politician and education-administrator Syed Hussein Alatas.

Firstly, it's not a negative act of aggression on any academics. Many that I have described as silencers are merely examples of a major problem in the development of global awareness, that is, the marginalisation of such discourses in the light of cultural nationalism and academic dependence.

Secondly, it must be noted that no deliberate silence whatsoever is due to certain writers whom I point to as participants in the silence of discourses. My primary concern is with the consequences and operation of silence, which is to preserve the oppression of those discourses.

Guru Foucault said in answering to his student, Derrida lacks charity, I am cynical, my teachers would say so---and if, more liley, and i want, they do so, hope, new synthesis may come.

Please note I am not Derridian, indeed, I enjoy the Oratory, Derrida and Foucault was similar.

Ecofeminism proposes collective forms of expression through dialogue and community-based, collective and ways of knowing (Gaard & Gruen 1993). Feminist spatial practice encompasses the ethical principles of inclusivity, flexibility and reflexivity. Bringing spatial aspects to planetary (both ecological and societal) injustices experienced by women, Lesley Kanes Weisman (cited in Rendell, Penner, & Borden 2000,p. 5) writes: One of the most important tasks of the women's movement is to make visible the full meaning of our experiences and to reinterpret and restructure the built environment in those terms. We will not create fully supportive, life-enhancing environments until our society values those aspects of human experience that have been devalued through the oppression of women, and we must work with each other to achieve this. These are feminist concerns which have critical dimensions that are both societal and spatial. They will require feminist activism as well as architectural expertise to insure a solution. Reflecting on gender and architecture first became prominent in the 1970s (Rendell et al. 2000), and since the 1990s a feminist perspective has offered a radical and critical approach to spatial practice and ecological concerns (Rendell, 2018). A feminist spatial practice can be seen as an act of resistance, an act of spatial justice, that is essential to mobilising Horton's (2018) vision of an 'emancipatory planetary health'. Rawes (2013: 2) argues that gender is inseparable from ecological practice, referring to: feminist thinking and practice for questioning the social justice and ecological health of our societies, and our built and natural environments. The concept of 'relational architectural ecologies' (Rawes 2013) offers a spatiotemporal and material approach to the relational concerns of injustice found in planetary health and ecofeminism, grounding a critical, feminist, position of ecological architecture.

The concept of planetary health blurs the artificial lines between health at scales of person, place and planet. At the same time, it emphasises the integration of

biological, psychological, social and cultural aspects of health in the modern environment (Logan et al, 2020, p 1). Planetary health—the youngest concept presented in this series—has gathered significant momentum since it first appeared in a 2014 commentary in The Lancet. The Rockefeller Foundation–Lancet Commission on Planetary Health officially launched the planetary health concept in 2015, and by the end of the year, a consortium of over 70 universities, NGOs, government entities, research institutes and other partners founded the Planetary Health Alliance at Harvard. In spring 2017, The Lancet debuted an open-access, online-only journal, The Lancet Planetary Health, based on the concept.

8.6. The Caveat and scope: A methodological gap

In addition to the above, Bangladesh is a signatory to the Rio convention, and World Intellectual Property Organization; both are concerned with indigenous knowledge and cultural heritage. We see that there are three Acts are in draft stage, such *Biodiversity and Community Knowledge Protection Act of Bangladesh 1998, Plant Variety and Farmers Rights Protection Act 2002*, *Medicinal Plant Protection Act 2005.* In the field, we came to know that researchers have almost free access to collect the medical knowledge from healers, even the local people are being threatened sometimes to disclose the information. One of the healers told us,

> "*Researchers, sometimes white skin people along with Banglaee, come and collect the information, sometimes, even they manipulate the local healers by money and political pressure to disclose the information to them, whatever they want.*"

The paradox is that Bangladesh signed on CBD, but ignored the UNDRIP. The reason is that if the government signs here, few obligations will be imposed to imply and meet for the people such, land rights, self-determination and other basic rights. No voice is seen, but, social scientists are admiring these Acts are "holistic in spirit and practice (Ahmed 2004, p.209)." The National Biodiversity Authority will be established for ensuring 'Access and benefit-sharing'. We are not surprised that it is a simple local version of Nagoya Protocol-2010 that is a follow up of the Rio summit 1992.

Sweeping in scope, PH focuses on the sustainability of our civilisation and the toll of inequitable, inefficient, and unsustainable resource consumption on the planet and human health. In addition to public health and environmental health considerations, it examines upstream political, economic, and social systems and calls for an interdisciplinary approach. The original planetary health manifesto and the Rockefeller Foundation–Lancet Commission on Planetary Health defined PH as "*… the achievement of the highest attainable standard of health, wellbeing, and equity worldwide through judicious attention to the human systems—political, economic, and social—that shape the future of humanity and the earth's natural systems that define the safe environmental limits within which humanity can flourish. Put simply, planetary health is the health of human civilisation and the state of the natural systems on which it depends*."

The Lancet Planetary Health's editor-in-chief Raffaella Bosurgi, breaks down the difference between public health, global health and planetary health this way: *"While public health is about health protection and health promotion within the health systems and global health looks at how to improve the health of populations worldwide , planetary health broadens this discussion by looking at the societies, civilisations and the ecosystems on which they depend. Planetary health offers an exciting opportunity to find alternative solutions for a better and more resilient future. It aims not only to investigate the effects of environmental change on human health, but also to study the political, economic, and social systems that govern those effects."*

8.7. A plane land of practicality

Bosurgi describes air pollution as a concrete example in the realm of planetary health. *"WHO estimated that exposures to polluted soil, water, and air contributed in 2012 to an estimated 8.9 million deaths worldwide—8.4 million (94%) in low-and-middle-income countries. Different pollutants are linked in children to noncommunicable diseases (such as asthma), cognitive disorders and perinatal defects, and among adults to heart disease, stroke and cancer. Although environmental pollution is reaching disturbing proportions worldwide, it remains a neglected problem in national policies and on international development agendas. Pollution imposes a great cost to society—in the US alone, the price tag is $76.6 billion.*

Successful control strategies deployed by high-income countries include reducing exposure at source (such as removing lead from gasoline), banning asbestos, and crafting policies to reduce water and air pollution. Such strategies have proven incredibly cost-effective. Removal of lead from gasoline has returned approximately $200 billion to the US economy each year since 1980."

From early on, the PHM has attracted tremendous enthusiasm and financial support, but the test ahead will be whether it sustains that momentum, makes a compelling case to economists, politicians and other decision-makers, and, even more importantly, achieves concrete on-the-ground results. Redvers and his colleagues are arguing that colonization (i.e., trauma, genocide, loss of culture and lands, etc.) disrupts indigenous peoples down to the molecular level with consequent feedforward effects at the planetary level. In Bangladesh, we see Debnath (2010, 2020) are the exceptional text in the context of Santal. Then what others studies (see Table 1) are escaping this?

Pongsiri et al. (2015) in their concepryual article *The Planetary Health Landscape From Concept to Action* vey judicially adopted this model, pehaps, the suitable suggestion for the new field of study.

1. Clarify the concept
2. Build the evidence base
3. Include all viewpoints
4. Embrace change
5. Balance preparation and action Pongsiri et al. (2015, p3).

We need to clarify the reletaed conpets, diversification is beauty in academia. However, a common consensus can guide us. May be a handbook contributed to by all the leading scholars could be a proposal. These include describing planetary health as a "paradigm shift," "scientific paradigm," "moral imperative," "movement," "field," "practice," and "discipline," each of which represent a specific mindset and a different approach, especially when it comes to implementation.

In Bangladesh, a strong case already exists for the links between human health and natural systems, as well as for anthropogenic changes. However, major evidence gaps still exist around the concept of PH. Therefore, a measured approach is needed. On the one hand, moving too quickly and promoting an untested PH concept could undermine its legitimacy. On the other hand, scientific and data gaps cannot excuse inaction.

To leverage these opportunities, individuals in the community should be ready and willing to share their perspective and insight. These efforts should reach

beyond academic levels toward broader calls to action around the need for systems change, new mindsets, behavior change, and collaboration.

Further, The concept of PH is envisioned to be inclusive of all geographies and perspectives. To fulfill this goal and become more credible and relevant to decision makers, the PH community must diversify from its Western, academic, and health roots. Stronger representation is needed from people and organisations outside of the USA and the United Kingdom, especially from countries in the Global South that disproportionately bear the brunt of health and environmental challenges. A better balance of perspectives will improve collaboration and learnings within the community, and help PH move from concept to action in a way that is meaningful and useful to decision makers at the global and national levels

8.8. And aid to glocal knowledge democracy

There is no doubt that our global environment is changing – from the hottest years on record, to the worldwide disappearance of pollinators, to the global collapse of fisheries, and to our use of about half of the planet's livable surface to feed ourselves.

We are now in a new geological era, the anthropocene, characterised by humanity's dramatic impact on earth's natural systems. Although the average global citizen's health has improved over the past century, the health of our planet has sharply declined—putting historically recent, and fragile, public health gains at risk. We are faced not only with climate change, but also with declining biodiversity, shortages of arable land and freshwater, pollution, and changing biogeochemical flows.

Since making tangible progress on PH will require deep commitment over many years, the community should continue to err on the side of external action. For example, resources are already being developed to raise broader awareness of the concept of PH and engage new people. These include the development of core planetary health messages, 10 a review of global policy frameworks relevant to planetary health, and ongoing efforts to develop a shared consensus statement on planetary health. Intentionally creating a culture of openness to new ideas, perspectives, and dialogue that reaches additional people will help expand and diversify the existing PH community and build more momentum around the concept. In this way, it will most effectively develop and grow, and has the best chance to reach and influence decision makers worldwide.

We are dramatically affecting our global food production system, the quality of the air we breathe and of the water we drink, our exposure to infectious diseases, and even the habitability of the places where we live. Changes to natural life support systems are already impacting our health and are projected to drive the majority of

the global burden of disease over the coming century, hitting today's most vulnerable and future generations the hardest.

Everything is connected—what we do to the world comes back to affect us, and not always in ways that we would expect. Understanding and acting upon these challenges calls for massive collaboration across disciplinary and national boundaries to safeguard our health.

8.9. Finding the way

In today's world, there is growing recognition of the need for holistic approaches to solve complex and interrelated global issues. The concept of planetary health has the potential to develop into a tangible roadmap for action, leading to sustained human health and preservation of the earth. Taking advantage of near-term opportunities and addressing key challenges to increase engagement with decision makers is a critical part of this process. To achieve this, the planetary health community should rise above the day-to-day and focus on longterm success by implementing these five key steps. By honing the concept, building the evidence base, welcoming all ideas and perspectives, embracing change, and balancing preparation and action, the concept of planetary health can fulfill its potential and create tangible, positive change in the world.

Many scientists believe that we are witnessing the tip of an iceberg, that without drastic steps now more pandemics will follow. A recent survey of 222 scientists across 52 countries by the NGO Future Earth ranked biodiversity loss and ecosystem collapse among the top five risks facing humanity. The others: extreme weather, the failure to mitigate and adapt to climate change, food crises and water shortages. Many of these scientists stressed, however, that their greatest concern is the prospect of one global risk cascading onto the others. Heatwaves, for example, can accelerate water loss and food scarcity, just as biodiversity loss exacerbates climate change, and vice versa.

There is an appropriate Malay saying for this atrocious situation: "*Kalau sesat, baliklah ke pangkal jalan*" — when lost, get back to where you started. It is important for us to join forces with like-minded movements, such as The Campaign for Nature, a partnership of the Wyss Campaign for Nature and the National Geographic Society, working with a growing coalition of more than 100 conservation organisations around the world that is calling on policymakers to commit to a science-driven, ambitious new deal for nature. This involves commitments to: Protect at least 30 per cent of the planet by 2030; help mobilise financial resources to ensure proper management of protected areas; and approach biodiversity conservation in a way that fully integrates and respects indigenous leadership and rights.

The campaign's rationale: "We need bold new ideas and decisive action from leaders around the world so that life on Earth can continue to thrive." And "we need to ensure the full participation of indigenous peoples and local communities." A slogan of the campaign says it all, from citizens to their leaders: "Nature is calling. How will you respond?"

But let's not win that way. Let's operate on the assumption that human beings are not grossly defective. That we're capable of acting together to do remarkable things (McKibben, 2019, p. 3).[34]

8.10. No Conclusion rather an action plan: the earth is sick

According to the World Health Organization, about ten percent of the global population may have been infected by the coronavirus as of 6 October 2020. Perhaps it in no surprise, but researchers for the indigenous communities are working more during the current global pandemic. In some cases, they have had to be working remotely, but many are working much harder. However, “What have we practically contributed?” is the bottomline question. The Earth is still sick, so no conclusion is drawn, instead a pledge is made for some practical work.

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9. The Plight of Migrant Workers of India during COVID 19 Pandemic

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9.1. Abstract

Migrant workers were caught unguarded by the COVID 19 pandemic, social distancing and lock down have resulted increasing the rate of unemployment. Many of them were left stranded. The fall in oil price due to decreased demand for oil has affected the economy of gulf countries, where sizeable Indian population serve as workers. Indirectly the migrant workers plight has imposed fiscal restraint reducing governments' ability to provide protection for the foreign workers. The remittances have reduced from 83 billion US dollars to 63 billion dollars. Such a decline will lead to hardships to meet the international payment obligations by India. It will also affect foreign direct investment (FDI). The repatriation of many workers will cost the exchequer as well as force some of the migrants to pay for their travel. This will cause a loss of labor force to the nation that employed them. It also has affected the recruitment process of many foreign migrants and made them face social insecurity and uncertainty. The status of internal migration is grave.

Many face travel restrictions and are made to stay in temporary shelters with limited amenities. Stories of people dying on the road because of long distance travel by foot and also the death of a mother on a railway platform are testament to the tragedy unleashed on the migrant population. There is no separate government policy on migrant work force to take care of their needs or responsibilities. The government was forced to take stock of the status of migrant population all of a sudden. Most of the migrant population are workers or daily wage employees who face brunt of COVID 19 pandemic. The statistics do not, most of the time, represent the true picture of the hardships faced by migrant force. They face social injustice in the form of unemployment, precarious supply of food and shelter, risky quarantine

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conditions including following the preventive measures like wearing face masks, social distancing or hand hygiene.

9.2. Introduction

Migration is circular in nature in South East Asia. It was not with a purpose of permanent settlement. It is for livelihood, better conditions of living and a standard income. This has led to cross border trafficking of migrants among South East Asian countries. Many are illegal migrants, some are contractual workers and some skilled workers. This migration was a necessary evil for the migrants were cheap laborers and served the purpose of that nation's work force requirement. Many were considered as illegal population that were used as human slaves say to increase the population of a particular community, or as a vote bank and some to work as second class citizens. With civil unrest and growing threat of terrorism nations suddenly wanted to regulate the flow of such migrants as a means to protect national security.

Along with such migration comes health issues, human trafficking and spread of infectious diseases. The migrant themselves suffer from malnutrition, primary health disorders following poor hygiene, lack of shelter and permanent economic resources. Rather poverty in the form of migration consumes human dignity and mental health. There is no single economic policy to regulate migration or consider the health requirements of such migrant population with different ethnicity and cultural background. Many non-governmental organizations (NGOs) try to serve these people with medicines and therapy to compensate for the lack of governmental support.

9.3. Imposition of Lock Down

The first case of COVID-19 in India was reported on 30 January 2020 and the number of cases continues to rise. Following the declaration of COVID 19 pandemic from March 24 the entire country is under lockdown, with localized lockdowns in containment zones extended to September 30. The lockdown measures undertaken are travel restrictions; closing educational establishments, gyms, museums, and theatres; bans on mass gatherings; there was a sharp decline of GDP 2020 due to the unprecedented lockdowns to control the spread of COVID-19. [1]

From the month of April 2020, there were attempts to revive the economic plight of the down trodden. The government announced several relaxation measures

in geographical areas designated as non-hotspot, permitted inter-state movement of stranded people, including migrant workers, managed by the nodal authorities who are designated by the states. Some graded relaxations in economic activities have been allowed in geographic areas designated as orange and red zones. [2]

Domestic air travel was restarted on May 2020. The finance minister, Nirmala Sitharaman, announced a relief package of around 10 percent of GDP, including previously announced monetary and fiscal measures. On July 29, the central government issued 'Unlock 3.0' guidelines further paving the way for a phased re-opening of activities across the country and limiting the lockdown only to containment zones till August 31. On August 29, the government issued new guidelines ('Unlock 4.0') to further re-open the economy in September, removing restrictions on metro rail, and allowing for social, academic, sports, entertainment, and other congregations of up to 100 people. Education institutions will remain closed till end-September, with lockdowns continuing to be implemented in containment zones.

Fiscal policy of the Government during the pandemic was directed in two ways. Firstly, there was direct spending (1.17 percent of GDP and deferred revenue (about 0.3 percent of GDP falling due within the current year). Secondly, below-the-line measures designed to support businesses and shore up credit provision to several sectors (about 4.9 percent of GDP). [3] The key direct-spending measures recommended were: in-kind (food; cooking gas) and cash transfers to lower-income households; insurance coverage for workers in the healthcare sector; and wage support and employment provision to low-wage workers. It was also mentioned that an additional 150 billion rupees (about 0.1 percent of GDP) to be devoted to health infrastructure. [3-4] However, there were no direct economic policies to help the migrant population. This is reflected in typical comments like "We see them everywhere. Yet, we never imagined migrant workers as a group big enough to be taken seriously" Migrant workers are seen everywhere: hotels, small industries, construction, metro stations, tourism. Now they have caught the attention of governments, policy makers, economists, and others.

Figure 9.1: Stranded migrant population

There are nearly 500 million Indians who live as internal migrants—either living in a place they were not born in or did not live in six months ago. The worker migrants form at least 30% of the total migrant population. When they prove their migrant status they need to be supported by economic measures. It is to be a tripartite measure: the central government, the receiving states to which the migrants have travelled, and those from where they hail. The relief money contributed to various relief funds is not only for ventilators. People also die when they don't have anything to eat. Nobody should go without a proper meal because they have no work.

India also has somewhere close to 20 million international migrants. Half of these are in six Gulf countries: Qatar, Bahrain, Oman, UAE, Kuwait, and Saudi Arabia. Out of these some 2.5 million are from the southern state of Kerala. So Kerala will be badly affected. As news of the announcement of lockdown, with less than four hours-notice, spread migrant workers were rendered instantly without work. The workers were struck with panic, crowded bus terminals, railway stations and highways wanting to reach their rural homes. Social distancing was the key objective of lock down policy. Migrant workers had no choice but to stay in cramped temporary shelters without work or social protection. They were left to make a choice between the virus and starvation. [5].

According to a Centre for Monitoring Indian Economy (CMIE) report, India's lockdown resulted in an increase of unemployment rate from 21 per cent to 26 per cent in mid-April and a weekly decline in labor market participation (The Economic

Times, 2020, April 29).The fear of COVID 19 spread by migration resulted in an initial travel restriction of movement from their place of work. Under such circumstances the Supreme Court of India directed the government to provide food, water and shelter for the migrants [6].

The case of Jaykumari taking her father home on a bicycle for 745 miles captured the consciousness of the global community illustrating the plight of migrant workers suddenly caught in the lock down and resulting travel restrictions.

Figure 2: Jyoti Kumari said she opted for the desperate ride from New Delhi to Bihar (745 miles) after rickshaw work ended amid the Covid-19 crisis.

9.4. Provisions for migrant workers:

The state governments were asked to make quarantine arrangements for all returning migrants and provide them with health services if required. It was reported that a sizeable percentage of population of COVID-positive cases were from such migration. Many migrant workers belonging to socially deprived communities faced discrimination. In some places migrant workers returned to their village were not given access to their own food stores or water from the communal hand pump. They were forced to depend upon water used by cattle. The return of migrant workers has led to social tensions in many states, and reports of violent clashes among villagers have come from many places. There was a critical gap between the absence of adherence to minimum standard of relief (including provision of food,

water, shelter and sanitation) and compensation for loss of life and livelihood that must be provided to affected persons under the disaster management law [7].

Most manufacturing units and spinning mills in the southern state of Tamil Nadu are closed - those supplying to hospitals remain open - leaving workers in close proximity and raising concerns that they could unknowingly be spreading the virus. "Hostel conditions are not ideal at all under the circumstances," said the director of the charity Rights Education and Development Centre, which helps garment workers.

Take the example of a migrant worker returning home from Ahmedabad to Banswara in Rajasthan, a distance of 240 km, after walking 90 km and hitching rides for the rest, who told a news magazine about how villagers continued to be suspicious despite the fact that he had tested negative for COVID-19 and was maintaining the required 14-day quarantine. He also mentioned how many lacked the means to self-quarantine in the village [8]. The village head of Saraiya block in Muzaffarpur district of Bihar described the situation there 'In my village school building, fourteen migrants have been quarantined for last three days, but the building has no window, toilet, door or bed' [9]. A youth was beaten to death in Madhaul village in Sitamarhi district on 29 March 2020, after he alleged that two migrant workers had returned to the village from Mumbai without taking any tests. In another incident, angry villagers in Jehanabad district of Bihar assaulted a team of officials who had gone to a village to detain migrant workers and put them in a quarantine center [10].

The Indian government's pandemic response is moving towards technologies and citizen responsibility to stay safe. The Aarogya Setu Application (ASA) launched by the Government for the contact tracing of COVID-19-affected people has become a bone of contention. Migrant workers and people in their rural communities are unlikely to own smartphones. For them, COVID-19 protection would require improved and free healthcare services, access to water and sanitation and support in the form of frontline health workers to monitor the health and well-being of returnee migrants to home communities through the period of quarantine and in the following days. Reliance on technology must be combined with, and not replace, measures that directly aid the well-being of informal workers and their home destination communities.

9.5. Conclusion

The lockdown measures in India, which are at the high end of the University of Oxford's COVID-19 Government Response Stringency Index, have impacted informal workers significantly, forcing many of them to return to or attempt to reach rural areas [11](Hale et al., 2020). With the sudden lockdown and halting of economic activities, migrants' crucial link of rendering their 'labor' was abruptly disconnected, and their only ownership in the form of 'physical labor' for any 'exchange-entitlement' collapsed. This brings us to engage with the insecurity and precarity of the lives and circumstances of labor migrants. The migrant crisis induced by the COVID-19 pandemic is in continuity with a series of social crises that temporary migrants face [12]. Temporary migration is the evidence of precarious rural livelihoods. It is reflective of mass exodus due to famines, droughts, floods and other social factors. The newer emerging phenomenon is the exodus of migrants from their places of work. They need to be provided with relief measures for a minimum duration period of few months.

COVID 19 has brought the migration issue to the center stage of policy concern and highlights how these vulnerable people require social protection. At this juncture one must remember the role of migrant population which drove the engine of globalization. Now these populations require a stable policy that can take care of their needs and provide them with social protection.

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10. Native-American tribes: Problems, solutions and decolonization

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Spider woman says that if we take care of the earth, she will take care of us and every night, she will repair the fabric (Native-American proverb)

10.1. Abstract

The problematic of Native American peoples is analyzed in depth, derived from a history that has been unjust since the arrival of Europeans, for more than four centuries. Economic poverty due to unemployment and lack of education, violence, alcohol and drug-addiction, depopulation and lack of housing, as well as deterioration in their physical and mental health, are still pending issues to be remediated in Indian reservations, to which we have to provide solutions. Promulgation of new laws in the Congress that protect Native Americans, and better enforce those laws that already exist, protect mother earth, their ancestral culture and customs and respect their ancestors are all measures that advocate for the sustainability of the environment and for the continuity of indigenous ways of being and life. The purpose of this paper is to review some problems and solutions found in the literature on indigenous colonization and give clues to decolonize Native American ways of live. Educating the entire population in decolonization is the greatest solution, creating strong and united indigenous communities, encouraging and investing in leaders that bridge with all other communities, creating new programs of Native American studies in universities and schools, and recovering their language and customs in their communities and in their school curriculum are other solutions.

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Keywords: *social marginalization, injustice, expropriation, poverty, education, decolonization, Native American, American Indian.*

10.2. Introduction

Americans sometimes speak of American Indians or Native Americans as a single compact group of tribes, which is a completely wrong impression, because each tribe has its own culture, language and territory. Furthermore, they have never united completely and even today some tribes can behave in harmful ways between themselves. The Navajo for example, sold the mining rights of the Black Mesa area without the agreement of the Hopi, who want the area as a spiritual center. However, these discords have been aggravated by federal policies that have fostered this conflict for many decades, as often the boundaries of one reservation had been set to surround the area of another tribe. In effect, the ensuing unease is the result of an unjust past, in which discrimination has been common towards the American Indians, who have become victims through being socially disadvantaged, expelled from their own lands, marginalized and even in some cases murdered.

For this reason, in the middle of the last century, many civil rights activists and the Native Americans themselves defended their rights openly, and thus discrimination is less visible nowadays. However, some traces of settler's attitudes can still be seen:

1. many sports teams from USA, as the "Cleveland Indians" or the "Washington Redskins" use publicly the image of an Indian with a discriminatory purpose;
2. many fellow citizens are ignorant or have only a vague understanding of the problems of Native Americans today;
3. conflicts between government and Native Americans are "resolved" without adequate political sensitivity, sometimes resulting in actions by the USA Army;
4. the decision of an Indian tribe must be recognized within the Bureau of Indian Affairs (BIA)[36], however that is a non-Indian organization with federal interests, which is somewhat incongruous;
5. the USA government has not yet signed an official state resolution to offer an apology to all the native peoples for the injustices committed throughout history.

[36] BIA (Bureau of Indian Affairs) "U.S. Department of the Interior of Indian Affairs" April 3, 2019, https://www.bia.gov/bia

Some problems that Native Americans are suffering, due to the unjust colonization since the arrival of Europeans, will be explained in the following points:

a) economic poverty due to unemployment and lack of education;
b) problems of violence, alcohol and drug addiction;
c) lack of housing and depopulation;
d) deterioration in their physical and mental health, all derived from an unjust and murderous history.

These problems have further increased due to ecological and capital problems. They could be turned around to find solutions, and evidence for this is supported by several references found in the literature on decolonization. Some Indians know the solutions and they are asking for:

a) new de-colonizing laws in the congress;
b) protection of the mother earth;
c) protection of their ancestral culture, customs and respect for their ancestors;
d) education of the American population regarding worldwide de-colonization, with positive measures for collaboration of native and non-native populations.

As has been said, each tribe is unique with its own history, culture and idiosyncrasy. Therefore, although the problems cited do not concern each tribe to the same extent, it is clear that all Native American peoples suffer from colonization to the same degree. The proposed measures are still valid for all Native Americans who are asking for them to be implemented. In this paper, I have listened to Indian voices, their voices in the streets, in the congress and in literature.

10.3. A History of Massacres in the name of Christ and the Capital

Christopher Columbus was sent by the Catholic Monarchs of Spain in 1492 and settled in Central America. The work entrusted to him and his men was to Christianize the native population. According to the doctrine "in the name of Christ", new Europeans arrived in the Americas; they had the right to own the lands they occupied, because they were Christians, as a papal bull gave them the right to own the land. Since the Indians were not baptized, they were considered soulless and expropriated from their lands[37]. Shortly afterwards, according to the Treaty of Tordesillas (1494), Spain and Portugal divided their colonized territory outside the

[37] "The doctrine of discovery", YouTube, March,3, 2019; https://www.youtube.com/watch?v=JvM4SJN76Yg&fbclid=IwAR3ZuPuhIXSkTi7Mh62qQwSnCvwHC91ApanJj24XjyqO-LJ01eRla190Vqw

peninsula, which caused many more Indians to be expelled or passed into the hands of other settlers, which increased dehumanization and genocide.

Many Franciscans and Jesuit religious were witnesses of this barbarism, putting themselves, in general, on the side of the oppressed. Bartolomé de las Casas was a Dominican friar, bishop of Chiapas, chronicler and writer, defender of Indians and was named "Procurator or universal protector of Indians of the Spanish Indies". In his book "Historia de las Indias" (1517), he described many details of how the first settlers arrived in the American territory.

Later in 1584, Queen Elizabeth I of England, although excommunicated from the Catholic Church, sent several commissioners to settle on the northeast coast of what is now the United States and expropriate lands from the Indians. Later it was called New England and it became part of England. When independence was declared in 1776, the US federal government established a treaty with Indians to return their land to them, but forced them to pay a fee for that entitlement. In 1823, the "Johnson and M' Intosh" Law, passed by the Supreme Court of the United States, prohibiting settlers from charging fees and taxes to Indians for occupying land, which broke the doctrine of discovery. However in 1830, the "Indian Removal Act" was passed, which forced the tribes of the southeastern US to migrate west of the Mississippi River, as an exchange for land. In fact, the majority of Native Americans had to emigrate, especially many Cherokee Indians, through the famous "path of tears"[38]. History tells how in 1832 the federal government forced the Potawatomi Indians to leave their land in Twin Lakes, Indiana, to travel to Osawatomie, north of Kansas. They made the 1000 km long journey in two months, but more than 40 people died on the road, including many children, due to poor weather conditions and inadequate supplies. At present, this road has been declared a path of historical-cultural interest, as "the road of death".

During the nineteenth century there was a massive arrival of European settlers to collect gold, committing abominations such as:

1) assimilation, where white Europeans want to inculcate their culture to Indians, for this, Europeans created special schools, because they thought that Indians were uncivilized and uneducated;

[38] "The trail of tears", Wikipedia, March 20, 2019; https://en.wikipedia.org/wiki/Trail_of_Tears

2) settlers decreased the population of buffalo, the main livelihood of American Indians;
3) settlers began to massively exploit mines and deplete forests in sacred places and lands;
4) Europeans expropriated Indian lands; many natives were forcibly baptized or exterminated by their rebellion that produced a great depopulation.

In this sense, the Wintu tribe of Northern California disappeared resoundingly, and the Lakota tribe in South Dakota were forced to flee north by the federal army after the civil war, many of them were killed and others died on the way. Of the survivors, most of their descendants live exiled in Canada.

It was not until the last decades of the twentieth century, when more protests began in favor of the Indians rights. Some rights that Indians requested were to reoccupy land that had previously been theirs, or occupation of land without an owner by exchange with stolen land, as was the case with Alcatraz in 1969. On the twentieth of November of the same year, eighty-nine members from different US tribe's occupied Alcatraz, a former jail on a small island in San Francisco, for nineteen months. This occupation-protest was due to the fact that, according to the treaty of "Fort Laramie" signed in 1868, Native Americans had the right to occupy land that was without an owner, together with other demands such as more self-determination for Indian lands, rights to a dignified education and health care system among other aspects (Casey-Ryan, 2014). Indian men, women and children sailed to the island to build a cultural center, sadly one of them died. The federal government cut off the electricity and most of them had to leave, all except fifteen men who were subsequently evicted by the government in 1971. Currently the island is still controlled by the federal government, but Native Americans occupy it each year on 20 November as a sign of resistance[39]; the resistance against colonialism. Many issues have improved thanks to these Alcatraz protests, although there is still much to be done (Hightower-Langston, 2003).

This was a protest with great media coverage that led to other parallel movements, several demonstrations in Congress against racism, violence in general, low wages and disadvantages in education, among other rights taken. In those hard times, American Indians received the support of Christians and the "black panther"

[39] "Alcatraz occupation by American Indians" Documentation, January 8, 2017; https://documentalium.blogspot.com/2017/01/la-ocupacion-de-alcatraz-por-indigenas.html

group, and even found some backing in some Republican presidents like Nixon or Reagan, with whom Indians created a radio station to talk about their rights, construction of more hospitals and education, among others. These protest movements ended up with the International Indian Treaty Council (IITC) in 1974, a meeting with Sioux tribe in Standing Rock, South Dakota. In that meeting it was established to develop and protect sovereignty, self-determination, recognition and the protection of rights, traditions, culture and Indians' sacred lands. This council was recognized by the United Nations as a non-governmental organization with consultative status in the Economic and Social Council of the United Nations[40]. However, although at the end of the 1970s, the foundations for change had already been laid, there was still much to be done. Currently, American Indians are still subject to white society, with its bureaucracy and politics that marginalizes rather than accommodates them, causing the problems discussed below.

10.4. Problems in Indian lands

To obtain a realistic impression of the American Indians it is necessary to analyze their problems, which vary due to the great diversity of tribes, making it difficult to make an exhaustive and detailed analysis. However, the following aspects[41] are common to all:

10.4.1. Unemployment and poverty

Before being in contact with Europeans, Native Americans were mainly engaged in farming, hunting, fishing and trading. Indians have only a fraction of the land they once had, and most of that is a lower quality according to the BIA, due to erosion caused by massive deforestation, mining or recreational activities, such as natural parks or ski resorts. Thus, many Native Americans can no longer make a living by farming, hunting or fishing freely on their own land. Other problems are both a lack of infrastructure such as electricity, telephones or Internet connectivity, which makes life difficult in reserves as well as insufficient transport links, which prevents many

[40]"International Indian Treaty Council" Wikipedia, April 4, 2019; https://en.wikipedia.org/wiki/International_Indian_Treaty_Council

[41] "American Indians Today/Current problems" wikibooks, February 3, 2019: https://en.wikibooks.org/wiki/American_Indians_Today/Current_problems Current problems

industries from establishing in reserves. The remoteness of reservations from large cities also limits tourism in reservation casinos and hotels. These circumstances make the unemployment rate high, between 50 and 80%, together with the lowest average income in the U.S.A.

In the 1990s, the federal government promised high economic rewards to the tribes that would accept the storage of toxic and radioactive waste on their land. Thus, the poorest reserves were tempted by money without being fully aware of the consequences for their health and environment. Their acceptance of this waste is understandable, since their poverty rates are above the national average (Yellow Bird, 2005). Unfortunately, the current engine of native's economy has been reduced to gambling in casinos, together with the hospitality industry services in hotels and restaurants within the reserves that attract some tourism from the cities. Some of this money is being invested in infrastructure, social services and education for the community.

In Arizona, things are changing little by little and the twenty-two Indian tribes are beginning to be economic forces, since some Native Americans are taking power from their land with the construction of renewable energy technology such as solar thermal projects, NNOGC[42] Navajo nation with oil and gas, among other projects such as those of the Salt River Pima-Maricopa Indian Community including a butterfly pavilion and an aquarium in the middle of the desert. According to Artman (2013), if tribal governments are stable with clear and honest rules in business, there will be administrative and cultural prosperity. These projects are very positive, despite all the challenges and barriers that must be overcome for the further development of Indian reserves.

10.4.2. Lack of education and poverty

The deficiencies at the academic level continue to be a serious problem in the American Indian populations. The data in this regard show alarming situations:

1. they have the highest dropout rate, 54%;
2. with a percentage of citizens with less graduates in secondary school;
3. only 24% of the total get a university degree;
4. Reserve schools have the highest rate of teacher turnover;

[42] "Navajo Nation Oil & Gas Company (NNOGC)"; July 18, 2017; http://nnogc.com/

5. they lack the means to provide sufficient school supplies and personnel and
6. many of the teachers do not have a university degree.

In addition, almost all teachers are women, which feed the vicious circle of machismo within the tribes, men do physical work and women are dedicated to educating and caring for children. Another drawback is that Native American students who could attend secondary and tertiary education are inhibited by bureaucracy and great distances to universities[43]. This lack of formal education feeds other social problems such as unemployment, teenage pregnancy, criminality, drug abuse and forces Native Americans to accept low-paid jobs, among other negative consequences.

Poverty is one of the greatest consequences of this lack of education. In effect, Native Americans are inhibited by the costs of food, which in the reserves are higher. There are financial burdens on the Indians living in cities too because they have to pay the high rents and taxes imposed by federal government, in addition their average incomes are much smaller than the rest of the American population. As a result, 25% of American Indians live below the poverty line and in reserves the figure exceeds 40%. However, the most worrisome is poverty among children, in the Pine Ridge reserve (South Dakota), 46% of children are considered poor[44].

10.4.3. Drugs and violence

Currently, the American population is dealing with serious social problems both within the reserves and outside. The situation of unemployment, the destruction of the environment and the general social decline, are examples of this. Moreover, there is an absence of positive future prospects, which in addition to inadequate educational and leisure facilities means that many young people do not use their time constructively, but abandon themselves to drugs and alcohol. According to the testimony of W.P. Ragsdale, Director of the Office of Indigenous Affairs, the use of methamphetamine is destroying lives and entire families. It is an epidemic that cannot be controlled and according to Indian leaders, an entire generation of young

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[43] "American Indians Today/Current problems" wikibooks, February 3, 2019: https://en.wikibooks.org/wiki/American_Indians_Today/Current_problems Current problems

[44] "American Indians Today/Current problems" wikibooks, February 3, 2019: https://en.wikibooks.org/wiki/American_Indians_Today/Current_problems Current problems

people could be lost soon to this drug[45]. It not only destroys the body and the mind, but the social consequences are terrible, addicted parents are neglecting their own and their children's health. Furthermore, homicides, aggravated assaults, rapes, child abuse and other violent crimes also increase (Waziyatawin and Yellow Bird, 2005).

Indeed, one of the greatest consequences of drug and alcohol abuse is the large number of crimes of gender violence, rape and child abuse reported with a very high number of cases. Children and young people are the most affected by this, both in their roles as victims and as stalkers. In addition, in recent years, gang violence, vandalism, robbery, assaults, both physical and sexual, and street fights have increased. All exacerbated by weak application of tribal laws (Waziyatawin and Yellow Bird, 2005). In effect, the lack of access to official tribal records and procedures together with the lack of transparency the situation in the reserves deteriorate (Bill Lawrence, member of the Red Lake band)[46].

10.4.4. Lack of housing and depopulation in reserves

The lack of housing is a serious problem that engenders others in turn. It is estimated that there are around 90,000 Indian families without their own home, or living in common households provided by the community, such as old huts or public departments, which often lack electricity, running water and hot water. In more than 50% of the reserves, there are public sewer problems or sewage systems in need of repair. As a result of the shortage of housing, many families offer a home to their acquaintances, friends and family, so that 30% of American Indians live crammed in overpopulated and small houses, which promotes lack of hygiene, spread of diseases and psychological health problems[47]. This absence of adequate housing has been a driver in the current depopulation occurring in the reserves.

According to Norm De Weaver (2013), there has been a brutal reduction of the Indian population in the last 200 years, and it is the federal responsibility to economically support the tribes within their reserves, in exchange for all expropriated lands. Robert Frost's most controversial poem talks about the

[45] "American Indians Today/Current problems" wikibooks, February 3, 2019: https://en.wikibooks.org/wiki/American_Indians_Today/Current_problems Current problems

[46] "American Indians Today/Current problems" wikibooks, February 3, 2019: https://en.wikibooks.org/wiki/American_Indians_Today/Current_problems Current problems

[47] "American Indians Today/Current problems" wikibooks, February 3, 2019: https://en.wikibooks.org/wiki/American_Indians_Today/Current_problems Current problems

disappearance of Indians in a dramatic way: *"It is said that he was the last red man in action, and it is said that the miller laughed (...) You cannot go back and see him as he saw it, it is a story too long to enter now (...) Who started it between the two races, some guttural exclamation of surprise (...) The red man gave in to poke about the mill (...) Come on, said John, do you want to see the look of the wheel? And took him under a cramp joist (...) that sounded even above the general noise (...) The Vanishing red man."*[48]

In effect, the Indian population has been reduced, but it is not known to what degree exactly, because the federal government has few data on the Indian population; and both, the BIA and other centers in the reserves, do not have very accurate records. Only sovereign nations have the right to determine who is a citizen and to do so, natives must register in a tribe. However, although the BIA conducts the census, this is a mess, since a person registered in a tribe can be anywhere in the world. "The census bureau" counts every 10 years house by house in the reserves, but does not allocate people to tribes, only in three broad categories: Native-Americans in general, other races and a combination of both. In Table 1, the population of the native tribes of Arizona can be seen[49]. On the other hand, the "American community survey" is done every year but it does not allow counting the tribe population, rather being defined by the cultural and socio-economic characteristics of the sample. With this questionnaire it is known that in Arizona there are 16% unemployed Navajos, very few Indians with a secondary education degree and even less with a university degree or master (DeWeaver, 2013). These data, although insufficient, are useful for intervention projects in societal problems.

10.4.5. Health and well-being in Native American reservations

The health figures in the reserves do not promote optimistic, Native Americans suffer from diabetes, alcoholism (in some reserves, eight out of ten families have this problem), tuberculosis, asthma, heart failure, cancer and AIDS, in higher proportions than other populations of America. Diseases related to nutrition, such as rickets or diabetes requires expensive medical treatments and the federal health service is

[48] "bartleby. 26, The Vanishing Red "; April 3, 2019; https://www.bartleby.com/119/26.html

[49]Inter-Tribal Council of Arizona and ASU of Americans Indians and public affairs. The state of Indian country of Arizona. Arizona: Arizona boards of Regents, 2013.

overburdened. Additionally, environmental contamination in some areas also threatens the wellbeing, health and lives of American Indians, since toxic and radioactive traces have been found in drinking water, soil, food and even in human bodies. This is especially so for agricultural workers in contact with pesticides, causing increased deaths from cancer. Babies are suffer deformities due to toxins, together with the "fetal alcohol spectrum disorders", when their increasingly younger mothers, drink alcohol during pregnancy affecting the central nervous system, with epileptic seizures, speech disorders, learning difficulties, inhibited growth and deformed bodies and organs[50].

Indian infant mortality is twice as high as in other American populations; the average lifespan is 59 years among Native Americans and 79 in the rest. Prenatal care in Native American women is more precarious; therefore, infant mortality is higher. Premature deaths are also greater in adults, who as a result of alcohol, die from cirrhosis, violence or accidents and others such as diabetes, flu or pneumonia. During the past century, although infectious diseases decreased, non-communicable diseases such as diabetes, alcohol dependency, cancer and liver problems increased, all of which are related to a low socioeconomic status (Brown, Molina, Moore and Murillo, 2013). In addition to all this, Indians have traumas from the past, as shown by the high rates of mental illness and suicide. All these diseases and problems could be improved with adequate medical treatment; however, there are not sufficient means. There is still a lot of inequality compared to the rest of the American populations, even though the sovereign states have federal resources for health, since throughout history several laws have been passed on the relationship between tribes and the state in matters of health. Treaties enacted between 1776 and 1858 obligate the American government to take responsibility for the health, education and welfare of Indians in exchange for land (Brown et al., 2013).

Another aspect, which affects many poor Native Americans, is the dependence on federal welfare and the lack of generosity of the US government with respect to medical care and social benefits. Many of these problems result from the complexity, lack of efficiency and poor organization in health systems. The Indian health system is divided into three: tribal government provision, federal government facilities and private, non-Indian providers. It would require more coordination and collaboration

[50] "American Indians Today/Current problems" wikibooks, February 3, 2019: https://en.wikibooks.org/wiki/American_Indians_Today/Current_problems Current problems

among all three, more reliability in the data and more rigorous studies to end the disparity of access to health care and resulting quality of health. Building a health model more in line with Indian issues, such as the "American Indian Health Commission of the State of Washington" would be a long-term solution (Brown et al., 2013).

There are some other solutions that are already being implemented, such as the "Health and Human Services Program of the Inter-tribal Council of Arizona" (ITCA), with a comprehensive approach to good health and well-being in Indian territory. This health program provides training and technical assistance to thirteen tribes located in Arizona, Nevada and Utah to treat chronic diseases holistically[51]. Another new initiative is the approach of Madison Fulton and Eric Hardy, both Navajo, who address the historical trauma and cultural resilience in health issues in their doctoral research at ASU, AZ[52]. The work of Madison Fulton focuses on finding solutions and establishing better systems of care for victims of sexual assault. For his part, Eric Hardy works on the implementation of projects for the prevention of chronic diseases from innovative approaches adapted to their culture and strength as a people. According to Waziyatawin (2005), colonization has had a detrimental impact on the health of indigenous people even to the extent of what foods are consumed, but once we understand how we have participated in this deterioration, we can begin to decolonize our diet.

10.5. Solutions from a decolonizing sovereignty

All these problems have solutions; the indigenous populations themselves propose actions that start from their ancestral knowledge. These solutions are discussed below.

10.5.1. Decolonizing laws and Treaties

The idea of savagery, that Europeans and Americans had about Indians, made them draft a constitution for whites, which underestimated the Indians' value and culture. Therefore, natives are not included in the American Constitution of Jefferson and

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[51] "Inter-tribal council Arizona", April 6, 2019; http://itcaonline.com/?page_id=10/#health-programs

[52] "ASU, American India Studies; Cultural Resilience: An Indigenous Framework Approach for Addressing Public Health Issues in Indian Country"; February 3, 2019; https://americanindian.clas.asu.edu/sites/default/files/ais_alum_speaker_series_032117.pdf

Adams, which was made based from the European perspective of law. Only the Supreme Court or US Congress supports the American Indians, thanks to several characters such as Dred Scott for example, a former slave who became a member of the political community of the Supreme Court, fighting for the rights of vulnerable people.

Throughout history, Europeans have been enacting treaties in favor of Indians, such as "the trilogy of Marshall" or Indian sovereignty. However, these treaties are not fair, it is written with a language for white people and that sovereignty is not completely real. The Supreme Court confirmed the legal and political position of Indians in a set of three court cases in the early nineteenth century, in which John Marshall, president of the Supreme Court, played a very important role. In the first case, "Johnson and M' Intosh" (1823), it was approved that private citizens could not buy land from Native Americans. In the second case, "The Cherokee Nation" (1831), the Cherokee Chief John Ross, tried to protect Indian lands by fighting against their expulsion and avoiding the imposition of the federal laws of Georgia. To do this he requested a court order from the Supreme Court of the United States, arguing that the Cherokee Nation were a foreign nation and that the laws of Georgia did not concern them.

The third instance was the "Worcester" case (1832) that involved a missionary, Samuel Worcester, who preached in Cherokee lands without a state license to do so. Therefore, Worcester was jailed and filed a lawsuit against the State of Georgia alleging that the state had no authority to control its activity in Cherokee lands. The Supreme Court sided with Worcester to find that the Cherokee Nation was a distinct community. This decision established that the Indian tribes had an inherent sovereignty and the authority to enforce their own laws within their lands. The laws that have given sovereignty to tribal peoples have been: the Indian Appropriations Act in 1871, the United States v. Kagama in 1886, the Empowerment of tribal courts in 1883 and The General Allotment Act or Dawes Act in 1887. In the twentieth century, the Revenue and Indian Citizenship acts were approved in 1924, the Indian Reorganization Act in 1934 and the Public Law 280 in 1953[53]. Other laws enacted were: "Religion Act" in 1978, freedom of religion, since Indians had been forbidden, for decades, to practice their religion and ceremonies, forcing them to be educated as

[53] "Tribal sovereignty in the United States"; Wikipedia; March 7, 2019; https://en.wikipedia.org/wiki/Tribal_sovereignty_in_the_United_States

Christian, targeted in "boarding schools", and otherwise natives were expelled from their own communities. In 2007, the UN proclaimed the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), which gives advice on respect for indigenous peoples, but it is legally binding. Odawi (2005) believes that it is not enough, that we must continue to decolonize the control policy of the Indians, offering a useful process to give more autonomy to indigenous governance, forming strong leaders within each community.

10.5.2. Corpses are sacred

The federal army and archaeologists have desecrated sacred sites for decades to extract human remains and funerary objects in the name of science. American archaeologists want to study the human remains of the time of the arrival of the first European pilgrims in 1600 and know types of diseases of the time, or know if Indians migrated from North Asia, among other topics and interests. In the mid-1800s, several archaeologists tried to make people believe that Indians were inferior to Europeans evolutionarily, according to a study of the skull. In the late 1800s, scientists made studies with Native Americans, killing many of them and several bodies mysteriously disappeared. However, archaeologists were not always against Indians, Frank H Cushing[54], an anthropologist sent by the federal government to New Mexico, did a study through observation, in exchange for food and horses for Indians. To do this, he was introduced to the Zuni community, defending them in an attempt to be expropriated by the federal government. The Zuni people made him a member of the community, but the government forced him to abandon his project with the threat of removing funds for the study.

It was in the massacre of "The Mulberry Creek" in 1869, when the federal army and some settlers killed a group of Pawnee men, thinking that Indians were going to attack the town, when Pawnees only passed by that place, after they had graduated from the army. The most terrible thing was that the skulls were sent to the medical museum of the Navy to be studied. Under the "act of antiquities" of 1906, the federal government prohibited more illegal excavations of corpses, but archeologists continued to do so, mainly in the southeast because of the weather. This has allowed many corpse thieves to sell these items in black markets. On the other hand,

[54] "Frank Hamilton Cushing, Wikipedia; March 19, 2019; https://en.wikipedia.org/wiki/Frank_Hamilton_Cushing

anonymous native people relied on archaeological museums and gave them many valuables. The "Indian Burial Pit" in Salinas, Kansas, has been an exhibition centre for tourists since 1989, and in 1964 it was declared a National Historic Landmark of the United States. The same happened with the "Dickson Mounds State Park", in which excavations were made and a museum of Native American corpses and funeral objects. However, in the early 1990s, many Indians went there and buried the skeletons exhibited to the public, with the intention of reconnecting with their own spirit. Museums and archaeologists have acted without morals by disappearing thousands of objects and without protecting the sacred places.

Everything began to change at the end of the 1960s, when many Indians and political activists tried to stop the looting of tombs and repatriate the remains and objects to the reserves, taking the idea to the congress. AIRFA[55], The American Indian Religious Freedom Act, was approved in 1978 to move these remains to sacred places. In 1990, NAPGRA[56] was passed by the federal government to repatriate human bodies, sacred objects and other objects of Indian cultural heritage. This law enables mediation with scientists and archeologists. However, although it respects Native American beliefs, museums and federal agencies have a claim on cultural affiliation and Indians can act in a consultation role but not fully participate. The fight for the return and protection of the bodies of indigenous ancestors and sacred objects is a struggle against colonialism. While the perpetrators ignored Indian views, beliefs and rights because colonialism instills in the colonizer a notion of absolute right, a notion that denies the colonized the respect and rights granted to other humans (Riding In, 2005).

On the other hand, the executive order 13007 of 1996[57], says that religious ceremonies and actions that were against the physical integrity of the sacred places would be penalized. However, these laws still leave authority to the government, without full decision for Native Americans. In 1998, the government built a highway

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[55]" The American Indian Religious Freedom Act 1978"; March 29, 2019; https://www.webpages.uidaho.edu/~rfrey/329airfa.htm

[56] "Native American Graves Protection and Repatriation Act" Wikipedia; March 20, 2019; https://en.wikipedia.org/wiki/Native_American_Graves_Protection_and_Repatriation_Act

[57] "Energy.gob., Executive Order 13007 Indian Sacred Sites (1996)" April 2, 2019; https://www.energy.gov/em/downloads/executive-order-13007-indian-sacred-sites-1996

in northern California, destroying sacred sites. In the Lyng[58] case, the protective association of Indian cemeteries in northeast of California, made reference to the first amendment and the 1993 act of restoration of free religion and they won. In the "Bonnichsen"[59] case in 2004, a judge judged the scientific experiments against the Indians in an oral trial and agreed with the Indians. With all this, it was suggested that subjects of sacred objects and cultural heritage, should be confidential and not revealed to the public.

In 2012, the NAPGRA round table held at the ASU law school, brought together more than 50 Indian delegates from Arizona and other states to find solutions. The committee called for more power to make decisions, more transparency for agencies with NAPGRA responsibilities, and more museum education on Indian beliefs and tribal governments. They desired to claim repatriation and encouraged interested persons to write letters to the congress. The UNDRIP helped to strengthen its authority to prohibit trafficking, including the making of arrests and subsequent prosecutions for this. The wisdom of the elderly and environmental organizations reviewed laws. It was proposed that there following rights should be upheld:

1. the right to burial protection;
2. the right to repatriation of stolen corpses, funeral offerings and cultural items;
3. the right to freedom of shipment to the reserve to which they belonged as a sacred place (Riding in, 2013).

Ola Cassadora Davis and other activists have been defending this cause for years. The apache survival coalition is a group that defends the rights of repatriation and spirituality. The Nebraska State Historical Society[60] keeps many Indian bodies for study and research, but in turn tries to bury lost bodies and return the bodies to their tribes. For the Indians the human corpses are sacred, the studies are under way but there is still a long way to go, to repatriate from other countries or penalize the black market of cultural objects. But who is interested in those results? It is a white science for whites. In 1996, archaeologist James Chatters discovered that Indians came from Mongolia. Indians already knew this, because their knowledge has been passed down ancestrally. Native Americans come from the Earth and must return to it, to close the

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[58] "Lyng v. Northwest Indian Cemetery Protective Ass'n" wikipedia, April 5, 2019; https://en.wikipedia.org/wiki/Lyng_v._Northwest_Indian_Cemetery_Protective_Ass%27n

[59] "Robson Bonnichsen" Wikipedia; January 24, 2019; https://en.wikipedia.org/wiki/Robson_Bonnichsen

[60] "History Nebraska; April 6, 2019; " https://history.nebraska.gov/

circle of their ancestors and heal wounds. It is necessary to leave them alone and treat them with sensitivity and respect, because in them lives the spirit of their families and ancestors, therefore repatriation provides spiritual healing.

10.5.3. Protecting Mother Earth

The "Dawes act" in 1887[61], allowed European-Americans to appropriate part of the remaining land that had been distributed individually among Native Americans. The remaining lands were sold to the Europeans who used them for the extraction of minerals and coal, such as "Balck mesa region" that belongs to the Hopi and Navajo. Later, "the whinters doctrine" approved by the Supreme Court in 1908, recognized the water rights associated with Indian lands as an exchange for land expropriated so far. With all this, Indians lost two thirds of the land they had, from 138 million acres, to 48 million, according to the Merian Report of 1928[62], prepared for the "Indian Reorganization Act" in 1934[63]. This resulted in the paralysis of the expropriation, forcing to conservation and development of Indian lands and resources. Until then, it was time for assimilation, where Indians were forced to build small farms, with swamps built by the government, which destroyed their irrigation systems and degraded many of their ecosystems. Between 1980 and 1990 several acts were enacted in the congress to keep water and air free from contamination, with the collaboration of federal agencies and NEPA[64], which since 1970 obliges the federal government to comply (Mariella, 2013).

Indian tribes seek sustainability, the intelligent use natural sources such as hunting and fishing, investing in repopulation of species and renewable energies. Their concept of land ownership is different, not property but administration, not exploitation but conservation. However, it is difficult, since they have lost a lot of land and, at the same time, their reserves are scattered and not contiguous, which means that there is less space to start up renewable energy projects, less farmland and less water, so that their economy and traditional structures are at risk (Mariella, 2013).

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[61] "Dawes Act" Wikipedia; March 15, 2019; https://en.wikipedia.org/wiki/Dawes_Act

[62] "Meriam Report" Wikipedia; March 10, 2019; https://en.wikipedia.org/wiki/Meriam_Report

[63] "Indian Reorganization Act" Wikipedia, April 10, 2019; https://en.wikipedia.org/wiki/Indian_Reorganization_Act

[64] "National Environmental Policy Act" Wikipedia, March 4, 2019; https://en.wikipedia.org/wiki/National_Environmental_Policy_Act

Protecting Mother Earth is one of Indians main objectives, which is in total union with their cultural and religious practices. However, this is threatened by the exploitation of mines, recreation in national parks, such as skiing or hiking[65], among others. Several Native American tribes, such as Lakota, Hopy or Wintu for example, are suffering this situation badly and ask for people to respect and protect these places. The mountains, lakes and rivers are their churches, where they practice healing ceremonies. Healers, transfer their knowledge to their descendants when conducting these rituals. In the land, in water, in animals, in rocks, there are the spirits of the ancestors, for that reason, the Earth is sacred. Indians do not want people to go there for other trivial purposes, since they do not respect the spirits that live there. This causes arguments between Indians and rangers, especially in ski areas and natural parks. Neo-hippies sometimes go to certain sacred places to do individualized ceremonies naked or drinking alcohol, acts that are disrespectful according to Native Americans.

Water is also sacred. In Dakota water protectors have tried for years to stop the construction of pipelines that will cross from the Missouri River of the Standing rock Nations -Dakota del Norte to Illinois[66]. Indians say they are connected to the earth and intuitively understand what is going to happen, some of them are healers and Native Americans feel like this destruction in nature, will lead to a climate change, something that has to be stopped for humanity to survive. The protests in Standing Rock have become increasingly popularity in recent years, many activists in the country have joined the fight and by using drones have shown the world damage caused to nature. In effect, rivers are in danger and plants and animals are drinking contaminated water. Coupled with these, there are other protests like "Oak flat"[67] in Arizona's Apache lands, where the feds want to mine in an area for sacred ceremonies. Or the case of the abandoned uranium mines in New Mexico, where several cases of lung cancer are coming to light, with justified government

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[65] "Oregon State University" ANTH 110 - Week 2 Video: In Light of Reverence and In Whose Honor; January 10, 2019; https://media.oregonstate.edu/media/anth_110_-_week_2_video:_in_light_of_reverence_and_in_whose_honor/0_niuq4yoj

[66] "John Little, Kenn Little & Suzan Shown Harjo More Than A World Film @ Indigenous ComicCon" Awake, YouTube; March 12, 2019; https://www.youtube.com/watch?v=kUEU12a0M_Y

[67] "Oak Flat (Arizona)"Wikipedia, April 3, 2019; https://en.wikipedia.org/wiki/Oak_Flat_(Arizona)

compensation[68]. Opposition to the extraction of uranium has played a central role in the life of Manuel Pino[69], who received the Future Free Prize for nuclear weapons in 2008. He is an academic-activist who studies the destructive impact of uranium mining in Native American culture and about the victims and deaths associated with cancer, bringing this to the attention of international conferences, including the 1992 World Hearing of Uranium in Salzburg.

Patricia Mariella (2013) detailed several solutions that the twenty-two Arizona tribes are carrying out to protect the Earth. These Indian tribes have 28% of the total land area of the state. This territory contains the majority of the mineral wealth, many renewable energy resources and has some virgin ecosystems. Maintaining these ecosystems can be done in a sustainable way, through hunting, fishing and collecting of wood. This is practiced by the Navajo in the Ponderosa pine forests between San Carlos Apache and White Mountains. Natives also work small farms with domestic animals such as turkeys and pigs and collecting cereals, such as cotton and corn in traditional methods. Indians harness renewable energy from sunlight, wind and biofuels. In addition, the most precious places for recreation are in Indian lands, with strict rules to protect the environment. Sustainability is more than merely maintaining an environment for Indians; it is maintaining their culture that is connected to their health, their lands and the well-being of their communities.

10.5.4. Respecting an ancestral culture

The culture of the Indian tribes is ancestrally based, and is in total union with nature. Fire is a metaphor of connection, of power and wisdom and to gather around it, it is responsibility of the communities. These ceremonies should also be political, as a commitment to offer all the knowledge and support strong people who lead changes (Molina, 2013). Sadly, from 1880 to 1930, non-Christian religions were banned in Indian reservations, but fortunately, native culture and religion did not disappear. Thousands of acres of land belonging to Native Americans passed into the hands of the federal government and are now public places that allow the exploration of farms, mines and other buildings that damage the ecosystem and way of life of

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[68] "Uranium mining in New Mexico"wikipedia, March 14, 2019; https://en.wikipedia.org/wiki/Uranium_mining_in_New_Mexico

[69]"REvolvy;Manuel Pino, professor of Indians Americans and Sociology studies, Mesa Community College., Tewa, Albuquerque, Nuevo México" March 10, 2019; https://www.revolvy.com/page/Manuel-Pino

Indians, especially the access to practice their religion (Rinding In, 2013). With the RFRA[70], Religious Freedom Restoration Act, there is freedom of religion. However the federal government still has power over this. Chi`XapKaid (2005) offers strategies for indigenous peoples to recover ancestral teachings and start telling stories from the elderly to the young native people.

Another important cultural aspect is the Indian language and its reintroduction into the communities, as an investment of future success, a responsibility of parents and grandparents and of the entire tribal community. It is necessary to help young people to prosper in the two opposing worlds, theirs and the world of whites, with which they do not identify themselves and which do not value Indian´s culture. Therefore, teaching the language and culture of the tribe in the school curriculum is essential, since only 3.5% of Native Americans in Arizona get a university degree. This would change if their language and culture were incorporated into their academics studies (Molina, 2013). Another important aspect is the language of the president of the tribe, the idea of whether it is important to handle the language perfectly or not. Although it is only a tool, language conveys all the nuances of thought. Encouraging communication in the tribal language is very important, enabling the community to make advantage of everything the elders can teach, since when they die it will be more difficult to recover any lost knowledge. According to Waziyatawin (2005), indigenous languages were systematically and intentionally brought to the verge of extinction by government policies and institutions. Therefore, indigenous communities must work at recovering their languages, creating sustained use of their own language by each tribe.

Not only were they banned, the Indian culture and ceremonies have also been ridiculed by many whites, due to prevailing racism. In several universities, a white man disguised as an Indian is used as a sports mascot. For example, every year at the University of Illinois in the football final, a boy disguised as an Indian chief appears dancing, because one of the teams is represented by a caricature of an Indian. Fortunately things have begun to change since a young Native American student who came with her children to watch a final, was so offended that she began to scream - asking to stop the show. Since that incident, a debate arose around these shows, since the Indians felt treated like pets. The response of the whites was that it was just a

[70] "Religious Freedom Restoration Act" wikipedia; April 10, 2019; https://en.wikipedia.org/wiki/Religious_Freedom_Restoration_Act

non-offensive tradition, adding that the Indians were not from there and did not pay taxes to their community[71]. In *More Than a Word*, a documentary by Jhon and Kenn Little[72], an inside look is taken into these controversial issues through the campaign and legal cases against the Washington Redskins[73]. They trace how racist terminology became accepted by sports teams and fans, making it clear that the fight against Indian pets is part of the wider struggle of indigenous peoples for political, educational and socioeconomic justice today. This shows that activism and indigenous art are alive and strengthening every day. The history of the defamatory term "red skin" and the cultural stereotypes of Native Americans are also explored, advocating instead for performances that honor them.

10.5.5. Education for decolonization

Colonization is not only the loss of rights of self-determination, land or raw materials, it is more than that. It is also the consequences that include: suicide, poverty, health problems and chemical contamination of the environment that can negatively affect the mental health of indigenous peoples. Therefore, it can be said that ultimately colonization is in the mind; otherwise, it is not complete colonization. On the flip side, decolonization is an intelligent, calculated and active resistance to the forces of colonialism that exploit minds, bodies and lands, that is committed to indigenous liberation and the overthrow of colonialism (Waziyatawin and Yellow Bird, 2005). Indigenous peoples have the power, strength and intelligence to develop a cultural decolonization with relevant and specific strategies for each community (Waziyatawin and Yellow Bird, 2005).

According to Cornel Pewewardy (2005), we must educate for the development of a strong and united tribal community against white supremacy and rebuild communities to offer stronger opposition to domination and injustice, by organizing ourselves into small action groups. This will involve reinforcing and making greater use of Indian traditions, encouraging and giving more importance to indigenous self-government and creating connections with other Indian and non-Indian institutions

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[71] "In whose honor?" YouTube, 316M In Whose Honor Clip; March 14, 2019. https://www.youtube.com/watch?v=MQ-zm7VO_3s

[72]John Little y Kenn Little, filmmakers and brothers, are members of the Standing Rock Sioux tribe; March 18, 2019; http://morethanawordfilm.com/

[73] "Native American mascot controversy" Wikipedia, March 5, 2019, https://en.wikipedia.org/wiki/Native_American_mascot_controversy

(T'hohahoken, 2005). According to Taiaiake Alfred[74], author, educator and activist in the community of Kahnawake, educational spaces such as universities are perfect to create power among indigenous people. These institutions should commit to Native American studies and history education with support and funding. In Taiaiake's words, honesty is a value and only when we are rigorously honest can we be useful to the community. This begins with an open and honest history revealed in other external institutions, as a bridge to continuity between all forces. This allows the past to be kept in mind, without returning to it. According to Waziyatawin (2005), telling long suppressed stories about human injustices in public, encourages both individual and collective healing, so the author tells of his experience of the Dakota Commemorative March[75]. He recounts how he returned along the route that his ancestors had traveled in 1862. According to Yellow Bird (2012) decolonizing the mind reaches the root of the problem. Through the practice of mindfulness, power is regained over oneself and goals can be successfully achieved through a silent revolution.

10.6. Conclusions

Native Americans have suffered an unjust history, with the arrival of European settlers who seized land and imposed their European culture through assimilation. All this has meant that Indian traditional ways of life are modified and their communities are forced into poverty and despair. The lack of hope due to unemployment and lack of academic training among Indians, leads to health problems, drug addiction and alcoholism, violence, lack of housing and depopulation in the reserves.

Starting from all the problems and possible solutions reviewed in the paper, it is concluded that educating in decolonization is the cure all to centuries suffering. This includes political decolonization, enforcing laws, respecting mother Earth and ancestral customs, reintroducing native languages in reserves and native schools. Training teachers, introducing programs for the teaching of Native American history and culture in the curricula at native and federal universities and schools, will help to

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[74] "Taiaiake Alfred "Wikipedia, April 11, 2019; https://en.wikipedia.org/wiki/Taiaiake_Alfred

[75] "twin cities. Pioneers , press, Dakota Commemorative Walk remembers 1862 forced march to Fort Snelling " April 10, 2019; https://www.twincities.com/2012/11/11/dakota-commemorative-walk-remembers-1862-forced-march-to-fort-snelling/

form strong leaders. They in turn will defend the unity within communities and build bridges with other Indian and non-Indian institutions. These are some of the solutions that could partially compensate for damages caused.

Although the purpose of this paper has been made clear and we know what we have to do to help Native American populations, it is difficult to change the mentality of the white Americans who want to stay in power and dominate. The colonialized mindset is something so inherent and so institutionalized that it is all the more difficult issue to understand and therefore eradicate. That is why the solutions have to be implemented at all social levels, policies, economics, and so forth. Mainly, we must get inside the consciousness of the people, both native and non-native, which this is our great role and challenge as educators for present and future generations.

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Table 10.1: Tribes in Arizona (Source: The State of Indian country Arizona, 2013**)**

	Description	Área	Population number	culture
Apaches	There are four Apache tribes	Southeast Arizona Green Valley Payson	San Carlos= 13000 White Mountain= 14000 Yabapai=2.500 Tonto apache= 110	They share the language "Athabaskan"
Pai	There are six different tribes	Central and Northwest Arizona Mogollon Rim Peach Springs Coconino County and Southwest of the Grand Canyon National Park Campo Verde y Prescott	Yavapai-apache: It is a mixture of the two cultures = 2.500 Fort McDowell=? Hualapai tribe, people of the tall pine=? Havasupai tribe=? Yavapai Prescott tribe=?	Culturally related but speak different dialects of a language called Yuman
O´Odham	Four tribes related by their language	Central and southeastern Arizona, including Mexico Sonoram desert Santa cruz valley Sur Phoenix/ Noreste de Phoenix.	Tohono O´odham nation o papago tribe=? Ak-chin Indian community=22000 Gila river Indian community=17000 Salt river pima-Maricopa Indian community = 10000	O'odham language
Tribus Del Río	They are not linguistically and culturally related	Arizona, Phoenix and California, San Bernardino Northeast Arizona Utah, Arizona, New Mexico, and 10 more states Arizona, California and Nevada North of San Luis and east of San Diego Yuma Arizona, Southern edge of AZ and CA with Mexico	Mohave, Chemehuevi= 7.500 Hopi=12000 Navajo = 27500 in USA(majority tribe) Fort Mohave=1.200 Cocopah = 1.100 Quechan tribe= 3000	Culturally linked by the Colorado River
Tribus De Paiute Sur	There are two main tribes	Colorado river basin and Mojave desert, East of the grand canyon	Kaibab-Paiute tribe =240 San Juan southern Paiute tribe =300	The same language, Ute and Paiute
Pascua Yaqui Y Zuni	Different peoples not related	South Arizona and sonora México/ New México	Pascua y Yaqui =18000 Zuni =19000	Different languages and cultures

I am your food system for you to transform

Namukolo Covic·
International Livestock Research Institute, P O Box 5689, Addis Ababa, Ethiopia
Email: n.covic@cgiar.org

I am your food system for you to transform
For you to thrive I must transform
But transforming I am in what direction?
And transforming I can in the direction you take

I am your food system for you to transform
But together you must work
Together, together, together, far and wide
So many components I have so together you must work

I am your food system for you to transform But together you must work
Or different paths my components will take Different paths to no good I will transform

I am your food system for you to transform
Will humanity fight one another?
Will humanity together transform me?
What direction together for planet and humanity to save?

I am your food system for you to transform Transform for affordable food, nutritious and safe Transform for nutrition and health
Transform for humanity and earth to save!

I am your food system for you to transform

·p. 250 in *Planetary Health and Bioethics,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

11. Impact of COVID-19 on Food Value Chain and the Need of Ethical Safeguarding of Farmers: A Perspective from India

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11.1. Abstract

The purpose of this paper is to investigate the ethical implications of COVID19 on the food value chain. The paper investigates the effects of COVID19 on the food value chain through the lens of small-scale farmers in India. In framing the phenomenon within the wider scope of farmers as producers and consumers, the paper discovers that the impact of COVID-19 and related measures on small scale farmers falls under ethical scrutiny because it affects all aspects of the farmers' lives; livelihood, employment, nutrition and diet, and so on. To address such concerns, the paper examines all of the consequences and concludes that, in the aftermath of a pandemic, ethical safeguarding of small-scale farmers is essential for the food value chain's resilience.

11.2. Introduction

The food value chain is a network of stakeholders that includes people involved in growing, processing, selling, and even consuming food. To summarise, the food value chain includes all stakeholders from farm to table. The COVID19 pandemic has taught us how pandemic-like disasters can disrupt food production and distribution, affecting the entire food value chain. In addition to the reported impact of COVID-19 on consumers, a large number of documents have highlighted the pandemic's disruption of the livelihood and economic activities of other food system actors,

pp. 251 - 260 in *Planetary Health,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

beginning with primary producers (e.g., Termeer et al., 2020; Rosen, 2020; Reis-Filho and Quinto, 2020; Urioste Daza et al., 2020; Quiroga Mendiola et al., 2020; Tounkara 2020).

These disruptions include the loss or reduction of access to farming input supply or the sharp increase in their prices, affecting a variety of stakeholders. Hence, understanding the interdependencies along the food value chain is more important than ever to reduce the pandemic's negative impact. It implies a strong emphasis on small-scale farmers, particularly in countries like India, where the majority of farmers live in rural areas and are generally poor. Focusing on Indian small-scale farmers, it cannot be overlooked that they may be the most vulnerable to the disruption in the food value chain caused by the COVID-19 pandemic. Based on this assumption, the paper seeks to investigate how COVID 19 has impacted small-scale Indian farmers who, on the one hand, produce agricultural food products and, on the other, are consumers and, in many cases, suffer from hunger. To address such concerns, the paper examines all of the potential consequences through an ethical lens and concludes that, in the aftermath of a pandemic, ethical safeguarding of small-scale farmers is essential for the food value chain's resilience.

11.3. Indian Scenario

Around 120 million smallholder farmers in India contribute more than 40% of the country's grain production and more than half of its fruits, vegetables, oilseeds, and other crops. India produces a large portion of the world's staple foods, such as rice and wheat, and agriculture employs nearly half of the country's population. However, risks from the COVID-19 pandemic had posed a challenge to a sector that was already under threat from changing rainfall patterns, price volatility, and rising debts.

A recent study looked at the effects of a multi-layered COVID 19 shock on vegetable farmers' production, sales, prices, income, and diets in India. According to the study, over 20% of farms experienced devastating declines (sold almost nothing), with 90% of farms experiencing a drop in farm income. Over 80% of farmers reported price reductions, and 62% reported dietary disruptions. The majority of farm households reported limited access to the most nutrient-dense foods. Around 80% of households reported being able to protect their staple food consumption, but the most significant drops in consumption were in fruit, animal-sourced foods, and

dairy. Almost 30% of households reported a decrease in vegetable consumption. The study also suggested that female farmers are more vulnerable in terms of livelihood and diet, and that there are different effects on smaller and larger farmers' ability to continue operating. (Harris et al.2020).

11.4. Impact on Supply Chain

When it comes to agricultural operations, Indian farmers face a slew of challenges. These stresses have been exacerbated by two lockdowns caused by the COVID-19 pandemic situation (2019-2020). According to a survey, 10% of farmers werenot harvesting at all due to the lockdown, vegetable farmers are suffering the most in terms of wastage, and nutrient-dense food consumption is decreasing (Jaacks et al. 2020). A study of retail prices in India discovered that they had increased and then stabilised on a national level, but that they varied depending on the type of vegetable (Pingali and Mittra 2020). Similarly, issues such as finding harvest labour, transportation to market, decreased demand by buyers and retailers, and increased retail prices for vegetables in various states were reported (Pothan et al. 2020). The measures to contain the health emergency had an impact on those in the sector, affecting jobs, meagre incomes, and food and nutrition security, particularly among vulnerable farmers. (Andrea Biswas Tortajada and Cecilia Tortajada, 2020).

Long supply chains have been severely harmed, particularly at the start of the lockdown when transportation was restricted. Drivers abandoned produce-laden trucks in the middle of interstate highways. Markets eventually ran out of supplies due to food spoiling in transit or never reaching the point of sale (Maggo, 2020). Agriculture input suppliers in Andra Pradesh (India) lost up to 75% of their business due to transportation and contact restrictions, according to Nedumaran et al. (2020). Three-quarters of these input dealers reported a 44% decrease in farmers visiting their stores to buy farm inputs. Harris et al. (2020) also reported that 87% of vegetable producers in India had their production interrupted. In some areas (for example, Jharkhand State), the figure was as high as 94%. While many of these jobs were restored, the level of employment in the agri-food system remains lower than it was prior to the COVID-19 outbreak. As a result, pandemic-like disaster resilience should prioritise long food supply chains involving multiple stakeholders and entities that are clearly vulnerable to pandemic-like shocks. (Maggo,2020).

11.5. Impact of Shortage of Labourers and Equipment:

The lockdown resulted in a labour and equipment shortage. Migrant labourers in India typically relocate to rural areas during harvest, and smallholder farmers frequently rent harvesting equipment rather than purchasing it. Labor shortages delayed the mid-April 2020 wheat harvest by two weeks (ICAR,2017), causing crops to be abandoned in some areas, while harvesting occurred more than a month later in others, with limited and more expensive labour (ICAR,2017).In one study, 45 farmers from North-West India (Haryana, Punjab, Uttar Pradesh, and Gujarat) reported difficulty in obtaining combine harvesters and labourers for harvesting Rabi crops and preparing Kharif crops (98 percent of all states reported high stress). In another study, a telephone conversation with 100 farmers in West Bengal revealed that they could not find an adequate number of labourers to work in their fields (42%). As a result, 91% of them had difficulty purchasing inputs (seeds, fertilisers, and pesticides) for Kharif, and 82% had difficulty selling their crop produce in the market. Another set of stresses caused by the COVID-19 pandemic led lockdown was the sale of crop produce (87% moderate to high stress in different states), access to inputs for next season crops (84.0% high stress), and mobility restrictions (63% moderate to high stress). According to experience, access to resources and services during and immediately following the imposition of a lockdown situation became major bottlenecks, particularly for resource-poor farmers (ICAR,2017).

11.6. Production Wastage:

Farmers (50%) lost their vegetables and flowers worth INR 5000 to 20000 of the value of their crops during the lockdown (2020), while 16% lost around INR 1000 to 5000 of the value of their crops (Deepa Maggo, 2020. WBCSD).

11.7. Impact on Pricing:

Increased demand from returning migrant workers increased wholesale prices by 9% and retail prices by 11% in the potato-producing states of Uttar Pradesh and West Bengal. While production/farmgate/rural prices frequently fell due to the 'collapse' of demand as a result of the disruption in the value chain and the lockdown

of (informal) traders, prices at retail and selling points may have risen in many urban areas.

In spite of these impacts, the Indian government's primary responses to ensure farmers' livelihoods, during the pandemic, had been to make loans more accessible, as well as to provide tax relief and direct farmer payments. Furthermore, the government's response to ensure food security had been too double Public Distribution System (PDS) allocations and provide cash payments to unemployed workers (but not self-employed farmers).

11.8. Impact on Nutrition and Diet

Food system, as a food value chain, includes not only producers but also consumers. Some groups of people, such as smallholder farmers, are particularly vulnerable due to a lack of equitable access to nutritious diets.

Recognising the risk of COVID-19's impact on the food value chain, international organisations such as the UN Food and Agriculture Organization (FAO), the International Fund for Agricultural Development (IFAD), the World Bank (WB), and the UN World Food Programme proposed that agriculture and its food-related logistic services be considered essential. As a result, greater efforts have been made to ensure that food value chains operate efficiently and promote the production and make available the diverse, safe, and nutritious food to all (WFP, 2020b). However, this commitment had fallen short during the pandemic in Indian context.

Female farmers, in India, experiencedmore vulnerability in terms of livelihood and diet. Women farmers claimed to employ more mitigation strategies in order to first secure their income and then their diet. The reasons being the perception of changes in food prices and rising cost of affordability.. As a result, the mitigation strategies at their disposal were insufficient to protect their livelihoods and diets from income and price shocks. Producing a variety of vegetables appears to reduce the impact on sales (possibly through different sales channels), but not on income (as prices are hit). Due to their inability to sell their own produce, many households increased their consumption of their own vegetables, and a portion increased their consumption above previous levels.

11.9. Food Value Chain and Ethical Safeguarding

The Food Value Chain and the need for ethical safeguarding are intricately linked. Several committees perceive access to markets for smallholder farmers as critical to improving food security (CWFS, 2020; FAO et al., 2019; Pingali et al. 2019). The food value chain and ethical safeguarding are defined as major issues in the sustainable development agenda to capture issues of this complexity. This includes how to ensure producers, particularly smallholder farmers, are involved in sourcing networks as well as institutional initiatives that assist them in meeting stringent food safety and quality regulations (Wilkinson, 2015). However, this has been a neglected area in India.

By 2020, India will have more undernourished people and food insecure people than any other country (FAO et al., 2019). Before and during COVID-19, India implemented a variety of food policies and initiatives, as well as legal architecture to ensure food entitlement to all, particularly those living in poverty (e.g., the National Food Security Act of 2013), and it has made some progress toward these goals (FAO et al., 2019).However, the COVID-19 pandemic and its cascading effects have threatened to increase food insecurity, including in its most severe forms of acute hunger and famine, for 265 million people worldwide (FSIN, 2020; CWFS, 2020). With some migrant daily wage earners succumbing to starvation since the implementation of COVID-19 movement restrictions in India (Mohan, 2020), there has been growing concern that a food crisis is looming large in India (Dahir, 2020; ICJ, 2020; Roy et al., 2020).

A food crisis in India could mean that: (a) food becomes less economically accessible to people, including food producers (e.g., as a result of lost wages and food price increases); and (b) food becomes less economically accessible to people, including food producers (Dev, 2020) and (b) food becomes less available in communities across India as a result of movement restrictions complicating food transport from rural to urban areas, disruptions in food production and distribution due to farmer illness, farm workers' migration to native places (Gunia, 2020), and increased transportation costs (Chowdhury, 2020). With COVID-19 mobility constraints, the availability and distribution of food has been a concern in the country (Mohan, 2020).

Since food producers, particularly small-scale farmers, face a disproportionate amount of food insecurity, they are the most vulnerable to the effects of changes in economic, social, and physical mobility (FAO et al., 2019). This emphasises the importance of protecting smallholder farmers' livelihoods and ensuring their right to food. These issues are critical in the context of COVID-19 in India, where a large portion of the population depends on small-scale agriculture for income. As a result, smallholder farmers in rural areas are most vulnerable to food insecurity in the food value chain. Rural starvation and increased malnutrition outcomes as a result of COVID-19 would be not only tragic, but also unethical, as it would reduce the ability of entire communities to produce food and hinder the entitlement to right to food.

11.10. Conclusions and Recommendations

The paper recommends, from an ethical standpoint, Indian farmers should be regarded as vital stakeholders in the food chain, not just as producers but also as consumers. After addressing some pertinent concerns, the paper concludes with the recommendation that the sector be more inclusive and equitable, thereby safeguarding both farmers' incomes and the right to affordable, nutritious food.

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12. The concept of eubios (good life) and Planetary Health

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12.1. Abstract

This paper presents the concept of a good life ("eu-bios") that has guided the work now in its fourth decade of Eubios Ethics Institute. The Eubios Declaration on International Bioethics (2002) and over efforts have promoted planetary health and an integrated and holistic approach to bioethics. The is a particular analysis of our relationships to animals and programs for bioethics education included amongst other topics.
Keywords: *Bioethics, eubios, animal rights, education, good life*

12.2. A good life

I coined the term "eubios" from the Greek words for good "eu" and life "bios" in 1990 after spending some years reading about the popular topics of eugenics (good genes) and euthanasia (good death) which dominated bioethics discourse. Both these terms are usually reductionist. Eugenics is linked to concepts of genetic determinism, i.e., a predominance of DNA as the explanation of why beings are made the way they are, and act the way they act. As a molecular biologist it would be too easy to focus on the central dogma, that DNA leads to RNA leads to protein in a one way flow. Three decades later we can see that the information flow is multidirectional, and both nature and nurture shape our life (Macer, 1990).

While there is a lot of attention surrounding ethical decision making at the end of life, and euthanasia is an important topic, our journey through life (Macer, 2022), has a lot more to celebrate than the last days. Eubios offers a more holistic approach to life, and the Eubios Ethics Institute has been widely influential because of the need to promote a holistic approach to bioethics.

As agreed in the Eubios Declaration on International Bioethics (2002):

pp. 261 - 272 in *Planetary Health and Bioethics,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

*"**Life as a Whole***

13. We recognize the dependence of all life (biota) on intact, functioning ecosystems, and the essential services that ecosystems provide. We urge action to halt environmental damage by humans that reduces biodiversity or degrades ecosystem processes.

14. Whereas wildlife provide numerous free services that make our life possible and pleasant, cleaning the air, water, and the soil of pollutants, providing food, medicines and a beautiful place to live, wildlife are in grave danger from the loss of habitat, the spread of exotic species, pollution, and direct consumption by humans. Wildlife often cannot protect themselves from humans, so without our help they cannot survive. The presence of humans greatly reduces the usefulness of a habitat to wildlife. Wildlife reserves act as sources for replenishing our supplies of animals and plants. Therefore, we urge all nations and peoples to make the protection of wildlife and wildlife habitat a top priority. In particular we urge them to set aside a large portion of their territory, interconnected by the wildlife travel corridors, for the exclusive use of wildlife, off limits to humans."

12.3. Our life

The new leaves emerge from the fig tree outside my window. Our space is the width of the wondrous tree that provides delicious figs in the summer months. Occasionally shared with the squirrel who also loves figs. My dear pair of love doves has flown back again this year to enjoy the spring fragrance and warmth, and to decide where to build their nest this year. I will postpone to cut the sprawling bougainvillea until their nesting is complete, as I had to live with regret over their early departure last year when my pruning disturbed their home. Dear crow comes by to start to gather twigs to build her nest. Last month the waxeyes and occasional hummingbird enjoyed the nectar of the cherry blossom in this space where I do most of my writing these days - Our Space. Now the intense perfume of the jasmine fills the air, and the first blooms of lilac are emerging. Blessed again from a self-sown tomato plant from my compost. Thank you all for your love and sharing time and space in our journey together.

The highest love is "Ours" and shared - not mine or yours. Not just the fig tree, the farmer who eats the fig, the bees who feast on the flowers, nor the crow who

travels to to bring her wisdom as she takes a brief respite from her mission to look into my eyes and soul. Can any human couple share the steadfast love of birds who mate for life? This perspective sheds a different vision of the multiple "Ours" that each of us are parts of, and all sets of "ours" that will merge in our life!

We directly enter the environment when we become a human "(in) being", and from that minute until the minute we pass away, our journey of environment education continues. Some of that education is informal and some formal. The gift that we receive when we are born into this world is love. This is the essential human value for the 21st century, as it was for every century in the past. While love is a gift that few are deprived of, a deprivation that is in itself an insult to the humanity that our flesh embodies, it is a norm for all forms of life for the new life to be given a good start (Macer, 1998). The ultimate gift that we can share with others is also love.

Each human person is composed of about 100 different species, and at least 17 of these species are the same between all human individuals. Our world is diverse with more than 10 million species, and more than 4 thousand indigenous groups. This linguistic, cultural, and religious diversity is a great resource yet it is generally under-utilized. The concept of eubios attempts to suitably broaden our life ethos.

Let us consider two quotes about love (Macer, 2022):

"It is certain that associated animals have a feeling of love for each other, which is not felt by non-social adult animals. How far in most cases they actually sympathize in the pains and pleasures of others, is more doubtful, especially with respect to pleasures."

- Charles Darwin, *The Descent of Man* (England, 1875)

"How do you spell 'love'?" - Piglet

"You don't spell it...you feel it." - Pooh"

- A.A. Milne

12.4. Relationships with animals and animal rights

All living organisms are biological beings, and share a common and intertwined biological heritage. Humans are members of the species *Homo sapiens*, one of the millions of species alive on the planet Earth. Fundamentally when it comes to the use of other animals by humans, we must ask whether that particular use of animals raises ethical issues and how we might want to assess such ethical issues because we are moral beings.

Throughout human evolution people have been in relationships with other animals around them as companions, sources of food, labor, security and clothing. If we use more economic language we can say that “consumers”, both human beings, as well as members of other species, have used other animals to provide both goods and services. All our relationships have ethical implications, and the use of animals by human beings has a long social, biological and spiritual heritage (Macer, 1998) .

Some other voices, especially among the bioethics community, ask questions such as whether humans are a special form of life, different from other living creatures that generally only harm others when they need to for their survival? Although annoyed hippopotamuses reportedly kill about five hundred humans globally every year, making them one of the most deadly large animals, most sentient animals only kill for self-protection or food.

For this second group of people, they may consider that the use of the pelts of animals that were being killed for food, might become ethical by a utilitarian calculation that it was better not to waste parts of the animal. Some may also accept the rationale of ecological balance used by the fur trappers above. Some argue from a deontological perspective may place particularly high moral status on certain species and encourage the use of alternative sources of fibre to make clothes.

The concept of "do no harm” or non-maleficence, which has a basis at a more fundamental level - the level of being alive, argues against hurting any living organism. If we are going to harm life, a departure from the ideal of doing no harm and love of life, it must be for a good motive (Macer, 1998). Such a motive might be survival, and we can see this as natural - all organisms consume and compete with others. Plants compete with each other for space to grow, animals eat plants or other animals, bacteria and fungi also compete for resources and space - sometimes killing other organisms and other times competing without direct killing.

Destruction of nature and life by humans is caused by two human motives - necessity and desire. Basically, it is more ethically acceptable to cause harm if there is necessity for survival than if it is only desire. This distinction is required ever more as human desire continues to destroy the planet.

Intrinsic values are something that exist without another person assigning value to something. We could also consider intrinsic value as some experience which has value in itself without any instrumental reference by others. To perceive

something of intrinsic value we need to have an object of value, whether it is the bone thrown to a dog or a ball thrown to a child, the object becomes of value. It becomes of value even if we cannot be conscious of the value or talk about it, as you can see from the reaction of the animal to the removal of the object that they have interest in.

A particularly important source of fibre for clothing is wool, which is shorn from sheep in the spring so that they will be cooler in the summer and it naturally grows back for winter months when they need it as a thermal protection themselves. Sheep farming has a long tradition, being also mentioned by Ovid in the quote cited above. I have not made a calculation of the amount of wool that could be harvested from the pelts of animals killed for food as opposed to just shearing of sheep. The pelts of sheep are also fashionable and used as rugs in a number of both ancient and modern societies. It seems to be ethically justified if you're going to kill the sheep for meat that you also make the sheep skin as a useful product.

However, vegans will prefer to use a fibre from plants such as cotton or hemp, as opposed to one made from animals, such as wool or silk (Choi and Lee, 2021). Vegan materials used in so-called vegan fashion include acrylic, bamboo, cotton, hemp, jute, linen, modal, nylon, ramie, rayon, and spandex. Sometimes the environmental consequences of use of vegan materials in fashion and food may not be ideal, as seen for example in the environmental costs of production of almond milk in water scarce environments compared to cow's milk. Having said that, the wool scouring industry does use a lot of water. More thorough environmental impact assessment, including analysis of the harms to animals, should be research priorities in these areas.

The leather industry relies on animals such as cows, buffalo, sheep, deer and kangaroo, for example. Around 95% of the leather used globally is a side product of the meat and dairy industries. The tanning industry will be discussed later. Basic footwear in many parts of the world has used leather for centuries and continues to do so. Unless people will give up eating beef, which is against the global trends which clearly predict significant global increases in beef consumption (Kanaly et al., 2010), our focus should be on making the tanning industry more environmentally sustainable.

The motive for using animals also alters the morality of their use in some religions, suggesting these concerns have a long history. All religions display

examples of the use of cosmetics and even particular fashion codes are used for priests, nuns and monks. Animal sacrifice for worship is used in Islam, but they would generally condemn scientific research or battery farming. Vivisection is allowed under circumstances where there is no pain or disfigurement and if other animals benefit (Macer, 1998). The use of animals in science is under the same moral codes as applied to humans. Even though the animals possess a lower consciousness, Islam says animals know their own mode of prayer and psalm, a voluntary act of praise. The killing of any breathing beings, except for food or religious sacrifice, is high on the list of deadly sins. Hindus, Jains and Buddhist believe that we will be reborn as another living animal, which creates their bond of caring and compassion for animals. So they will reject animal sacrifice, even though the sacrifice of an animal won't kill what is essential, in the reality, the soul, of that animal.

Christian scriptures and traditions accept animals do have valid claims upon us. Animals cannot be viewed simply as expendable raw materials for our designs, they do not exist simply to serve us, the doctrine of creation is opposed to anthropocentric notions. The use of animal sacrifices does not mean animals should be sacrificed for the selfish pursuits of humans, the practice of animal sacrifice was to bring God into the focus of human hearts in place of their own selfish desires, and was not necessary after the birth of Christ. The tradition of the Roman Catholic church is to regard animals as means to human ends, and the moral objections to cruelty on animals are more concerned with fear that those inflicting pain will contract habits of cruelty, something also seen in Kant (Macer, 1998). The contrasting attitude of St. Francis of Assisi, to talk of sister cows or brother dog, is a picture which is appealing to those with a more biocentric view.

Who should judge whether a practice is a need or a desire? If we live in cold climates the use of an animal fur as warm clothes is a need rather than a desire. If we go outside in the cold catching food, gathering fuel for the fire, or water, and so on, it is usually a necessary excursion. Can we then criticize a socialite who likes to venture out in the cold winter to attend parties? If it is a business dinner, necessary for employment and gathering an income is this more justifiable compared to a birthday party? Is wearing a fur coat a necessity for a homeless person on the streets at night, but not for someone who lives in a warm house? What about in times of natural disaster? A fur coat can be a life safer. The principles of balance and context

seem critical here, but even more fundamental is whether anyone can limit our autonomy.

Animals such as ostrich, peacocks, doves, geese and turkeys are some of the few species that have been involved in the feathers trade (Ferreira, 2016). These are not all from dead animals, and a percentage of the world's supply derives from birds plucked alive. The plucking of feathers is painful and damaging for the animal, and it may be repeated every six weeks. The brutality in which these feathers are plucked can lead to serious wounds that are usually taken care off without anesthesia and dirty materials.

Some indigenous tribes find particular spiritual meaning in some feathers, and in USA use of bald eagle feathers, a protected species, is limited to Native Americans, on the grounds of religious freedom. Thus not all feathers are produced through industrial processes, and these are retrieved from dead or molting eagles.

12.5. Legal Evolution and Recognition of Animals

Modern legal systems developed in Europe during the eighteenth and nineteenth centuries. These systems resulted from the capital market economy, together with the ideologies such as individualism and liberalism, unified state power and modern bureaucracy as its foundations. Technological innovations require a re-examination of the fundamental legal concepts of humans and nature which have formed the premises of the modern law up until now (Kitazawa, 1998). The debates on cosmetic industry, endangered animals, and research on animals have also been important in the evolution of laws to protect animals.

Under modern law, persons are treated equally as legal personalities, each possessing the capacity to hold rights. The modern law regards the person's intention and activities as the most significant element of law. Contracts and wills are built based upon such a presupposition. Land, resources, animals and plants are all conceived of as things which, as the object of a subjective right, may be owned by a person. Attention should be paid to the legal ramification of the conception that animals and plants are viewed as "things" in law. All creatures except humans are categorized as "things." This dichotomy is an unbridgeable one under the modern law. Kitazawa (1998) and others argue that the time has come for us to introduce a new concept called a "life unit" which is, in the world of microorganisms, the

fundamental element of the third legal order and which is an addition to the existing legal dichotomy of "persons" and "things." Upon successful building of the "life unit" concept, it becomes feasible for us to begin constructing the new legal system of the "life unit." In this new legal order, a "life unit" will not necessarily be recognized as a new subject of a right, nor as a new thing. This legal order for the "life unit" and its constituents may require a complexity of new legal norms. When our intention is not to sacrifice other beings in order to safe our life or the life of a sick child, but only to look good at a party, the legal justifications weaken substantially. Although it took some decades, the evolution of laws to reject cosmetic safety testing in animals in the USA does represent a significant milestone in the balancing of human need and desire.

The so-called “moral” and social acceptance of a technology evolves over time (Tortora, 2015). Fashion and cosmetics also evolve over time, and what is “normal” changes over time. There are some fashion brands that promote their policy of not using fur from animals, for example Stella McCartney’s “Fur-free fur” (Ferreira, 2016). While they do use silk and wool, they reject animal testing and use of fur and leather. Some other mass market brands promote reduction of animal products in fashion, such as Bodyshop and H&M, for example. Many exotic products are still used in the luxury fashion and cosmetic industries.

Although some proponents against the use of animal products in the fashion industry argue that we should all wear either plant based products or synthetic clothes. There are not just a few bioethically minded persons who would consider it more ethical to wear natural fibre compared to synthetic fibers and products. CITES and education against the use of endangered animals has been successful to reduce the use of some species. What we may all agree upon is that we need to protect our environment and find a better ethical balance in the use of animals in the fashion industry, but the recovery of the fur industry in recent years suggests that animal products will continue to be widely used in fashion in this millennia, as they have been in past millennia.

12.6. Eubios Bioethics Education Project

The global trends in education are transformational and critical to address issues for the 21st century as countries emerge through the COVID-19 pandemic and confront

increasing climate change. We need to consider the variety of viewpoints from anthropocentric, biocentric, ecocentric and/or cosmocentrism (Rai et al., 2010). Critical thinking capacity is essential for empowering persons to cope with changing times. How do we promote the creation of ideas and individuality in an era of globalization? Rapid progress of technology has led to challenges in the way that we live. The systems and patterns that are seen in the relationships between people and the environment, and in society in general, have changed.

The pursuit of a good life is a goal that all persons can hope for. A good life (eu-bios) should be understood in a holistic sense, and is clearly more than just a contented life, free of want and fear. At the international level this is what the United Nations was established to help provide. This is also the duty of all governments to provide to their citizens, and those with the abilities to provide to those in need.

This project aims to increase the amount of free on-line teaching materials for bioethics education in different countries. The main products so far have been:

1) Production of cross cultural materials. Improvement via expert meetings. Adapted and translated in different languages to teach school and university classes about bioethics.
2) A network of teachers in different countries that have tried the materials, and created bioethics curricula for their local school, bioethics clubs and other endeavors. (Network now 18 years old)
3) Development of a Statement (Eubios Declaration of Bioethics, 2002) and joint action plan with UNESCO (July 2006)
4) Testing of evaluation methods
5) Sharing of museum displays and teacher training strategies
6) Moral games and participatory methods
7) Teacher training workshops and government support
8) Curriculum review and development
9) Launch of dedicated Degree programs (founding of American University of Sovereign Nations (https://www.ausovereignnations.org) a decolonised University).

The Eubios Declaration on International Bioethics (2002)[78] stated:

"Bioethics Education

25. To work towards a social consensus requires participation of informed citizens, which requires education about issues of bioethical importance. We applaud the public discussion on bioethics that has started to emerge in a number of countries, but these efforts need further support.

26. In order to achieve the above goals, greater effort is required to educate all members of society about the scientific and clinical background, and the ethical principles and social and legal problems involved, in the life and medical sciences. This will enable the active collaboration of all individual members of society, many academic disciplines, and the international community.

27. Education of bioethics is to empower people to face ethical dilemmas. Ethical challenges come to everyone. The process of debate and discussion is important for developing good minds to face bioethical dilemmas. It also develops tolerance and respect of others. In these troubled international times, it is very important to develop tolerance of others, and to learn that everyone as a human being is the same regardless of race, sex or religion. Same in this sense means equally diverse, it does not mean identical.

28. The process of debate and discussion in classrooms is particularly valuable and we urge all persons, organizations, institutions and countries to take appropriate measures to promote the principles set out in the Declaration, through promotion of education in bioethics."

12.7. Conclusion

How do we form a loving and mature society full of well informed and balanced persons? Bioethically mature means a person, or a society that can balance the benefits and risks of alternative options, and make well-considered decisions, talk about it, and love! Every person has a lifelong responsibility to develop his or her own bioethical maturity and values.

Our Oneness with Nature is the True Love that is a foundation of Environmental Conservation and Action together. Bioethics truly is the bridge to the future (Potter, 1971), the foundation of human responsibility to plants and animals (Jahr, 1927),

[78] http://www.eubios.info/eeidec.htm

and is the result of our love of life (Macer, 1998). As we shift from awareness of the environmental issues, we will have a greateer appreciation for biophilia and a greater sense of our duties of stewardship of this planet, and ourselves.

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13. Culling, Relational Decision Making, and Capabilities: A Perspective from India

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13.1. Abstract

Culling of animals has been globally considered as a legitimate and cost-effective public health intervention to prevent zoonotic diseases. This practice has been widely used against poultry in bird flu outbreaks, against sheep and cattle in foot and mouth disease outbreaks, and was applied to cull the entire mink population in Denmark in 2020 when infections with SARS-CoV-2 were confirmed. This paper discusses several ethical arguments against this practice including animal rights, the One Heath approach and bioethics as the love of life. This paper includes data from field research, as well as religious and cultural factors. Focusing on India, the paper argues for the inclusion of elements from social justice theory that can actually help to address the 'fairness' issues in the ethical decision making of culling practices in the country. A capability approach-based decision-making process to maintain just and fair processes of culling in India involving farmers, governmental agencies, animal welfare personnel and other actors is suggested. The applicability of various approaches to practices that have more social resistance such as the culling of pets including domestic cats and dogs, will also be examined, in the context of potential policy reform that may challenge the anthropocentric views that dominate the practice of culling in public and planetary health.

Keywords: *Bioethics, culling, animal rights*

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13.2. Introduction

Biologically culling is defined as the process of segregating organisms from a group according to desired or undesired characteristics. It is also used as a term to describe indiscriminate killing within one particular species which can be due to a range of reasons, for example, disease prevention. Globally, culling is considered as a legitimate and cost-effective public health intervention to prevent zoonotic diseases such as AH1N1 "Swine Flu", AH5N1 "Bird Flu", and to reduce the number of vermin. For example, the European Union (EU) Directive sanctions culling of poultry in an Avian influenza outbreak (The Council of the European Communities Council Directive 92/40/EEC, 1992 Art. 5). The World Health Organization (WHO) has often implemented a 3km rule in response to outbreaks of Avian influenza in poultry.

In June 2019, millions of pigs were culled in China and Vietnam as the UN Food and Agricultural Organization (FAO) urged Asian governments to make containing virulent African swine fever their top priority.[80] However, suspecting ethical justification and effectiveness of culling practices as a public health measure, some researchers (Lederman 2016) urged all involved to support alternative practices and strategies founded on the concept of One Health (OH) all over the globe. The novel paradigm of One Health has certain benefits of adding non-anthropocentric elements over traditional culling practices, opening up research opportunities across disciplines, and integrating a reasonable ethical framework for evidenced based approach. But culling continued to be the main public health strategy to prevent the zoonotic diseases and population control of species.

There are a diversity of views on the use of animals within each society, as indicated by adherence to vegetarianism, or approval with animal experimentation. Analysis of a survey question on animal research "Scientists should be allowed to do research that causes pain and injury to animals like dogs and chimpanzees if it produces new information about human health problems" in fifteen countries found a range of agreement, with women being less supportive (Pifer et al., 1994). Persons in Japan and the USA show less disagreement than most European countries. That analysis also found some association between interest in environmental issues and rejection of animal research, but not with scientific knowledge. Overall it suggested that persons in less industrialized countries may have a tendency to be more

[80] (https://www.aljazeera.com/ajimpact/millions-pigs-culled-swine-fever-spreads-asia-190621083556329.html

pragmatic about animal research because they have more contact with farm animals compared to developed countries where people are mainly in contact with pets as companions. Females are also reported to be more empathic and knowledge about animals than males (Kellert & Berry, 1987). Hills (1993) reported from a survey of members of animal rights groups, urban public and farmers in Western Australia that there were significant trends between these three groups with empathy (farmers least), viewing animals as an object or instrument (farmers most), and underlying world views on the place of non-human animals compared to humans.

Relationships that we observe between people and animals around us depend upon the circumstances, so we should consider the situation and type of animals. The same place can be viewed in different ways by different people (Macer and Yokoyama, 1998). For example, the public view a farm as nice place to grow animals, or as scenery, or the production of wheat or meat. A farmer sees animals as property, money, or as companion for life together in the farmland image of nature, or as production of a certain quality or quantity of steak or wool, etc. Farmer's children may see some animals as pet. A farmer themselves, may think of a pet dog as a pet, but sheep dogs or working animals as either work companions or instruments. There may be pet chickens to lay eggs, or turkeys for celebrating visits of guests or special occasions.

There are numerous values that people can have relating to different animals, and other species (Bosworth et al., 2012). Kellert and Berry (1987) suggested people can hold both instrumental-ethical distinctions as well as empathy or love to animals. Results of a survey looking at the types of attitudes that people in Japan, Germany and the USA have towards animals suggest differences in the types of relationship (Kellert, 1991; 1993). His surveys were based over a ten year time period, and found that the most common feeling towards wildlife was appreciation, and affection for particular wildlife species. Hills (1993) suggested there are three motivational bases for attitudes to animals, instrumentality, empathy/identification, and values and beliefs. Broida et al (1993) found intuitive and feeling personality types were more likely to oppose animal experimentation than sensate and thinking types.

In a biocentric viewpoint we may see animals as fellow survivors of life, given the grace to live with us on this planet (Macer, 1998). We are still left with the personal and social question, how much interaction should we have with them?

Should we leave them alone unless we need to farm them. We may eat meat, or kill them if we think it is better for us, only for eating. We may dislike hunting, but appreciate food killed "humanely" in shops. Should we adopt animals as companions is another interaction that the euthanasia of stray cats and dogs raises. In 1997 the fate of 1500 retired chimpanzees was decided (National Research Council 1997). The fact that they were not euthanised is another sign that the relationship to animals, some at least, includes the duty to care for them. Those with a purely anthropocentric view of life will argue that it makes humans kinder to each other, or provides psychological relief, however the media and the scientific discussion suggests that biocentric views are being used as a standpoint towards many issues.

The rationales behind culling are to prevent and protect life and livelihood of common people, farmers, communities and other beneficiaries. Such interventions, presumably, follow the International Health Regulations. However, the decision-making process has always been vague and not been open and transparent and an ethical framework is found to be a missing element in the decision-making process of culling practices. Therefore, this paper investigates how inclusion of elements from social justice theory can actually help to address the 'fairness' issues in the ethical decision making of culling practices in India, and beyond.

13.3. Culling in Indian Context

In India, culling of animals are performed to prevent the zoonoses (AH1N1, AH5N1, etc.) and also to reduce the number of vermin. The rationale behind these culling is to prevent and protect life and livelihood. Common people, farmers, communities are considered as the beneficiaries of these culling practices. The subcontinent adopts such interventions following the International Health Regulations.

For an instance, in January 2008, a sudden outbreak of H5N1 resulted in death of more than 10,000 birds in Margram, Birbhum, and West Bengal. The State Governments ordered complete culling within a 5 km radius in 13 out of 19 districts within three weeks got affected. The total poultry losses, including culling was more than 4 million birds, the majority belonging to poor rural households. Total birds culled due to bird flu (2006 - Dec 2018) were estimated to be 8.3495 million. The culling of birds led to loss of income/livelihood, socioeconomic losses, reduction in health, education, and clothing expenditure, Panic, Migration, Affected self-

confidence, autonomy, and loss of status of women in the family, Compensation was insufficient to reinvest in the business again (Ahuja et al., 2009). However, without any such deep reflection of relevance and significance, culling has continued to be implemented to prevent animal-vector borne diseases in the country without much inclusiveness and engagement at the ground level.

The paper tries to investigate how culling as a public health measure does affect the backyard poultry farmers, especially when backyard poultry farming has been adopted at the country level as the means of empowerment and socioeconomic development, however, the culling decision making process has not been that inclusive.

13.4. Culling decision-making during Bird (Avian) Flu in India

According to 2011-2012 data, women in the labor force comprise 25% of all rural workers (Catalyst, 2015. *Quick Take: Women in the Labour Force in India*. New York: Catalyst). Many of these people have been under the Below Poverty Line (BPL) category and are involved with backyard poultry rearing through central government funded programs. Backyard poultry farming has been supported as the means of the empowerment for these women in order to meet the domestic and socioeconomic need, household nutrition, food security, and Income security. However, when culling is implemented as a public health preventive measure, the concept of empowerment and socioeconomic development is found to be undermined.

Consequences for the culling operation triggered hiding laying hens, smuggling birds out of the culling zone, ban on trade and movement of all poultry related products, 'distress sales', 'forced home consumption', reduction in education expenditure, loss of negotiation, decision making power within household, migration in search of alternative livelihood (Ahuja et al. 2008). Although culling has been taken as a governmental strategy, however, there has been no governmental strategies adopted for the decision making with the stakeholders involved. Rather, the decision-making process of culling as intervention has always been vague and not been explicit, open, and transparent. On the contrary, government initiatives are implemented for information, education and communication for zoonotic diseases and culling as the measure to have better biosecurity(DGHS, 2005). Focusing on the culling practices in the event of Zoonotic disease such as A H1N1, A H5N1, the

present study investigates how inclusion of elements from social justice theory can actually help to address the 'fairness' issues in the ethical decision making of culling practices in India.

At present, in India, the decision-making model of culling process is utilitarian, mainly, involving governmental agencies. To have a ground level perspective, this study consulted 21 (2= Female; 19= Male) backyard poultry farmers in Purba Medinipur District, West Bengal, an eastern state of India during March- June 2019. Questions were asked about the farm size; impact of bird flu; notion of culling they possess; impact of culling; communication and Information about culling; stakeholder consultation for culling process and implementation (Refer to the Appendix).

The interview resulted in the farmers being in the business minimum of 3 years and maximum of 20 years with the farm capacity ranging from 200-100,000 birds. The farmers have been affected by bird flu in 2015, 2016, and 2017, respectively. In terms of loss, the farmers suffered death of birds, financial loss, and surprisingly mentioned about the environment pollution as the loss.

When asked about the culling decision and process, the knowledge of the reason of the culling process, 4 farmers mentioned that the reason was known to them and 17 mentioned the reason of culling practice was unknown to them.
When asked if they have been the part of consultation of culling process and practice, 4 responded negatively and 17 mentioned positively.

For the knowledge of the total procedure, 2 mentioned positively as they acquired the knowledge of process and 19 mentioned that they did not have the knowledge of the total procedure.

When asked about the consequences of culling practices being informed, respondents replied mainly about health and economic loss but less than half were aware of compensation and recovery of business. None of them mentioned other losses, however, some respondents suggested another active participatory method, vaccination, as the alternative method to culling.

The implications of the findings are that there have been no clear and transparent process of culling explicitly undertaken in practice; Stakeholder consultation seems to be very vague; Decision is utilitarian, thinking about whole population; Decision is undertaken without clear rules and regulations about

compensation, undermining impact on capabilities ; Decision undertaken is not comprehensive, no due consideration to integral/ whole loss of the farmer, no concern of the capabilities to cope ; Decision is non-inclusive, not "just and fair" to secure the individual and collective capabilities even after the outbreak. Hence, the question arises about this public health prevention measure, is culling a necessity?

13.5. What Follows?

Following the perceptions from the ground level, it implies that with respect to culling in India, the capabilities of the farmers are subject to deprivation of economic empowerment; right to exercise choices; right to education, life opportunities; opportunities to think with practical reason; Freedom to decide for the outbreaks are reported in the following manner.

13.6. Decision making on Culling in India

The Indian Pandemic Influenza plan is divided as per WHO prescribed phases: Inter pandemic, Pandemic, and Post Pandemic situations. The components are sectioned components as per the situation (India affected, not affected), Objectives, Actions, and Lead Agency. The plan mentions poultry farmers as a potentially vulnerable group (DGHS 2005) who need targeted interventions. However, there is no reference to the groups who are traditionally disadvantaged due to prevalent social and economic conditions. There is also no further specification of women poultry farmers and the language exhibits no sign of inclusion, or representations though financial compensation is a consideration in the plan.

Moreover, the decision of culling is executed by district administration or State Government with help of veterinary team and report of incidence. The process follows international regulations, prepares and implements Surveillance Plan (2013), Action Plan (2009/10, 2015), trains Veterinary personnel, community workers, makes sure of sensitisation of general public through Information Education and Communication (IEC), focusing on agreed amount of compensation(Action Plan 2015), and issues advisories to farmers on disease control, surveillance, and importance of biosecurity, and allocating responsibilities to designated agencies (DADF, Annual Report 2018-19). Hence, the whole process follows a Top Down Approach.

13.7. What Actually is Happening?

With respect to culling in India, the capabilities of the farmers are usually subject to deprivation of economic empowerment; right to exercise choices; right to education, life opportunities; opportunities to think with practical reason; Freedom to decide for the outbreaks are reported in the following manner.

13.8. What Needs to be Done in Pandemic Planning (PP)?

Following the discussion and to get the pandemic plan and culling process more inclusive and fair, a clear vision with theoretical foundation of the plan is implied. It also requires:

(a) **Risk Estimation and Assessment with** Acknowledgement, Identification, Affiliation of farmers across the socioeconomic class.

(b) **Modification of Surveillance strategies for** identification, Inclusion, Control over environment including the views of the farmers.

(c) **Prioritization beyond Financial Needs such** Physical & Mental health, Life choices of the farmers

Contrary to the existing approach, this paper suggests decision-making process to maintain just and fair process of culling in India involving farmers, governmental agencies, animal welfare personnel etc. It suggests for a mutual agreement on the necessity of the public health intervention such as culling. It claims that farmers' participation in the decision-making process would not only make the process just and fair but would also empower them at agency level by exercising shared responsibility, shared interactions, and shared values about public health.

13.8. Discussion

The foundation of pandemic planning is bioethical values such as protection of life. But whose life? All sentient beings suffer when killed. Further exploration of the relationships that we have to animals will be important to develop more ethical and represenative policy,

We can see different attitudes between farmers and some other community members, and consumers. However, the growing movements for consumers to prefer free range or cage free poultry begs questions on how the ethics of poultry farming is evolving (Macer, 2019). A generation or two ago, animals were mentioned by less than 10% of respondents to the International Bioethics Survey in Japan in 1993 as part of an image of nature, with only a few more mentioning animals in images of life (Macer, 1994). However, 80% agreed with a statement that animals have rights that people should not violate. Among high school teachers there appears to be less concern about animal rights in Japan than in Australia or New Zealand, however, there are still a similar number of people who show some general concern (Tsuzuki et al. 1998; Macer, 1998). Thus, the idea of relationships may be a more useful word to explore the ways that people view animals than rights.

A fundamental question for the relationship is a feeling of dislike or like. In response to interviews with farmers, the public and pet owners in Japan (Kudo and Macer, 1999), overall, 50% said they liked the animals, 16% said they disliked and 35% said they do not feel anything. Significantly more people who did not own pets said they disliked animals (34% of non-pet owners, compared to 4% of pet owners and 2% of farmers, and no veterinarian said they disliked animals). It is interesting that many farmers did not say that they liked or disliked the animals, saying they have no feeling, especially all the pig farmers and most cow farmers. Those who felt something to chickens, disliked them. Some of these people were temporary workers, who did not own the animals but moved around farms. Farmers may see animals more in terms of money, and this would be interesting to compare overseas also.

The reasons given in open comments were placed into categories for analysis, and a diverse range of feelings was seen, in addition to the predominant response, which was cute or pretty. The most common reasons for dislike were because they were dirty or smelly (17 persons), noisy (5 persons), foraging in the trash (4 persons) and other reasons like general dislike (16 persons), with 14 choosing each of cats and dogs, and 6 choosing birds.

No matter whether it is India or Japan, people do have a range of relations to animals, both as pets and as food. The culling of animals challenges the general laws on protection of animals, respect and love for life, and the concept of One Health. Over time there is greater legal protection for animals and laws against animal cruelty.

Culling rasies difficult issues of balancing public health and safety and love of life. It will also be interestiung to reaxmine attitudes now given the increased awareness of sacrifices made while living with COVID-19 due to public health, perhaps people will be more supportive of the cuylling of animals due to fear of personal risk from any pandemic. More research is needed, from a planetary health perspective.

13.9. Conclusions and Recommendations

Culling processes impact a vast range of stakeholders. Stakeholders such as backyard poultry farmers depend on such farming to empower them and to uplift their socio-economic conditions. To improve the status, the paper recommends to include the elements of just and fairness in the pandemic planning to reflect in the culling process involving the different stakeholders. Change in the vision and mission of bird flu planning, a change in the language of the pandemic plan, extended stakeholder consultation for culling, pandemic plan, modifications in the IEC materials with broader consultation with backyard poultry farmers in countries like India could be some of the elements that can be thought through for the inclusion of "just and fair" elements in the pandemic planning.

Although this paper has focused on India, culling practices and guidelines exist in eveyr country. Their impacts extend well beyond simply the farming community. During the COVID-19 Pandemic for example, the decision to cull all the farmed minks in Denmark contributed to a change in political representation across the whole country. There are many further implications for planetary health that need to be discussed.

13.10. Acknowledgements

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Appendix A: Questionnaire for Personal Interviews in India

Survey on *A* H5N7 (Bird Flu) Related Culling Procedure and Participation in Decision Making of Culling Operation in West Bengal, India

Dear Sir/Madam,

As part of an independent research on the culling process during Bird Flu (A H5N7) , myself, Dr. Rhyddhi Chakraborty is conducting a survey on the culling procedure, and the participation of the poultry farmers in the decision making process of culling operation. The focus of the research is the culling operation undertaken during any Bird Flu (A H5N7) incidences in different parts of West Bengal. The study aims to explore the extent by which the poultry farmers were/are being affected by culling and had been involved in the culling decision making procedure.

Culling procedure is considered as one of the major public health procedures to prevent highly communicable diseases such as Bird Flu (A H5N7). However, with the loss of birds culled during the procedure, culling operation also impacts the well-being of the farmers, whose sole aim is to be empowered (in skills, resources, opportunity(economic), authority, motivation (social), competence, and satisfaction (mental)) through the poultry business. This study, therefore, is undertaken, to cross check with ground reality how the farmers have been affected during culling procedure and how they have been involved in the decision making procedure of the culling operation.

The survey with the open ended semi-structured questionnaire will be conducted taking your consent and will take a couple of minutes from your time. All information will be kept confidential, anonymous, and used solely for research purpose. The final outcome will be presented in the September 2019 Annual Conference of Human Development and Capability Association in London, United Kingdom and will be published in academic journal. Audio recordings will be kept, transcribed, and destroyed securely no longer than three years and/or until the publication of the outcome. Participants can withdraw their data at any point of time through telephonic or email request. All participants will also be rewarded for their

time. Therefore, your honest and accurate expression of opinion is highly expected and appreciated.

Kindly help by filling this questionnaire.

Yours faithfully

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UK Contact Number

A 1 Background Information (will be kept as anonymous)

A1.1 Name:

A1.2 Gender: Male/ Female (Tick One)

A1.3 Occupation:

Backyard Poultry Farming with government support/ Private poultry farmer:

A1.4 Location: Rural/ Urban/ Semi Urban:

A1.5: Communication Details:

A 2 Questions

A 2.1 (a). How long you have been in the poultry Business?

A 2.1 (b) Did you receive any government fund to start the business?

A2.2. What is the capacity of your farm?

A 2.3. Please mention whether you have ever been affected by the Bird Flu? If yes, when (which year) and how?

A2.4 (a). If yes, had you suffered any loss of poultry birds during the Bird Flu?

A 2.4 (b).If yes, what kind of loss you had suffered?

A2.5 (a). Please mention how have you been contacted and communicated for the culling procedure to prevent Bird Flu?
For example:

1. have you been notified by the Panchayat? /
2. have you been notified by the local Veterinary Surgeon?
3. have you been sent a letter from the government public health officials? Or
4. have you been called to a meeting/group discussion to decide on the culling process?

A 2.5 (b1) Did you know why culling was taking place during Bird Flu?

A 2.5 (c) Have you heard the term culling before you experienced it, if you have?/ Did you know about culling before you faced it?

A 2.5 (d) Have you given enough information about culling process operation in your farm? And How you were given the information?

- For example,
- Who will do it?
- How it will be done?
- What you have to do to help in culling?
- What restrictions you would have after culling operation?

A 2.5 (e) Were you discussed about the followings before the culling operation?
(1) health consequences:
(2) economic and social loss:
(3) recovery of business:
(4) compensation:

A 2.5 (f) Did you agree to culling operation giving full consent? If yes, why did you agree to the operation? If not, why not?

A 2.5 (g) What did you think when agreeing to culling operation?

A 2.5 (h) Did you think about your loss when agreeing to culling operation?

A2.6. As a poultry farmer, what problems you have faced during the culling operation?

A 2.7. Please state how the problem had been addressed, and what are your recommendations for future culling operations .

A 2.8. Please mention whether you have been compensated for your loss due to culling operation?

A 2.9. Please mention whether there had been any check on your socioeconomic background before the compensation paid?

A 2.10. Please mention whether your health has been checked after the culling process

A 2.11. Please specify the help that you received from the government to recover your business, if you have restarted your business? If not, what occupation you have chosen after the loss of birds in the culling operation?

A 2.12. If you have any further comments to make, please feel free to communicate

Thank you very much for your time and kind co-operation.

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14. Development of Bioethics and Biosafety Programme for professionals in life sciences

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14.1. Abstract

An outbreak of COVID-19 in late 2020 highlighted the risks associated with a highly virulent and fatal disease, whether naturally or deliberately. This meant a responsibility to ensure the safe conduct of research by all those involved in the biological sciences, especially scientists, specialists in biomedical sciences. It is everyone's responsibility to demonstrate biosafety awareness. The need for increased knowledge and awareness of biosafety among biological scientists has been widely recognized.

Biological sciences have experienced enormous growth over the last 30 years, as biotechnology has become a global enterprise; they offer tremendous promise for meeting many 21st century challenges. Under these circumstances, it is essential to modernize education in life sciences and biotechnologies. Scientists in life sciences and professionals of public health must acquire a sense of responsible science at the very beginning of their professional education.

In developing countries, the level of biosafety and biosecurity education needs to be improved, new disciplines must be introduced in the curricula of high schools and universities, giving the students' knowledge on codes of conduct for life scientists, dual-use concerns, and biorisks. This goal can be reached by cooperation among universities and lecturers through the information exchange on international standards and good laboratory practices, improving biosafety of society and

pp. 288 - 299 in *Planetary Health,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

environment, fostering the social and civic role of scientists in the community, with particular attention to the "next generation of scientists".

Under the International Science and Technology Center (ISTC) and with the financial support of the EU, we are implementing a 2-years project named “Raising awareness and responsibility of scientists in the life sciences” to address biosecurity and biosafety education in Tajikistan. This project is getting its first results, expanding its scope to nine universities across the country where these crucial topics will be taught.

Keywords: *Bioethics, biosafety, responsible science, code of conduct*

14.2. Introduction

Advances in biotechnology over the past decades have brought and will continue to bring significant benefits to humanity, animals and plants, but these advances also carry risks that need to be aware of and not be allowed to do harm. Many scientists wondered what biosafety is and how it can be incorporated into the biological sciences. What steps need to be taken to ensure this and other dual-use research is not misused?

It is increasingly recognized that biosecurity and biosafety refer not only to work carried out in the laboratory but also to what those activities outside the laboratory will affect if they could lead to accidental outbreaks of disease in humans, animals or plants. The life sciences are inherently inextricably linked to concerns about their dual-use. Dual-use dilemmas arise when the same scientific work can be used for peaceful or hostile purposes.

The scientific community generates knowledge and educates students. Therefore, working with the scientific community and raising awareness within the community is critical to properly implementing any oversight system for them. Raising awareness of the potential for misuse and the responsibility of scientists to address the challenges of dual-use materials, knowledge and technologies as an integral part of formal education is an essential first step in this process.

This responsibility includes critically examining ethical dilemmas and engaging in public dialogue as crucial strategies. All scientists—especially those working in the life sciences—are called to cultivate a culture of responsibility regarding the

execution and the achievements of their research. An organizational culture's foundational values that emphasize responsible conduct are research excellence, bioethics, biosafety and biosecurity.

The difficult epidemiological situation in 2020, associated with the emergence and spread of COVID-19 in the world and Tajikistan, in particular, showed that the country has an acute problem because of the shortage of life sciences experts. Therefore, the leader of the nation, the President of the Republic of Tajikistan, respected Emomali Rahmon, in his message to the country's Parliament, "On the main directions of the domestic and foreign policy of the Republic of Tajikistan" dated January 26, 2021, set specific tasks: to establish mandatory courses in biosafety, biosecurity and bioethics based on the Tajikistan National Academy of Sciences to obtain a master's degree and a doctor of natural sciences.

Also, in the speech of the President of the Republic of Tajikistan at a meeting with health workers on August 18, 2020, some noted that “the provision of highly qualified personnel to medical institutions is one of the main problems of health care, since their role is always decisive in difficult social situations to prevent disease and save lives”.

Life sciences are inherently inextricably linked to concerns about their dual-use. Working with the scientific community and raising awareness is critical to the proper implementation of any technology oversight. In the international and expert community, concepts such as bioethics and biosafety are combined, and it is necessary to raise awareness of the possibility of misuse and responsibility of scientists for solving problems related to materials, knowledge and technologies of dual-use. These issues become especially relevant in connection with the possibility of uncontrolled transfer of information and publication of materials using modern means of information transfer.

14.3. The international state-of-the-art in biosafety

The problem of biosafety remains a concern of the international community, which numerous statements at the international level emphasise. Technology, leading science in the past 20 years (e.g. DNA synthesis), has become now routine, and the cost of sales decreased by orders of magnitude. This newly emerging field of

knowledge, such as nanotechnology, synthetic biology, and "reverse" genetics, have opened new horizons for researchers who previously seemed unattainable.

The key here is the problem of dual-use technologies, the solution of which is seen in cooperation and dialogue among all stakeholders: public and private institutions and enterprises of the biotechnology industry. Among the main tools to overcome the problem of dual-use technologies are the use of approved international community guidelines, intelligence interaction of different countries, and active countermeasures: the creation of national systems for pathogen detection, diagnosis, and decision support bioterrorist threats occur.

Dual-use technologies mean that the technology and scientific and technical information used for civilian purposes may also be used to produce weapons and military equipment, including weapons of mass destruction (chemical, biological, nuclear). For example, modern research in biology goes accompanied by revolutionary developments used in medicine and pharmaceutical manufacturing. Simultaneously the results of these studies, and in other areas, can be used for terrorists.

In 2004, the Research Council of the United States (USA's National Research Council) published an extensive report entitled "Biotechnology Research in the Age of Terrorism", also known as the Fink Report. Among the mechanisms regulating the availability of information in it, it is relevant to mention:

- raise awareness of the scientific community about dual-use technologies from the perspective of biosafety and combat bioterrorism;
- empowerment of institutional biosafety committees to restrict the publication of controversial issues in terms of dual-use results;
- increasing the role of self-censorship of the scientific community (as a counterweight to state censorship) to prepare materials to be submitted for publication; and
- creation of a new advisory body to coordinate the actions of the government regarding dual-use technologies.

The nature of threats in biosafety is constantly changing, contributing to the economic, political and technological factors. Therefore, solving this problem needs a multilateral approach based on internationally recognised guidelines and effective national legislation, reflecting the achieved level of science and technology, including

educational programmes for biosafety and biosecurity for students of natural faculties, veterinarians, and physicians, etc.

There is a convergence of safety, bioethics and practice in the life sciences, and promoting a culture of responsibility in the life sciences to address emerging biosecurity concerns. Here biosafety is understood not only as laboratory biosafety, but also as the goal of several policies, mechanisms, regulations and initiatives to ensure that life sciences continue to benefit and are not deliberately misused. It is imperative that life scientists engage with the safety community and promote a robust ethical framework besides legal and regulatory measures under development. Such participation has been limited, not least due to the predominantly low level of scientific awareness of the discussions on dual-use, bioterrorism and emerging threats. In 2008, at the Biological and Toxin Weapons Convention (BTWC) States Parties Meeting formally noted “the value of education and awareness programmes that encompass the moral and ethical obligations imposed on those using the biological sciences”.

14.4. The ISTC project on Raising awareness among life scientists

The openness of any state regarding its priorities in international security is the most important means of building confidence, increasing predictability in interstate affairs, and promoting multilateral solutions to problematic issues. The Concept of National Security of Tajikistan is a fundamental document that enshrines such priorities. In addition, the proliferation of nuclear, chemical, and biological weapons is an important factor determining the nature of threats to Tajikistan's national security, given its geographic location in Central Asia.

In Tajikistan, the ISTC project "Raising the awareness of scientists in the life sciences" is being carried out with the financial support of the EU. Within this framework, a training seminar took place on March 29-31, 2021, for specialists in life sciences and the country's universities.

The project aims to introduce elements of dual-use science into formal education in the natural sciences and engineering in Tajikistan. Also, to instill awareness of the potential abuse of life sciences in the next generation of Tajik scientists and the generation of researchers by integrating CBRN dual-use training into national curricula.

The seminar was focused on raising awareness of the possibility of misuse in the life sciences and the responsibility of scientists for working with materials, knowledge and technologies of dual-use. At the end of the seminar, a Resolution was adopted, which noted the successful holding of the seminar that meets the current level of knowledge in life sciences. Furthermore, it was decided to create a working group to develop and disseminate an educational programme (textbook, syllabus, educational methodological and scientific recommendations) on bioethics and biosafety for further implementation in the educational processes of the country's universities.

Bioethics and biosafety are poorly covered in universities and rarely discussed at conferences, so developing an educational programme on this topic can significantly affect practice and discourse.

To achieve the goal and objectives of the project, it was necessary:

- to conduct a seminar with key national experts to perform comprehensive consultations on the feasibility and necessity of developing a dual-use educational programme in the life sciences and the content of the educational programme, and on how best to integrate this message into the National Programme;

- based on the conclusions of the seminar, draw up policy recommendations for decision-makers;

- to conduct a briefing for key decision-makers and stakeholders from the Ministry of Education and Science of Tajikistan, the National Academy of Sciences of Tajikistan and the Bioethics Council;

- to develop training materials based under the guidance of the participants in the expert workshop and considering the results of the briefing for decision-makers;

- to introduce courses developed based on educational materials in the universities of Tajikistan; and

- to present the results and initiative in international magazines, national media and at international conferences, increasing the visibility of this initiative.

The participants of the seminar, having heard and discussed the reports and presentations of experts, recognizing the relevance and significance of the issues discussed in terms of increasing the level of education and awareness of dual-use sciences, considering the recommendations of expert groups in areas, emphasizing the need to comply with international norms (instruments) and national legislative

acts of the Republic of Tajikistan and other regulatory documents and principles of bioethics, approved a **Resolution**:

- To recognize the seminar's work as successful and meet the current level of knowledge in this area for teachers and specialists of universities of the Republic of Tajikistan (Tajik Agrarian University, Tajik State Medical University, Tajik State Pedagogical University) working in life sciences.
- To create a working group to develop and release an educational programme (textbook, syllabus, educational methodological and scientific recommendations) on bioethics and biosafety in three languages - Tajik, Russian and English with the calculation - **1 credit (24 hours).**
- To accept as a basis the draft Code of Conduct for Scientists dealing with Dual-Purpose Sciences and, considering the additions, submit it for approval to the appropriate State body.
- To consider the possibility of organizing an international exchange of experience in life sciences to improve the qualifications of specialists assisted by donors.
- To take measures to introduce a course on bioethics and biosafety in similar and specialized universities of the Republic of Tajikistan.
- In the universities of Tajikistan, determine and appoint a responsible person for implementing the course on bioethics and biosafety and its supervision.
- To prepare an appeal to the Central state authorities and departments of the Republic of Tajikistan on the results of work toward improving state policy (regulatory and legal support, standardization, certification, licensing, advanced training) on dual-use sciences, bioethics and biosafety in the light of the decisions taken by the Government of the Republic Tajikistan.
- To consider the possibility of organizing and conducting a final seminar and a round table on the results of implementing the course on bioethics and biosafety within the framework of the current project.

14.5. The Handbook

The book has been reviewed by specialists from scientific and methodological Councils of Universities in Tajikistan, where the course will be implemented, and

recommended for publication. Translations of texts, technical editing, corrections of the text were carried out, and changes were made according to reviews and reviews.

The textbook "Basics of Bioethics and Biosafety" has been finished and printed. According to the seminar results and the discussion among experts, it was decided to develop a textbook consisting of an Introduction, eight chapters, appendixes.
The textbook is:

"BASICS OF BIOETHICS AND BIOSAFETY"

Authors: Nasyrova F.Yu., Jalilov A.U., Rahmatov A.S.

CONTENT

	Introduction (Nasyrova F.Yu.)
Chapter 1.	Policy and strategy in the field of biosafety and bioethics (Rahmatov A.S.)
	1.1. National biosafety policy
	1.2. A set of measures aimed at neutralising biological threats
	1.3. International biosafety policy
Chapter 2.	"Bioethics" as an independent area of knowledge (Nasyrova F.Yu.)
	2.1. Preconditions for the emergence of bioethics
	2.2. The emergence of bioethics
	2.3. Principles and rules of ethical issues of modern human genetics
Chapter 3.	Genetic Engineering. Applications of genetic engineering in medicine and agriculture (Nasyrova F.Yu.)
	3.1. Traditional breeding
	3.2. Genetic engineering
	3.3. The importance of genetic engineering for medicine
Chapter 4.	Dual-use and prevention network (Nasyrova F.Yu.)
	4.1. Dual-use
	4.2. Prevention network concept
	4.3. Special role of scientists
	4.4. Education and involvement of scientists
	4.5. Dual-use technologies
Chapter 5.	Ethical dilemmas in scientific practice (Nasyrova F.Yu.)
	5.1. Uncertainty and risk in science
	5.2. Freedom of scientific research is the most valuable conquest of civilization
	5.3. Real threats

5.4. Ethical dilemmas in the scientific community

5.5. Code of Ethics in Life Sciences

Chapter 6. The role of scientists and codes of conduct in dual-use sciences (Jalilov A.U.)

6.1. Bioethics as a practical discipline

6.2. Ethical issues in biosafety and biosecurity

6.3. Code of Conduct for Scientists in the Life Sciences

6.4. What is a Code of Conduct?

Chapter 7. Biosecurity of genetic engineering activities (Nasyrova F.Yu.)

7.1. GMOs and food safety issues

7.2. Bioterrorism and agroterrorism - a real threat to the security of society

7.3. Features of agroterrorism

Chapter 8. Ethics of scientific research (Nasyrova F.Yu.)

8.1. Relationship, interaction and mutual responsibility of science and society

8.2. Modern challenges and risks: artificial intelligence

8.3. Technology concepts: responsibilities

Appendixes:

Appendix 2. Danish model of biosafety (Nasyrova F.Yu.)

Appendix 3. Code of Conduct for Scientists in Life Sciences Jalilov A.U.)

Appendix 4. Terminology (Nasyrova F.Yu.)

Appendix 5. List of Internet resources (Jalilov A.U., Rahmatov A.S.)

Appendix 6. Tests and exercises

Life scientists for peaceful research

Literature and list of regulations

14.6. Conclusions

The textbook "Basics of Bioethics and Biosafety" has been published and distributed among the seven pilot universities and two other educational organizations.

With the beginning of the educational period in the pilot universities, measures were taken to implement the programme and course in the educational process. The results achieved so far are the introduction of the course "Basics of Bioethics and Biosafety" in the educational process of these universities and institutes:

- Tajik State Pedagogical University,

- Tajik State Medical University,
- Tajik Agrarian University,
- In the Department of Master's and Postgraduate Studies of the Tajikistan National Academy of Science,
- Pamir Biological Institute of the TNAS (Khorog),
- Tajik National University,
- Technological University of Tajikistan,
- Dangara State University,
- State educational institution "Khujand State University named after academician B. Gafurov".

In all these educational institutions, syllabuses (Curriculum) of the course for undergraduates and postgraduates have been prepared, agreed with the Educational and Methodological Councils and approved. The contents were introduced into the autumn and spring sessions curriculum, agreed with the Ministry of Education and Science of the Republic of Tajikistan.

The professors who will deliver the lectures were identified among the participants who successfully completed training and received a certificate of the seminar organized by the EU, ISTC, TNAS and PO "TABioS" on March 29-30 and November, 18-20, 2021 for each course.

On certain specific topics, the teaching process includes specialists and scientists from TNAS and international experts from of the ISTC project team.

An appeal to several relevant ministries was made to improve the state policy in education and training (regulatory support, standardization, certification, licensing, advanced training) in dual-use sciences, bioethics and biosafety in the light of decisions made by the Government of the Republic of Tajikistan. This proposal was addressed to the Ministry of Education and Science of the Republic of Tajikistan, the Ministry of Industry and New Technologies of the Republic of Tajikistan, the Ministry of Health and Social Protection of the Population of the Republic of Tajikistan, the Ministry of Agriculture of the Republic of Tajikistan, and was based on the early results of this project and the courses implemented.

The call includes asking the departments mentioned above to find the possibility of having the discipline "Bioethics and biosafety" in universities'

educational programmes at three levels of education, depending on the specifics of specialties (bachelor's, master's and PhD programmes in specialties).

Educating scientists on biosafety dual-use is a key component in achieving the project goal and improving the country's safety and security. An ongoing fruitful dialogue is needed in which security experts and scientists discuss the potential threats posed by scientific research and how they can be mitigated, both through responsible research by scientists and through implementing prudent measures by security experts.

Bioethics and biosafety courses at the university level are important elements in the education of academics. However, the theories and principles taught in such courses do not automatically translate into ethical practice, and many seem considered professionally "inconvenient". In addition, conflicts between academic problem-solving methods and day-to-day routines in hospitals and research institutions appear to be sources of ethical problems. Dual-use bioethics programmes should be updated annually to reflect the latest policy and scientific advances.

14.7. Ethics

Ethics. Approval and consent for this work was given by Bioethics Council TNAS.

Competing interests

The authors declare no competing interests.

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Bradford, BD7 1DP,
West Yorkshire, UK.

15. Environmental Pollution and Planetary Health

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Human activity and population density have wrecked the planet and the health of many forms of life. How human activity has destroyed some ecosystems and biodiversity is illustrated by the improvements shown in two examples: one is the Capital of India, New Delhi after lockdown due to the pandemic COVID 19 and the other one is the Chernobyl Exclusion zone.

For example, pollution in many forms has destroyed environments and been deleterious to planetary health. When we say pollution it means the contamination of the earth's environment with particles or materials that interfere with human health, quality of life or the natural functioning of the ecosystems. The major forms of pollution include water pollution, air pollution, noise pollution and soil contamination. Other less-recognised forms include thermal pollution and radioactive hazards. It is difficult to hold any one particular form responsible for maximum risk to health; however, air and water pollution appear to be responsible for a large proportion of pollution related health problems. (WHO 2016, 2018, 2020).

Delhi is one of the highly polluted cities of the world with airborne particulate matter (PM) exceeding the normal limits by more than 100 times. It has a population density of 168 million residents with an area of 1483 square km with a density of 11,297 person/square km (Census, 2011; http://census2011.co.in). Delhi was shown to have the highest level of annual population weighted mean $PM_{2·5}$ (particulate matter of diameter values greater than 125 $\mu g/m^3$. Delhi's toxic air is choked with smoke, partly from farm fires in neighboring states, industrial and vehicular pollution, and road dust. This toxicity shoots up every winter due to several factors, including lower wind speeds, festival fireworks and crop residue burning by farmers in neighboring states. .A recent study showed that India's toxic air—particulate matter and household air pollution—claimed 1·24

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million lives in 2017. That is 12·5% of the deaths recorded that year in India.

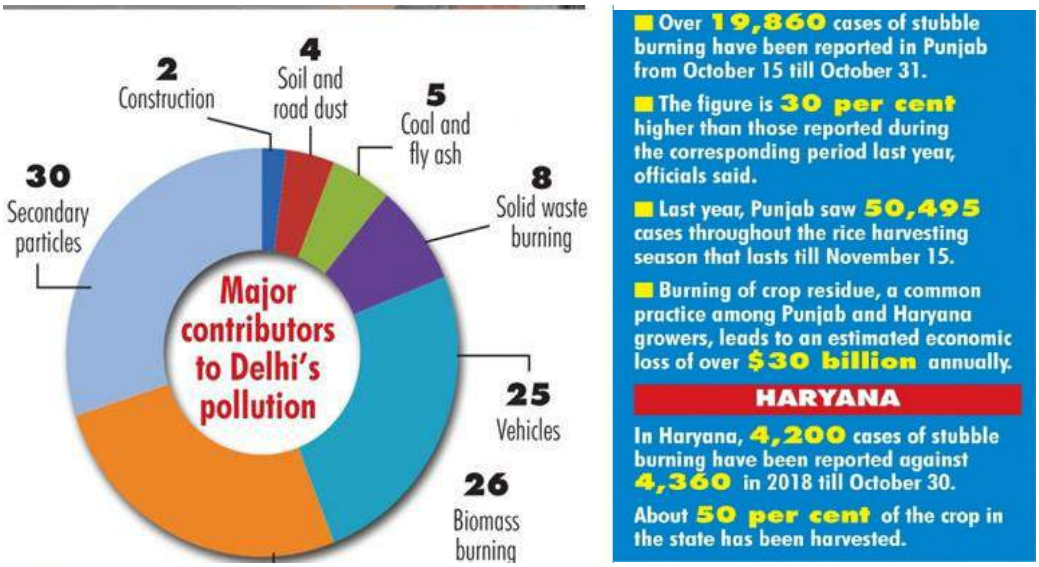

Figure 15.1: Possible sources and effect of Air Pollution in Delhi, India

There are many indices to express the magnitude of air pollution. The air quality index (AQI) is usually based on pollutants criteria, where the deliberation of an individual pollutant is transformed into a sole index using appropriate aggregation method (Ott, 1978).

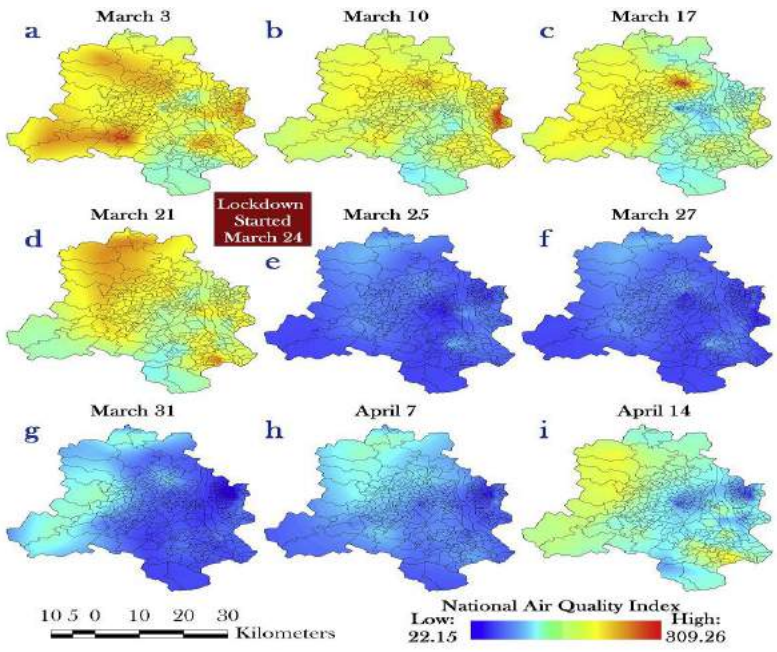

Figure 15. 2: Air quality index before and after lock down in Delhi

In general the lock downs resulted in a drastic improvement of air quality in megacities.

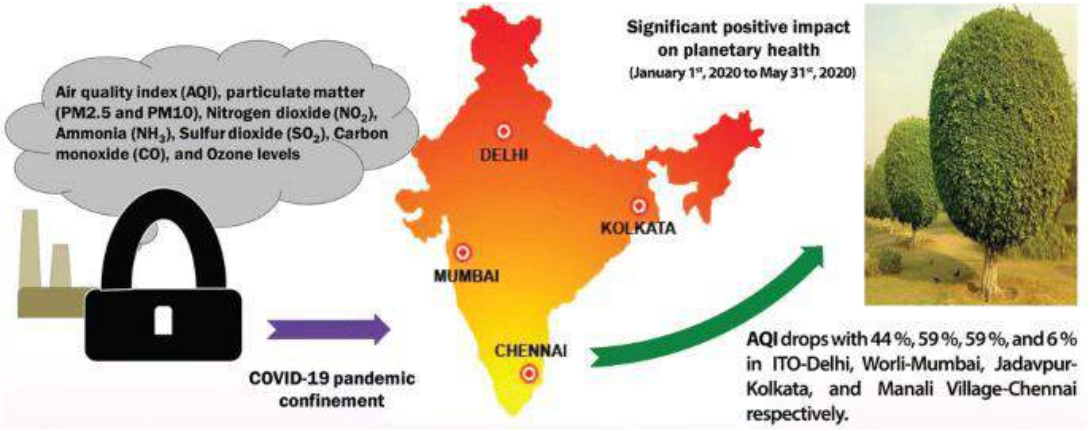

Figure 15.3: Air quality improvement in some of the major megacities of India

Burning of agricultural crop residue to clear the rice fields is one of the major contributors to air pollution. North-western states of India nearer Delhi cause the major air pollution by stubble burning in Delhi indicated 20 times beyond the world Health organization's threshold for safe air. It is associated with a three fold increase in acute respiratory infection and this is particularly so in children.

Egypt and India are among the countries with the most annual deaths from outdoor particulate matter pollution, with 111 and 69 deaths per 100,000 population respectively, according to the Institute for Health Metrics and Evaluation and Our World in Data, while Finland and Sweden have the lowest rates at 8 per 100,000. (WHO,2018). The improvement shown by lock down (as reduced human activity) has helped to improve air quality as well as the environment as shown by the study related to the megacity Delhi, Capital of India.

The other example is Chernobyl exclusion zone, area now in Ukraine and Belarus, which now is inhabited by brown bears, bison, wolves, lynx, Przewalski horses, and more than 200 bird species, among other animals. The Chernobyl disaster was caused by a nuclear accident on 26 April 1986, near the city of Pripyat in the north of the Ukrainian SSR. The following announcement made started the evacuation of the residents in and around the city mentioned below.(Collin

Barras,2016)

"For the attention of the residents of Pripyat! The City Council informs you that due to the accident at Chernobyl Power Station in the city of Pripyat the radioactive conditions in the vicinity are deteriorating. The Communist Party, its officials and the armed forces are taking necessary steps to combat this. Nevertheless, with the view to keep people as safe and healthy as possible, the children being top priority, we need to temporarily evacuate the citizens in the nearest towns of Kiev region. For these reasons, starting from 27 April 1986, 14:00 each apartment block will be able to have a bus at its disposal, supervised by the police and the city officials. It is highly advisable to take your documents, some vital personal belongings and a certain amount of food, just in case, with you. The senior executives of public and industrial facilities of the city has decided on the list of employees needed to stay in Pripyat to maintain these facilities in a good working order. All the houses will be guarded by the police during the evacuation period. Comrades, leaving your residences temporarily please make sure you have turned off the lights, electrical equipment and water and shut the windows. Please keep calm and orderly in the process of this short-term evacuation" (Maples,1988).

Over the past 33 years, Chernobyl has gone from the being considered a potential desert for human life to being an area of high interest for biodiversity conservation.

Figure 15.4: Animals living in the Chernobyl exclusion zone

A few studies related to the Chernobyl exclusion zone showed that at present the area hosts great biodiversity. In addition, they confirmed the general lack of big negative effects of current radiation levels on the animal and plant populations living in Chernobyl. All the studied groups maintain stable and viable populations inside the exclusion zone.

Figure 5.5: Forest and meadows inside Chernobyl Exclusion Zone (Ukraine).

Over the years, Chernobyl has also become an excellent natural laboratory for the study of evolutionary processes in extreme environments, something that could prove valuable given the rapid environmental changes experienced worldwide. Due to the exclusion of human activity around the shuttered power plant, the numbers of some wildlife, from lynx to elk, have increased. In 2015, scientists estimated there were seven times more wolves in the exclusion zone than in nearby comparable reserves, thanks to the absence of humans. It is clear that these potential effects do not, in any case, hinder formation of thriving animal populations. The striking conclusion is that the world's worst nuclear disaster is much less destructive to wildlife populations than normal human activities. The habitat left empty after the nuclear disaster is a boon for wildlife. While evacuation is a very drastic and (for humans) disruptive way of creating space for a wildlife habitat, it is very hard to argue that biodiversity and animal populations in the area are worse off thanks to the Chernobyl disaster.

The following comments by Maria Neira sums the effect of lock down after COVID 19 pandemic on the global environment.

"No matter what, we have to tackle the causes," Neira said in an interview. "During the confinement, in many countries, during that period, it was like a laboratory. Take the example of New Delhi – they were so happy to see a blue sky that for many years they couldn't see. And the levels of air quality were so good that it was something absolutely exceptional for them."

Dr Maria Neira, WHO Director, Public Health, Environmental and Social Determinants of Health.

In general, the planetary health is affected by human activities such as polluting the environment and destroying biodiversity. This teaches us the lesson that the health of the planet is the wealth of human welfare.

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16. Ozone Layer – Saviour of Life on Earth
- September 16th: International Day for Preservation of Ozone layer

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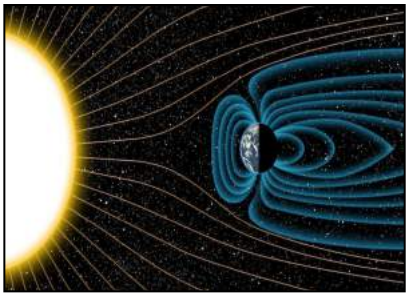
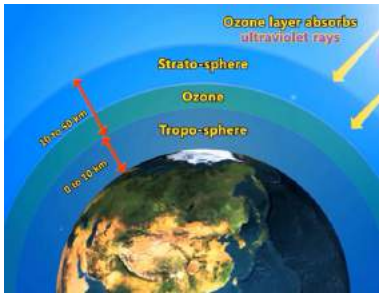
16.1. Introduction

Life on earth evolved from some basic chemicals, in a conducive environment and via specific processes. Some physical properties of the Earth and some very strange phenomena make life continuously tick on earth. The evolutionary history of life on Earth traces the processes by which living and fossil organisms evolved from the earliest emergence of life to the present. Earth was formed about 4.5 billion years ago and evidence suggests that life emerged more than 3.7 billion years ago. The similarities among all known present-day species indicate that they have all diverged through the process of evolution from a common ancestor. Approximately one trillion species currently live on Earth!



Earth's Magnetic Field



Ozone Layer over Earth

Nowadays, the depletion of the ozone layer, which is present at a altitude of about 15 to 35 kilometres in the atmosphere, poses a great threat to all life forms on Earth. Therefore, in a concerted effort to bring about an awareness, 16thSeptember is commemorated as the International Day for the Preservation of Ozone Layer.

pp. 307 - 310 in *Planetary Health,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

16.2. Constant Threat to All Life Forms on Earth

Although our Earth is at an approximate distance of 150 million kilometres from our sun, the constant radiation emitted by the sun and the entire cosmos on a 24 hour by 365 day yearly basis is sufficient to kill all life forms on Earth within a few days. The Earth and its life forms are protected from the danger of this radiation by two components. The Earth's magnetic field protects us from the intense stream of charged particles (alpha and beta). The Ozone layer protects us from the dangerous UV-c and most of the UV-b radiations from our sun (*see images above*).'

16.*3.* The Ozone Layer

Ozone is present in the normal air that all of us breath at our homes and in the open air. Pure ozone is a pale blue poisonous gas. However, its abundance is so low that human senses cannot detect it. It is only about 0.3 parts per million (ppm) in most of our cities, carbon dioxide for comparison is approximately 400 ppm. At a height of 15 to 35 kilometres, the concentration of ozone is about 35 times greater than at normal ground level. Ozone at this concentration, permits the visible light and overlapping harmless UV-a radiation from the Sun to reach the Earth. Ozone absorbs 99.7% of the UV-b radiations and permits only about 1/350 times the incident of UV-b radiation to reach Earth. This provides protection so that we are safe, whilst at the same time we are able to synthesise enough Vitamin D without getting sunburned. Thus the ozone layer completely absorbs the harmful UV radiation from the sun and protects all life forms on Earth.

16.4. How Does the Ozone Layer Work?

The ozone molecule absorbs the UV-c radiation and most of the UV-b radiation from the Sun decomposing into an oxygen molecule and a reactive oxygen radical. These can recombine to form another ozone molecule. Thus, the recycling recurs continuously and, in the process, the ozone layer is sustained around the Earth. This process releases limited heat energy, which is passed on to Earth, which subsequently re-radiates heat back to outer space. The net result is that all life forms on Earth are protected from the dangerous effects of much solar radiation.

16.5. Ozone Hole – Creation and Consequence

The Ozone hole is not really a hole. It is only a reduction in the concentration of ozone in certain regions. Chlorine as a gas and some chlorine compounds are a main culprit of this depletion

Chlorine has many uses. It is used in swimming pools and drinking water to kill bacterial and fungal contaminations. Gaseous chlorine dioxide is used to decontaminate enclosed spaces and equipment. However, these chlorines do not possess a threat to ozone layer since these chlorines are water soluble and do not rise to the stratospheric altitudes.

During the last fifty years researchers found that the chlorinated species that rise to the stratosphere are primarily from manufactured compounds like the chloroflurocarbons (CFCs), carbon tetrachloride, methyl chloroform, and the hydrochlorofluorocarbon (HCFC), which are substitutes for CFCs. These, together with small amounts of hydrochloric acid (HCl) and chloromethane (CH_3Cl), which are partly natural in origin, can all produce radicals that may prevent the reforming of ozone molecules or directly react to destroy them. Researchers have measured nearly all known gases containing chlorine in the stratosphere. They have found that the emissions of the human-produced halocarbons, plus the much smaller contribution from natural sources, could account for all of the stratospheric chlorine. They found that the increase in the total stratospheric chlorine measured, corresponds to the known increases in the concentrations of human-produced halocarbons at any point of time.

16.6. Two Harms in One Stroke

The presence of these manmade compounds and chlorine in the stratosphere are harmful in two ways. Firstly, they convert the ozone molecules into normal oxygen molecules irreversibly so that the ozone protection to earth is gradually depleted, exposing us and all living organisms to harmful radiation. Secondly, the presence of these manmade chemicals in the stratosphere increases the greenhouse shielding around Earth, which restricts the reflection of the heat radiated from Earth, out into space. This prevents Earth maintaining steady temperatures that present life forms have evolved to thrive in. Indeed, this prevents the Earth from cooling itself as a natural process. Subsequently, harmful global warming, is leading to polar ice-cap

melting, sea-levels rising, and the endangerment much terrestrial, marine and aquatic life.

16.7. Global Ozone-Layer Monitoring

Scientists under the aegis of the Global Atmosphere Watch, program of the World Meteorological Organization, NASA and the independent observatories of many countries, who are members of the UN, monitor the ozone concentration on a 24 hour, daily basis throughout each year. They also do monitor sources which produce ozone–depleting, banned chemicals and share the data with the UN. This is in accordance with the Montreal Protocol that has been a success story in reducing ozone depletion and has even seen some significant restoration to the ozone layer this century.

16.8. Conclusion

The ozone layer enveloping our Earth is a life-protecting shield provided by nature. Unfortunately, man-made chlorine-based chemicals have damaged that shield. The reversal of this trend and discovering alternate chemicals for various uses are an ongoing challenge to mankind in the effort to survive and live well for the benefit of generations to come. It is hoped that mankind will win this challenge.

17. Tin mining, are there unforeseen radiation risks?

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17.1. Abstract

Mining is a vital part of the global economy, providing minerals and metals, employment and supporting infrastructure development. It can however cause health problems for humans and ecosystems. Tin is one such metal, used mainly for solder in printed circuit boards (PCBs) and as a coating for canned-food packaging. The market for tin has rapidly grown in recent years as it is used in both the PCBs and screens of smart phones. The extraction of the tin bearing minerals, mainly cassiterite that is itself a stable mineral with relatively low toxicity, often happens in hazardous conditions and due to poor management there is consequential environmental damage due to mining processes. Environmental damage by erosion, deforestation in protected areas, resulting in biodiversity loss and water pollution is often linked to artisanal and small-scale mining. Radioactive minerals such as monazite are often obtained as by-products of tin mining or may be left as waste in mining sites. This has been linked to deaths connected to the high level of radiation from monazite-rich sand that was used for the construction of the houses for people who were unaware of the risks to radiation from these materials.

This chapter explores the extent of this issue in a selection of countries, the level of exposure and some possible pathways of radiation into food chains. There are recommendations of how to address this through in-depth quality community education as well a call for rethinking our consumption patterns and models of economic growth.

Keywords: *Cassiterite, monazite, equivalent dose rate, tin mining, background NORMs, community education*

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17.2. Introduction

Mining is a vital part of the global economy, providing minerals and metals, employment and supporting infrastructure development. It can however cause health problems for humans and ecosystems. The modern world relies on many of the metals extracted from rocks and mineral deposits around the world for construction, mechanically engineering products, packaging and containers, electrical wiring and electronic components. Tin, for example, is a good electrical conductor, with a relatively low melting point, it is insoluble, unreactive and non-toxic making it safe for human use. Tin is used mainly for solder in printed circuit boards (PCBs) and as a coating for canned-food packaging. The market for tin has rapidly grown in recent years as it is used in both the PCBs and screens of smart phones.

Tin is one of the 3TG conflict minerals as defined by Bourgouin, Chase, and Han (2014). The extraction of the tin bearing minerals, mainly cassiterite that is itself a stable mineral with relatively low toxicity, often happens in hazardous conditions and due to poor management there is consequential environmental damage due to mining processes. The subsequent processing of tin tailings can magnify the exposure to radioactive materials that are associated with the rock in which tin deposits are found. These stages in the 'life cycle' of tin are mainly located in countries and within communities far from the final use locations and peoples. The lack of monitoring and enforcement of standards in locations such as this exacerbates the associated health problems and environmental damage.

This chapter aims to explore the risk from radioactive minerals linked to tin mining and processing to the health and wellbeing of workers, communities and nature. It addresses how taking bioethical considerations and values into account could help ameliorate the situation.

17.3. General mining issues

Mining can cause environmental pollution and related health problems for ecosystems and humans as discussed by Plumlee and Morman (2011). The most significant environmental harms being destructive changes in habitats and resulting biodiversity loss, Sonter *et al* (2018). This environmental damage by erosion, deforestation in protected areas, resulting in biodiversity loss and water pollution is

often linked to artisanal and small-scale mining (ASM). Furthermore, breaches in human rights raises concerns related to ASM in some countries such as the Democratic Republic of Congo. These violations include the use of child labour, dangerous working conditions relating to occupational and community health and safety concerns. Miners are regularly exposed to risks from hazardous working conditions, during long working hours, such as falling rocks or cave-ins, exposure to toxins, and poor sanitary conditions sanitation (Bourgouin, Chase, and Han; 2014). It has to remembered that the economic incentives to miners are such a strong motivation that they accept the dangerous conditions as an acceptable risk. However, are they *fully* aware of all the risks to themselves, their families, communities and Nature that supports them?

ASM for gold for example is expanding, leading to widespread riparian deforestation and excavation, and hastening sediment transport into nearby rivers. This has caused significant increases in river suspended-sediment concentrations across a wide region of the Peruvian Amazon. The magnitude of suspended-sediment increase we detect implies detrimental and long-lasting impacts on aquatic biota, particularly behavior and community structure of fish populations, and increased riverine transport of mercury-laden sediments, Dethier *et al* (2019).

According to Plumlee and Morman there is good reason to improve mining conditions and health and safety standards since:

> *"Historical mining and mineral processing have been linked definitively to health problems resulting from occupational and environmental exposures to mine wastes. Modern mining and processing methods, when properly designed and implemented, prevent or greatly reduce potential environmental health impacts. However, particularly in developing countries, there are examples of health problems linked to recent mining. In other cases, recent mining has been blamed for health problems but no clear links have been found. The types and abundances of potential toxicants in mine wastes are predictably influenced by the geologic characteristics of the deposit being mined. Hence, Earth scientists can help understand, anticipate, and mitigate potential health issues associated with mining and mineral processing."*

This is all the more important as studies such as Singer *et al* (2013) show that the environmental legacy from mining can lasts hundreds of years and over a significantly wider region than just the immediate mining locations.

17.4. Tin specific issues

Tin is used for coating steel cans and in alloys such as for solder. Increasingly the consumption of tin is driven by the demand for electronic goods including cell phones. For example, Christian, Romanova and Turbini (2012) analysed the elemental composition of twenty-nine cell phones and found that on average they contained 1g of tin. The Fairphone (2017) *Smartphone Material Profiles* lists tin mining for phone solder as being associated with serious health risks to artisanal miners, radioactive waste, water and soil pollution and significant biodiversity threats. This use of tin in the electronics industries is reflected in the high consumption by countries such as China[83], which now consumes over half of the world's smelted tin each year. As renewable energy technologies including new batteries are developed there will be developing new markets for tin. However, much of the production of tin is in developing countries, as data from the US Geological Survey (2019) that is in Table 1 shows. Indeed it is classified as one of the 3T and G conflict minerals as discussed later in this chapter.

According to Robinson (2009), who assumed a total global of 20 million tonnes of electronic waste annually, there is an annual 48 000 tonnes of tin from solder and LCD that contributes to pollution. That electronic figure of electronic waste could be multiplied many times in the last decade, and so therefore could the tin. The tin is most commonly retrieved by simple incineration of waste and then the tin is separated by floatation as described by Balasubramanian and Karthikeyan (2016). The fumes from this incineration are the main environmental pollutants.

The tin metal itself has a very low toxicity, and likewise so does its most common mineral cassiterite (tin oxide). However, cassiterite is most commonly found as secondary deposits downstream from granitic rocks and frequently there are associated minerals such as monazite, which is a phosphate mineral containing

[83] In 2020 China consumed 216.2 kilotonnes of tin in comparison to less than 10 kt in India, 4kt in Thailand and less than 3kt in both Malaysia and Indonesia. Source https://www.statista.com/statistics/1130039/apac-refined-tin-consumption-by-country-or-region/.

approximately 2-20% thorium dioxide[84]. The principle tin bearing mineral is cassiterite, but this is found in association with other minerals such as in some granites on Phuket island that contain topaz, monazite, rutile, cassiterite, and columbite and form low- grade tin-tantalum deposits that are mined by hydraulic techniques, Pollard *et al* (1995). Tin ores are often found with associated with monazite. In Thailand, monazite (Ce, La, Nd, Y, Th)PO_4, occurs in heavy-mineral sands and vein deposits in low grade tin ores in the south of the country, Yaanant (2016).

Table 17.1: Annual Tin production by country for 2019

Country (or area)	Production (tonnes)
China	85 000
Indonesia	80 000
Myanmar	54 000
Peru	18 500
Bolivia	17 000
Brazil	17 000
Congo	10 000
Nigeria	7 500
Australia	7 000
Vietnam	4 500
Malaysia	4 000
Rwanda	3 000
Global total	310 000

Source: adapted from USGS (2019) https://www.usgs.gov/centers/nmic/tin-statistics-and-information

Radioactive minerals such as monazite, pyrochlore and xenotime, which were obtained as by-products of tin mining in the Jos Plateau in Nigeria have been left as waste in many mining sites in the region which led to people dying. These deaths were connected to the high level of radiation from monazite-rich sand that was used for the construction of the houses the people lived in (Omotehinse and Ako; 2019).

[84] The Thai Department of Mineral Resources reports that monazite was produced by processing tin dressings from several provinces including Phuket and Ranong. In 1990, Thailand produced 377 metric tons of monazite, but since then, the output has decreased. Source: http://www.dmr.go.th/ewt_news.php?nid=581&filename=min5

However, the risks to radiation from these rocks and materials is not widely known. This is reminiscent of building materials that were made using ^{60}Co-contaminated steel used in Taiwan in the 1980s that was not identified until a decade later, by which time a slightly increased level of cancer was found in a sample of 6250 residents (Thorne and Wakeford, 2020).

Thorne and Wakeford report that the global average of natural background radiation dose, from terrestrial sources, is 480 μSv a^{-1} in a typical range of 300-600 μSv a^{-1}, the Canadian Nuclear Safety Commission (2020) states that average effective dose from terrestrial sources is 0.5 mSv a^{-1}, but varies due to underlying geology and can be as high as 260 mSv a^{-1} in northern Iran and 90 mSv a^{-1} in Nigeria. Cosmic rays are also contribute to background radiation to give a worldwide average effective dose from natural radiation of approximately 2.4 mSv a^{-1} Gratsky *et al* (2004).

Adiputra *et al* (2020) refer to the granitic rock in the South East Asian belt zone as being the source of both cassiterite and monazite in ores and sands. Visitors to the Ban Muang Ranong Museum and Hardsompaen Learning Centre exhibitions of historical tin mining in Thailand are able to buy samples of cassiterite sand and monazite that both have significantly higher levels of radioactivity than background levels, Waller (2021). Jaffary et al (2019) found that Malaysian technically enhanced monazite exceeded the international safety limits. They recommended that "Personal protective equipment (PPE) such as respiratory mask should be worn by workers to prevent inhalation or ingestion of the radioactive gas or dust." Stocklin-Weinberg et al (2017) identify that it is the processing of tin tailings where there is a significantly higher risk of inhaling radioactive dust compared to the mining stage itself. Minerals such as monazite, pyrochlore and xenotime, which are obtained as by-products of tin, are radioactive. Since these minerals were mostly treated as waste and dumped in tailing ponds or just abandoned in many closed mines, the incidence of radiation contamination cannot be ruled out, Omotehinse and Ako (2019). These and some other minerals and rocks are naturally occurring radioactive materials (NORMs), as Michalik (2009) clarifies, but through separation and processing to optimise levels of monazite as a by-product, as proposed by Adiputra *et al* then these NORMs become technologically enhanced TENORMs. Several of these mineral resources are used outside the nuclear industry such as metal ores like tin, leachates from some metal mines and materials used as source for phosphate fertilizers.

Thorne and Wakefield (2021) identify metal mining and processing amongst a variety of industries that handle materials containing higher than normal radionuclide concentrations. This is largely due to the concentrating effect during the production of waste slags. Michalik (2009) distinguishes these TENORMs such as tin tailings, which may have a radionuclide concentration several factors higher, from NORMs based on a definition that the "concentrations of radionuclides have been altered (enhanced) as a result of technological processes to levels causing a significant increase of the radiation hazard above natural background." In Thailand for example Yaanant *et al* (2017) reported a maximum very high dose rate, 62.2 μSv/hr close to monazite storage facility with an average of dose rate around the wall ranging from 30-60 μSv/hr, about 30-60 times higher than the background level of 1 μSv/hr in the vicinity. They recommended that a plan be drawn up to secure the storage facility to protect workers.

The debate over the dangers of enhanced natural background radiation was heightened due to controversy over 'Gulf War Syndrome' allegedly caused by depleted uranium munitions. Pattison *et al* (2010) cite Hamilton (1988) saying that radioactive hot particles can naturally occur from the weathering of igneous rocks.

According to Yusoff and Muslimin (2010) the normal practice in the tin mining industry is that the amang produce from a particular tin mine is offer for bidding and the highest bidder will secure the mineral (Hasbi, 1985; Dahan, 1990). An amang treatment plant does not only treated amang from a particular area but also from other sources. This can add to the varied radioactivity levels as there will variations in mineral contents from different sources (Alnour *et* al;2017). The process besides producing the tin metal also produces a slag waste (Hasbi A., 1985). When the price and demand for tantalum superconductors were high, tin slag waste that contains high content of this element was recovered from the ground. Significant amount of uranium and thorium was found to be present in the slag, illustrating that the risk from radiation had been there for years.

Indonesia has large tin deposits and is one of the largest tin-producing countries in the world. Here, with some similarities to Bourgouin's findings in Africa, policies intended to benefit local communities and environments have actually done the opposite, Purnaweni et al (2019). Their study focuses on negative impacts on the

people of Bangka Belitung, which produced nearly 20% of the total global tin production in 2014.

17.4.Human Health Issues

Stewart (2020) lists several health risks associated with mining in general due to poor infrastructure, crowded living and poor working conditions. The list includes communicable diseases such as AIDS from HIV transmission, tuberculosis and now of course Covid-19 in addition to silicosis. Shaikh (2014) referred to 2012 figures of 150 deaths annually to miners in Bangka-Belitung alone due to the risky working conditions.

In relation to artisanal cobalt mining in the Democratic Republic of the Congo, Williams *et al* (2021) state both consequential environmental and health effects that miners and nature are at risk from: "The environmental impacts o*f informally monitored small scale mining are numerous, including toxic trace metal contamination of local waterways and soil. This contamination results in animal habitat destruction and arable farmland pollution. Miners often work without basic protective equipment and experience dangerous exposure to dust, chemicals, and potential mine tunnel collapse."*

In relation to radiation risks from tin mining, many reports indicate that radiation levels are within acceptable ranges and usually lower than recommended safety limits. The IAEA states that the general public should not be exposed to an effective dose rate of 1mSv per year or an annual equivalent dose to the skin of 50mSv, Waller (2021). Yet the IAEA also reports that the total average effective dose from natural radiation is about 2.4 mSv in a year, but doses can vary a great deal. Some national averages exceed 10 mSv in a year, and in some regions individual doses may exceed 100 mSv in a year, IAEA (2004). In *Radiation, People And The Environment* the IAEA adds that: *"Average doses are useful measures for comparing the health significance of radiation from natural and artificial sources, but they may need to be supplemented by additional data when there are, as with indoor radon, large variations about the average. The most helpful step might be to describe the frequency with which doses of a certain magnitude occur in the circumstances of interest."*

There is variable frequency in the reporting of radiation levels around tin mining areas. Waller (2021) recorded what would equate to annual equivalent dose

levels of up to 60 mSv from some displays at a Thai learning centre. Yaanant *et al (2017)* from the Thailand Institute of Nuclear Technology recorded comparable levels at a monazite storage facility, where they concluded that with such levels of contamination in pond water samples there should be clear signage, separation and containment along with other measures to prevent contaminating workers. With little awareness of the issue at the tourist centres assessed by Waller there is currently no such precautions being taken.

This is similar to findings in several other countries. Ademola (2008) found that in some mining regions in Nigeria: *"The annual gonadal dose equivalent was calculated as 92.4 mSv. This is much higher than the world average dose equivalent rate to individuals from soil (0.30 mSvy^{-1})."*

This could potentially expose workers to the risk of developing mutations in gametes or lead to tumour development if workers are not suitably protected. Augustin (2019) quotes Dr Looi Hoong Wah, a fellow of the Malaysian Academy of Medicine and a specialist in radiology and radiotherapy, as saying that "monazite found in tin tailings was nearly fifty times more radioactive than waste from the Lynas factory in Pahang." Jaffary *et al* (2019) analysed Malaysian monazite processing residues and found annual effective dose rates of up to 172 mSvy^{-1} and annual gonadal dose equivalents much higher than recommended values. Similarly, Hamzah *et al* (2008) found high levels of radioactivity around former tin mines in Malaysia that they considered could endanger people's health. More recently, Atipo *et al* (2020), based on their findings from the Jos Plateau, conclude that there is a high probability for the potential of miners and people dwellers around the tin mines to develop radiation-induced health defects as a result of high radiation absorbed dose rates. The Fairphone report, referred to above, states that in places such as Indonesia where some mine waste is not safely stored and workers are not protected then this poses a radiation risk. In Indonesia, Stocklin-Weinberg *et al* (2017) list several specific sources of risk to miners on Bangka including; physical harm from unstable slopes in mines, poor sanitary and hygiene conditions, dermatitis, fumes and dust inhalation and the inhalation of radioactive dust.

17.5. Environmental Issues

There are several studies that report raised levels of radioactivity around old mine sites on the Jos plateau in Nigeria. Jibiri, Alausa and Farai (2009) reported elevated radiation levels around abandoned Nigerian tin mining sites. They concluded that this revealed occupational health risks to agricultural workers from dust inhalation and ingestion, which should not be neglected. Aliyu *et al* (2015) report raised levels in some vegetation including grasses, lichen and mosses that are in the diet of many herbivores. Bitrus *et al* (2015) found that the levels of radioactivity due to ^{40}K, ^{226}Ra and ^{232}Th in some tin mining locations were sufficiently above global averages to significantly raise the risk of cancer. More recently Ugwu *et al* (2020) found eight Nigerian mine sites with levels of radioactivity would lead to doses significantly above the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) recommended maximum annual dose rate. In South East Asia there have been similar reports of elevated levels of radioactivity in mining regions. Hamzah *et al* (2008) found levels of up to a factor of ten higher than global averages in former tin mine areas in Malaysia. Syarbaini (2015) conducted a baseline assessment on Batang in Indonesia and calculated that the outdoor annual effective dose equivalent from all radionuclides was 1.17 mSV a^{-1}, that being higher than the global average of 0.07 mSv a^{-1} and slightly higher than the recommended value of 1mSv a^{-1}.

Conversely, some studies report radiation levels on mining sites that are lower than national or global averages, such as Ibrahim *et al* (2019). This is encouraging as it suggests that mining in some areas can be conducted in ways that limit environmental risks or harm. It must also be borne in mind that there is no universal consensus on what minimum levels or sources of radioactivity can be definitively linked to the onset of cancers. For example, Pattison, Hugtenburg and Green (2010) remind us clearly that it has not been proven that depleted uranium microparticles caused the disputed Gulf War syndrome of illness reported by a large number of war veterans.

Mcleod (2000) points out that:

"At every stage there are numerous impacts to take into account. For example, in the exploration phase, several negative impacts can occur, such as the destruction of flora and the pollution of water. More significant are the damages produced in the operation stage with the 'removal of soil and rock, loss of topsoil, loss of vegetation and

economic plants, pollution of surface waters and loss of fishing grounds, sedimentation of rivers and streams, pollution of inshore fisheries from tailings, dredging of rivers and inshore reefs for rock, sand or coral from construction and the reduction in local wildlife and biodiversity'. "

In addition to these impacts, mining managers and governing authorities also must consider the impacts linked to the closure of mines and the rehabilitation of mining sites. Mantero *et al* (2020) investigated lakes at twenty-three former mines in Sweden and found that 26% of the water samples had enhanced radioactive uranium levels. Indeed, the highest levels of uranium in surface water were found in at a former iron and granite mine, so an assumption on radionuclide concentration should not be made firstly on what kind of mine it was, but rather on the bedrock. They concluded that measurement of natural radioactivity should be added in routine analysis of characterization in mining areas worldwide. The environmental damages caused by tin mining in Jos-Plateau include: the destruction of pastoral land while searching for cassiterite; mine dumps; mine tailings containing radioactive waste; and also mine ponds. These mine ponds have resulted in several deaths. Additionally, during tin mining, radioactive minerals were released into the environment, Omotehinse and Ako (2019).

The environmental impacts of legal and illegal unconventional surface mining are grim. Impacts range from the mining of protected mangroves, habitat destruction, deforestation and more. Stocklin-Weinberg et al (2017) reported seeing no evidence of land rehabilitation being done by unconventional miners and that most notably many of the environmental impacts of the mining activities go hand in and with health and safety of miners and nearby community in the case of onshore mining.

Bioaccumulation of toxic materials in food chains has been increasingly exposed since Rachel Carson's publication of *Silent Spring*. Michalik (2009) refers to examples of biologically enhanced naturally occurring radioactive materials (BENORMs) such as in northern aboriginal communities who consume large amounts of caribou having radiation from ^{210}Po of 10 $mSvyr^{-1}$ and some fishermen who have a predominantly seafood diet reaching doses of 3 $mSvyr^{-1}$. In Thailand Boonsirichai et al (2014) report that following DNA fingerprinting of weeds around a monazite storage facility where radioactivity levels were significantly higher than recommend annual limits, they found that there was increased genetic variation in the plants.

This could be merely a correlation rather than a causation, furthermore there was no research into either uptake of radioactive elements into the plants or along the food chain. But their findings do illustrate that there is good reason for further research to be conducted in this area.

17.6. Bioethical issues

One of the key concerns regarding metal ore extraction and use is that of distributive justice, Urkidi and Walter (2018). Tin is often produced in poorer countries (see table 1) largely for the benefit of those in wealthier ones. It is one of the 3Tand G conflict min*erals that Sonter et al (2018) should be sourced with due diligence: "These minerals' extraction and trade may illegally finance armed groups, conflict, and related atrocities in the DRC and Great Lakes region. Governments, NGOs, and humanitarian activists, as well as the private sectors throughout the United States, Europe, and Africa, have built regulatory frameworks and stimulated the global market for responsibly sourced minerals."*

However, businesses should not examine the ethical standing of 3T and G sourcing exclusively in terms of conflict; they should look at the broader environmental, socio-economic and human rights conditions of these minerals' production. Angers *et al* (2013) point out that:

"In addition to demands for the mitigation of the negative impacts of mining activities, the [local] population often demands that the company engages in community development. This is particularly important in marginalized communities where the mining industry is often the greatest and only opportunity to achieve development. Such an engagement from the company towards community development can take the form of local employment, training and skill development, and provision of infrastructure and services."

This training should include awareness raising and education about the possible long term environmental and human health risks. This should incorporate training for protection to reduce the impact of those harms and resources to help mitigate damage that is incurred. This could be linked to monitoring and data tracking programmes so that, as a Phenrat (2020) advocates: *"Community citizen science approach provides social learning and empowers and emancipates marginalized individuals and communities. With sufficient scientific data and understanding, an*

empowered community can meaningfully participate in and influence a risk management decision. Their choice for risk management is rational and based on scientific information. Yet their choice is also flexible and considers the financial constraints of the polluter. "

NIMBYism relates to more affluent people or communities having the power to benefit from dirty technologies without suffering detrimental health or the negative aesthetic impact on their immediate environment. If highly desirable minerals were mined in their locality, or within their communities, they would have the economic clout to insist or safe working conditions and thorough environmental impact assessments. In practice most tin is sourced from less developed countries where such standards are all too frequently not met even though international 'soft laws' are in place.

The UN Declaration on the Rights of Indigenous Peoples (DRIP) (2007) sets out various rights of indigenous peoples that are relevant to mining, including: rights to property, culture, religion, and non-discrimination in relation to lands, territories and natural resources, including sacred places and objects; rights to health and physical wellbeing in relation to a clean and healthy environment; rights to set and pursue their own priorities for development, including development of natural resources and broader territorial management issues, as part of their fundamental right to self-determination; and participatory rights, including the right to make authoritative decisions about external projects or investments. Unfortunately, DRIP is not legally binding and in some countries such as Peru, where mining is a significant economic resource, demonstrations against the environmental damage done by mining companies have been criminalised, Stewart (2020). He adds that mining companies who act responsibly can help to improve local health as happened for women and children in Zambian copper and nickel mining communities.

17.7. How many R's?

Consumerism creates jobs and wealth in some sectors of the global population, but as can be seen from other trends since the Great Acceleration that it also has detrimental health and environmental impacts. As with all consumption it is not the producers that are solely responsible and consideration of the 3 R's reduce, re-use, recycle and shifting from linear to circular systems for sustainability is an ethical, as

much as an economic, consideration. So following the 3R mantra then reduce becomes an imperative, with refuse (to buy more) a strong request or recommendation, and to repair before recycling may well be a more sustainable option in the long run.

This surely places a responsibility on manufacturers to seek alternatives and design improvements, in other words take a leaf out of nature's book. Nature always finds opportunities to exploit gaps, occupy new niches and evolve to new conditions – essentially a great model for us to always be innovative and receptive to new ideas. Likewise most organisms have some level repair mechanisms, and nutrient recycling is a classic function within ecosystems. Repair and/or refurbish usually require less overall energy inputs than complete recycling and should therefore be higher priority, unlike in the UK document from DEFRA (2006) Best Available Treatment Recovery and Recycling Techniques (BATRRT) and treatment of Waste Electrical and Electronic Equipment (WEEE) where 'Repair And Refurbishment' was given a mere paragraph of attention in a twenty-three page book. Essentially we need to reflect on the consequences and revise produce-use-dispose patterns as there is the potential to improve at many different life cycle opportunities.

17.8. Technical solutions

If the R's of reduce, replace, reuse and recycle are considered then firstly it would be appropriate to seek alternatives to tin such as biodegradable packaging from plants or other biomaterials to replace tin canning. The reduction in physical size of electronic gadgets could also lead to a reduction in tin composition by mass. Yet these suggestions will not make a great impact without more detailed cradle to grave assessments of where tin is extracted, processed, used, lost and disposed of.

When reviewing how economics and policies can be used to reduce ecosystem decline and improve human health Pattanayak *et al* (2017) call for scientists to improve environmental impact assessments. This includes both a broader field of assessment not just with the immediate vicinity in time and place, but over longer periods and further reaching impacts such as what happens to slag materials or changes of use in mine lakes and the overall impact of conservation or restoration programmes.

Gordon *et al* (2006) state that for many geologically scarce metals extraction rates have increased by at least 3% per year for half a century and that recycling is become more and more important as virgin stocks are depleted. They recognize that there is no immediate concern, but limitations will occur if restrictions are imposed on international trade or by legislation against the environmental harms of mining and processing lower grade ores. As both of these situations are increasingly likely fifteen years after their assessment then it is all the more important to address tin recycling.

In some countries of Europe and North America recycling rates have increased in the last decade, but there is still much scope for improvement. Not least as a large proportion of recycling does not occur at the point of use, but is transported to other countries where environmental regulations as not necessarily enforced so rigorously. This is particularly significant with respect to PCBs as the quantities of these that are manufactured and disposed of each year continues to rise. Sahan *et al* (2019) found that the PCBs from a variety of mobile phones contained from 1.3 – 6.4 % tin and state that: *"The total economic value of the recovery of precious metals and of base metals from PCBs was estimated to be around 37.6 and 1.72 million USD per year, respectively."*

This is not an insubstantial sum and yet, as recycling rates are generally still low across the world, it illustrates that the economic potential for the global PCB recycling industry could well exceed the GDP of some smaller countries. However, a full life-cycle analysis is required – an overall systems analysis, as urban mining may have hidden, and potentially costly, health risks of its own.

Noll *et al* (2017) explored the effectiveness of automated disassembly, separation and recovery of metals from cell phones and PCBs, resulting in recovery rates of over ninety percent for some metals including tantalum and tungsten. This automated approach should reduce some health risks for workers. Hong *et al* (2020) explore a novel approach for recovering precious metals from electronic waste as the current methods using pyro-metallurgy and hydro-metallurgy either produce hazardous waste or have other environmental consequences. They are seeking a new approach as urban mining from electronic waste is not viable yet due the lengthy isolation process, health risks, and environmental impact. Sonter *et al* (2018) suggest that future metal extraction technologies such as phytomining or phytoremediation

could reduce threats to biodiversity, but as yet these technologies are still in the small scale research stage. However, the economics of such processes may make them unfavourable compared to reworking old mines.

Bennett (2021) reports of £4 million raised through crowd funding to support the reopening of a former Cornish copper mine that was found to contain high concentrations of lithium, which is needed in many batteries. This seems at first to support green technology development but as Bennett points out, there is a paucity of studies on the impacts of lithium mining on local communities and the environment. The same criticism would apply to the risks from radiation at tin mining sites. This lack of evidence and information does not mean that there is no risk, and therefore this implies that communities cannot give fully informed consent to allowing or endorsing mining activities on their doorsteps. This is where bioethical considerations need to be included in considering whether or not to proceed with new mining ventures.

17.9. Bioethical solutions

In reference to the growing extraction of virgin stocks of metals and minerals Gordon *et al* (2006) ask two relevant questions: *"Do we really envision a developed world quality of life for all of the people of the planet? and if so, are we willing to encourage the transformational technologies that will be required to make that vision a reality?"*

Bioethics seeks to pose and contribute to answers these and broader questions relating to more than just technological solutions. Their first question relates to the equitable distribution of and access to 'goods' as well as well protection from 'harms'. A large proportion of tin mining is ASM and this chapter has already shown how in many of those mines the workers and communities are exposed to considerable 'harms' and being predominantly in developing countries they clearly do not benefit from the 'goods' as much as those people in the wealthier developed countries who purchase the majority of the tin bearing products. To remedy this requires both safer working conditions and greater environmental protection in mining and processing regions. This could, theoretically, be partially funded by redistribution of some of the profits added along the supply chain back to the original source. An efficient method for this would be the purposeful taxation of electronic goods with an environmental

tax. Naturally this would lead to 'free loaders' in the forms of governments who did not apply the tax in order to maintain higher product sales.

The Bourgouin, Chase, and Han (2014) report into ethical resourcing of conflict minerals including tin advocates proactive supply chain management that considers wider issues than conflict alone. These issues include human rights, working conditions, environmental impact and local societies. Now there are regular media reports of social and environmental harms of 3T and G conflict minerals, for example Shaikh (2014) reported that Friends of the Earth Netherlands had started a campaign against Microsoft who were sourcing tin from Bangka and Belitung Indonesian islands. They claimed that other global giants such as Apple, Philips and LG were already acquiring tin from more responsible sources. A European Parliament TV programme discusses how a company called Fairphone demonstrates that it is possible to source tin in a responsible way is possible, by tracing it from mines up to the refiner – demonstrating they show due diligence. However, Purnaweni *et al* (2019) conclude their review of the business, policy and politics relating to tin mining on Bangka by emphasizing that conflicts of interests in local management due the high profitability of extracting local resources was the ultimate cause of environmental degradation and lack of concern for the welfare of the local communities.

17.10. Community education and participatory action

As discussed earlier community education at the source is required for reasons of fairness and justice. The concept of informed consent is well stabled in bioethics, but local communities cannot really endorse mining exploits if there are not fully aware of long term direct health, environmental impacts and the associated decrease in human wellbeing. When people are informed then as likely as not they will work synergistically rather than antagonistically to resolve a problem.

In the UK the government increasingly seeks contributions from citizens such as the 2020 Climate Assembly members report or a recent request for "Nature-based Solutions for Climate Change" from The House of Lords Science and Technology Select Committee, to assist in ways of meeting the UK's target of net-zero greenhouse gas emissions by 2050. The Asia Foundation (2020) note that in developing countries, including Myanmar, there are some hopeful signs of government listening

to people's views. *"There are also emerging examples of engagement mechanisms initiated by civil society and government. For example, in Tanintharyi, civil society have been successful initiating a complaint mechanism at a sub-township and township level as a channel to feed mechanisms directly to the Department of Mines, with a certain level of success." (Asia Foundation, 2020, p. 27)*

Phenrat (2020) describes the benefits of community engagement to develop a mine waste monitoring system, as this waste often produced fumes that were harmful to local residents. *"This outcome of a science-based risk management decision by the community will be forwarded to the regional government for enforcement. This process of community citizen science is in line with the normative rationale of public participation, which is meant to influence decisions, elevate democratic capacity, and empower marginalized individuals and communities."*

So, educating the community about the risks from long term exposure to low to medium levels of radiation from some minerals is essential. Hansen and Hammann (2017) argue that education to understand risks requires learning about science, statistics, risk-benefit analysis and ethics. This shows that there must be a commitment to quality in depth education, not merely information sharing.

17.11. Way forward and Recommendations

To reduce the chance of possible impacts of radiation from tin mining and processing industries in proximate communities there are three key recommendations: radiation monitoring, community risk education that results in the construction of meaningful warning signage where appropriate along with greater conformity to adopting radiation protection measures. A fourth recommendation is that ongoing research should be funded to obtain a greater knowledge and understanding of how radioactivity from concentrated mineral ores can be transferred within food webs and the extent of harms that it can cause therein.

Michalik (2009) concludes there is a great need to educate people working with radioactive materials in various industries outside the nuclear industry of the risks caused by enhanced natural radioactivity. This extends to education regarding health risks and environmental issues. Knoblauch *et al* (2017) report that when assessing the health of children in copper mining villages in Zambia they found that: *"Repeated cross-sectional monitoring of key health indicators and determinants of health in*

communities impacted by projects help to better understand whether and how human health is impacted, which population sub-groups are most vulnerable and help identify underlying risk factors."

Regarding exposure to radiation from amang tin tailings containing monazite Alnour *et al* (2017) recommend the use personal monitoring devices by all workers who potentially at risk. More than just human health, there should be provision to monitor local ecosystem changes for levels of known potential toxins (including radiation levels), habitat stability and measures of biodiversity. Then the results of all the collective monitoring must be used to inform future good practice. This is in line with the recommendations of Aliyu *et al* (2015) who admit that further research is needed into radioactivity levels of crops and other vegetation that may be drawing mineral ions from tin mine waste dumps or water that contains mine leachates.

On a wider scale the growing use and disposal of tin is illustrative of the need for changes in our consumption patterns. Moving to circular economies, whilst ensuring safe recycling procedures are in place is essential. So too is the assumption that sustained economic development is achievable and desirable; surely more equitable distribution of wealth and resources will lead to a more stable, healthier and sustainable life on our planet.

17.12. Summary

In conclusion, tin is mined for increasing use in PCBs and for coating some single-use food containers. Tin mining is often conducted in geological regions that also contain radioactive minerals such as monazite. The associated leaching of radioactivity and physical impacts of mining often lead to environmental degradation, added to this tin is also classified as one of the 3TG conflict minerals as much tin mining is conducted by ASM in politically unstable regions. Although the tin bearing mineral cassiterite has low toxicity there are dangers from processing waste materials that may be discarded or inadvertently used for other purposes such as in construction materials by local communities. This poses health risks to both people from dusts and other organisms if there is uptake from the soil by plants. By moving from linear to circular consumption this would reduce the need for extensive mining. Quality in-depth community education of the risks from radioactivity in mining areas, together with appropriate protection signs and systems along with established ongoing monitoring

routines would reduce the potential impact on both human and the health of the local ecosystem.

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17.13. **References**

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18. A nature-based gamble: Hedging our bets or betting on hedges?

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18.1. Abstract

Many governments such as the UK and some countries within the European Union are evaluating the potential of Nature-based Systems (NbS) to help meet international agreements. According to the UNEP present challenges of climate change, biodiversity loss and human health are likely to be met at lower cost over the longer term by employing NbS rather than using conventional technical approaches. Establishing and maintaining both rural and urban hedges is just one example of how NbS can be an affordable low tech approach that not only increases carbon capture through photosynthesis but simultaneously provides many other benefits both to human health and also nature as a whole. Although hedgerows are not an ecosystem as such they do provide vital habitats and support many ecosystem services. Hedgerows contribute to providing functions including promoting soil health and reducing water runoff, habitats and food for a diverse range of species including pollinators, provision of field boundaries whilst acting as pathways or green corridors, food and material resources, shelter from wind that reduces soil erosion and organic carbon storage. Within the UK in 2019 the Climate Change Committee (CCC) advocated increasing hedgerows alongside other methods of carbon capture. In the report *Net Zero: The UK's contribution to stopping global warming* it recommended planting 200 000 km of hedgerows and a pilot subsidy scheme is due to start before 2022. This chapter explores the benefits and feasibility of using hedgerows as NbS for carbon capture to reduce biodiversity decline and improve human health. There is also some discussion of the possibility to engage citizen scientists in hedgerow monitoring and management.

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Key words: *Nature-based Solutions; Natural Climate Solutions; hedgerow; decarbonising; urban greenspace*

18.2. Introduction

Many governments such as the UK and some countries within the European Union are evaluating the potential of Nature-based Systems (NbS) to help meet international agreements. The targets in these agreements were initially set by The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC). Currently in response to the 21st Conference of the Parties (COP21) Paris Agreement signatory countries are required to prepare, communicate and maintain successive Nationally Determined Contributions. NbS is sometimes referred to as Ecosystem-based Adaptation (EbA) is promoted in many countries, often through international funding bodies such as the UNEP *Enhancing Climate Change Resilience Of Rural Communities Living In Protected Areas Of Cambodia* project (UNEP, 2021a). The *State of Finance for Nature* (UNEP, 2021b) report from the UNEP, the World Economic Forum and the Economics of Land Degradation Initiative claimed that even if only 0.1% extra of global GDP each year was invested in restorative agriculture, forests, pollution management and protected areas could avoid the breakdown of natural ecosystem "services" such as clean water, food and flood protection.

NbS can be referred to as an umbrella term for, or sometimes synonymously with, Natural Climate Solutions (NCS) and EbA. NbS generally can be applied to address different environmental or nature dependent issues such as biodiversity loss, food security, water security, human health, and social and economic development, EbA emphasizes successful adaptation to new conditions such as adjusting to lower pH values in lakes during acidic precipitation and NCS is more specifically focused on redressing the causes and impacts of climate change (Griscom *et al.,* 2020). Indeed there are a plethora of terms relating to and definitions of what constitutes NbS (Castellar *et al*, 2021) but for this chapter it will used as defined by the IUCN as:

> *"actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits"*[85].

According to the UNEP present challenges of climate change, biodiversity loss and human health are likely to be met at lower cost over the longer term by employing NbS rather than using conventional technical approaches (UNEP, 2021). The UNEP is so committed to promoting NbS that it has produced free MOOCs that have already been successfully rolled out in over one hundred universities and to hundreds of thousands of learners worldwide[86]. The resilience that can be built into strategies to reduce atmospheric carbon by employing NbS is highlighted in the UNEP (2021) *Emissions Gap Report: The Heat Is On*. There are many examples of NbS that are advantageous for increased carbon capture such as:

- Restoring and protecting forests for timber products, biodiversity and carbon storage;
- Conservation of peatland, wetlands and water catchment areas for flood protection and reduce soil erosion and fertilizer leaching that leads to eutrophication;
- Greening cities with roof planting schemes and planting more trees and bushes can reduce heat island effects and improve both physical and mental health;
- Restoring coastal habitats such as mangroves can benefit local economies, reduce coastal erosion, provide storm flood defences and secure habitats for many unique species.

As the majority of NbS involve carbon capture through photosynthesis they are effective at reducing atmospheric carbon dioxide, which is a very long-lived greenhouse gas compared to methane or nitrous oxide. Considering all of these applications and benefits, in the light of increasing global temperatures induced by anthropogenic activities, can we truly risk gambling on decarbonizing our future without employing NbS? One simple example of NbS for decarbonising our world is through conserving and re-establishing increasing lengths, volumes and diversity in our hedgerows in both urban and rural settings. The fourth article of the Paris

[85] This definition of NbS can be found on the Commission on Ecosystem Management page of the International Union for Conservation of Nature (IUCN) website: https://www.iucn.org/commissions/commission-ecosystem-management/our-work/nature-based-solutions

[86] The 2021 MOOC certificated programme on *Nature-based Solutions for Disaster and Climate Resilience* is available from: https://pedrr.org/MOOC/

Agreement states that successive nationally determined contributions will reflect highest possible ambitions. This aim and the cumulative nature of climate change and several fast approaching tipping points such as levels of biodiversity or soil erosion and soil degradation makes the immediate inclusion and adoption of NbS, such as hedge laying, all the more important.

18.3. Are hedges a safe bet?

Land sparing is a system that involves separate, probably large areas of sustainably intensified agriculture and separate reserves for wilderness. Land sharing is a patchwork of low-intensity agriculture that incorporates natural features such as hedgerows, copse and ponds rather than keeping agriculture and wilderness apart. The land sparing approach would tend to a series of safe oases or islands of security for nature, but with potential isolation between sites these sanctuaries would not be stable for an unlimited future. The land sharing approach would give hedgerow development, regeneration and management legal conservation status that would assist in preserving pathways between isolated patches or nature reserves. However Phalan *et al* (2011) found that in northern India and south-west Ghana the land sparing approach had better results for maintaining biodiversity levels. This suggests that what works well in one country may not be the ideal solution in another. It also reminds us to adopt a more holistic approach when evaluating benefits of NbS. The use of hedgerows for carbon capture also has advantages as corridors for a variety of biota such as *Plecotus auritus* (Entwistle *et al,* 1996) that could be essential for a land sparing system to achieve long term sustainability. Dondina *et al* (2018) provide a compelling case that hedgerows are the only safe bet.

Establishing and maintaining both rural and urban hedges is just one example of how NbS can be an affordable low tech approach that not only increases carbon capture through photosynthesis but simultaneously provides many other benefits both to human health and also nature as a whole. Although hedgerows are not an ecosystem as such they do provide vital habitats and support many ecosystem services. Hedgerows contribute to providing functions including promoting soil health and reducing water runoff (Waller, 2019), habitats and food for a diverse range of species including pollinators (Kremen *et al.,* 2011), provision of field boundaries whilst acting as pathways or green corridors (Lavorel *et al.,* 2020), food,

material, shelter from wind that also reduces soil erosion and organic carbon storage (Höpfl *et al.,* 2021; Seddon *et al.,* 2020). Both coppice managed and unmanaged hedgerows have significant potential for carbon sequestration (Crossland, 2015; Drexler *et al.,* 2021). Hedgerow benefits are being promoted across the globe from research into reducing runoff in Kenya (Angima *et al.,* 2000), nitrogen fixation through alley cropping in Jamaica (FAO, 2020) to estimations of carbon sequestration rates in Indian contour hedging (Adhikary *et al.,* 2017). In Uganda, Reid *et al.* (2017) report that: *"nature-based agricultural practices (e.g. soil and water conservation, organic fertilisers, crop diversification, hedgerows, agroforestry, mulching, and rainwater harvesting and storage), led to increased crop yields and incomes, improved diets and reduced flood risks."*

It must be kept in mind, if the main objective of planting hedgerows and other NbS is to promote carbon capture, that there are many other ecosystem services and functions that could, and most likely will, be co-benefits. The significance of such benefits adds value which may assist in funding applications or overcoming prices, Malhi *et al.* (2019). However the co-productivity of these functions must not be assumed, for example Roberts *et al.* (2020) reminds us that planting forestry monocultures for carbon capture will reduce biodiversity. Likewise the degree to which co-benefits are achieved must be determined. As Nemitz *et al.* (2020) say regarding the use of NbS to reduce urban pollution: *"Even large-scale conversion of half of existing open urban greenspace to forest would lower urban $PM_{2.5}$ by only another 1%, suggesting that the effect on air quality needs to be considered in the context of the wider benefits of urban tree planting, e.g. on physical and mental health."*

It is this wider, holistic overview of synergistic benefits that must be considered when planning for and deciding whether to allocate funding to found NbS. Alvarado (2020) argues that:

> *Growing urban populations are facing numerous environmental, socioeconomic and public health challenges that significantly impact the liveability of cities. Lately, there has been growing acknowledgment of the role that nature-based solutions (NBS) can play in addressing these societal challenges while simultaneously providing a range of long-term benefits to human well-being and biodiversity. Yet the unceasing, large-scale loss of natural areas in cities implies*

that local authorities are failing to consider the benefits of NBS, and thus incorporate their value, into urban spatial planning decisions.

The Convention on Biological Diversity (CBD) guidelines for EbA list 10 principles, one of which is to maximise synergies in achieving multiple benefits, including for biodiversity, conservation, sustainable development, gender equality, health, adaptation, and risk reduction, UNDRR (2021). This synergy is nicely illustrated in diagram of nested circles for the SDGs by Haage et al (2015) with goals related to wellbeing at the centre but all goals being subsets of those directly related to nature. That is to say goals 13, 14 and 15, which are targeted at addressing climate change, and conservation of terrestrial and marine ecosystems respectively. The importance of this contribution to carbon capture comes at a time when carbon dioxide levels of 413.2 ± 0.2 ppm have reached a new high according to the World Meteorological Organisation (2021). A joint report from the IPCC and IPBES (2021) notes that declines in biodiversity will impact climate through changes in the carbon, nitrogen and water cycles. The report emphasises that nature already absorbs almost half of anthropogenic CO_2 emissions, but transformative change in all parts of society and economy is needed to stabilise our climate and stop biodiversity loss.

18.4. Health Benefits

Many writers connect mental health and wellbeing with immersion in nature (Duncan, 2018; White *et al.,* 2019) although it may not be so clear in exactly what way nature improves a sense psychological wellbeing, there is stronger evidence to show that higher levels of mental health have associated physical and public health benefits (Allen, 2011; Southon *et al.*, 2017; Trudel-Fitzgerald *et al* ,2019). In urban places both green and blue spaces provide areas for physical activity, stress relief, and social interaction. Shading and evapotranspiration by plants provide cooling that reduces the impact of the urban heat islands during hotter seasons. There is some evidence that vegetation may improve air quality by removing air pollutants as outlined by Waller (2019) All these functions contribute to public health and wellbeing, Kabisch *et al.* (2017). This wellbeing is not just a matter of pleasure or feeling good, but also good functioning through resilience and positivity (Keyes and Annas, 2009; UNDRR, 2021)

Conversely reductions in the amount of greenspace in cities has been shown to have negative health consequences. For example, very high temperatures in cities during increasingly extreme and frequent heat waves aggravated by urban heat island effects are likely to result in heat-stress-related health problems, including heat stroke, dehydration and heat exhaustion; some of which impact mortality and morbidity rates, Hobbie and Grimm (2020). There are also psychological and behavioural health issues linked with heat stress such as aggression, criminal behaviour, suicides, mood disorders and dementia. So greening of urban spaces through rooftops schemes and hedging initiatives could all have additional benefits to carbon capture.

18.5. Ecological Benefits

Carbon sequestration in hedgerows has comparable potential to that of forests according to a meta-analysis study by Drexler *et al.* (2021), who found variable capacity for average increases soil organic carbon after the establishment of hedgerows on cropland and a hedgerow biomass carbon stock of 92 ±40 Mg C ha^{-1}. According to Jones *et al.* (2019) existing UK urban woodland removes 0.7 kt $PM_{2.5}$ yr^{-1}, reducing the health burden from $PM_{2.5}$ by about 1900 life years lost/year. How much more potential reduction in costs could be achieved by increasing the amount of urban green space. Both some urban and rural hedges could be managed through coppicing and the harvest used as directly as biofuel or feedstock for secondary fuels. This, working in conjunction with e-Fuel[87] use, would assist in the transition from fossil fuels in some hard to decarbonise industries such as electricity generation.

Furthermore hedgerows contribute towards many ecosystem services and other functions such as:

- Aiding water infiltration into soil, increasing water uptake from soils, reducing waterway silt loads and slowing water runoff rates which help flood reduction
- Enhancing carbon storage both above and below ground
- Improving soil structure (Holden *et al,* 2019)
- Pollarding or coppicing for wood and wood products
- Providing privacy, enhance natural beauty and contribute to a sense of place

[87] E-Fuels are produced using electrolysis of water, using electricity from renewable sources, and the resulting hydrogen can be combined with carbon monoxide, derived from atmospheric carbon dioxide, via Fischer-Tropsch synthesis reactions. These e-Fuels such as methanol can supplelement or be substituted for traditional fuels.

- Reducing fertilizer and pesticide runoff into watercourses
- Acting as corridors and habitats for wildlife including pollinators and some crop pest predators
- Wind breaks that lower wind speeds thereby reducing crop damage and soil erosion
- Providing shelter, shade and adding diversity to the diet of livestock
- Reducing the degree of pollinator parasites (Cohen *et al,* 2021)

18.6. Sociopolitical and economic considerations

It is all well and good to support, in principle, the use of NbS to redress the impacts of climate change. Next this ideology needs to be translated into clear achievable targets that can be monitored and tracked. However, as Seddon *et al.* (2016) conclude: *"Few countries that recognise the importance of EbA include clear and measurable targets by which progress towards implementation can be assessed; even fewer acknowledge the importance of local community involvement in designing and implementing adaptation activities."*

This is not beyond our reach with already some cities such as Toronto, Basel and Portland, Oregon having compulsory regulations to include green roofing in new urban developments, Snep *et al.* (2020). NbS has the potential to reduce social-ecological vulnerability. This involves decreasing ecosystem sensitivity by increasing adaptive capacity which is determined by the diversity and connectedness within the system. Socioeconomic sensitivity is affected by low levels of education, employment and health as well as high levels of corruption, all of which increase sensitivity. Whereas a high socioeconomic adaptive capacity due to a culture and infrastructure that supports innovation will increase resilience, Seddon *et al* (2020). However in a study of seven major cities across the world Croeser *et al.*(2021) reported that: *"practitioners were effectively navigating challenges in the areas where they had significant control, including community engagement, strategy development and technical skills. The greatest barriers were outside the influence of project teams: understaffing, a lack of intra-organisational processes, and risk-averse organisational cultures."*

This classically illustrates how support for and enthusiasm of NbS both politically and within civic society can be thwarted and progress stalled by

bureaucratic systems and practices. There are also changes in associated infrastructure that are required for the full implementation of some NbS that need acknowledging – NbS is not a magic bullet – as Nelson *et al* (2020) caution.

"Within the UK in 2019 the Climate Change Committee (CCC) advocated increasing hedgerows alongside other methods of carbon capture. In the report *Net Zero: The UK's contribution to stopping global warming* it recommended planting 200 000 km of hedgerows. Wall (2021) reports that a new pilot scheme will pay farmers up to £24 per 100 metres for establishing hedgerows is due to start by the end of 2021. What will need to be seen is how well these investments store carbon and help conservation."

18.7. Managing hedgerows for NbS

Monitoring, reporting and verification systems for carbon sequestrations in soils and hedgerows in developing countries must use be affordable and use accessible technology (Mikos and Radcliffe, 2011). Sampling for this as described by Crossland (2015) can be carried out by non-specialists. Summarising research involving citizen science contributors that compared urban and rural hedges in the UK Gosling *et al* (2016) said: *"Utilising the manpower of the general public enables scientists some additional capacity to study hedge habitats. Furthermore, educating the public about hedges and the plants and animals that use them can help to protect their future. Encouraging people to develop a passion for the natural world and recording, monitoring and protecting it is perhaps one of the best future-proofing techniques against further habitat loss that scientists can provide."*

Some interesting developments in this area include the use of new technologies such as Black *et al* (2014) who demonstrated the possibility of developing a cost-effective and efficient national hedgerow carbon inventory for Ireland using Light Detection And Ranging (LiDAR) remote sensing and terrestrial laser scanning (TLS) technologies. Katie Jane Parsons and Josh Wolstenholme (2021), both of the University of Hull propose developing a project that:

"…has been engaging with youth organisations to enhance their environmental and digital knowledge, whilst combining their input with state-of-the-art artificial-intelligence approaches. The open dataset created with public contributions will inform planting decisions whilst educating young people and citizens. The aligned education

programme will provide resources detailing how new planting will drawdown CO_2, reduce flood risk and increase biodiversity availability, ultimately fostering the participants as agents of change in addressing the climate crisis. Citizens will be trained in hedgerow surveying techniques, with focus on both remote sensing/geographic information systems applications (GIS) and field surveying - enabling contributions from home (during COVID) as well as encouraging outdoor activity and learning. Through a series of surveys and tasks, citizens are able to utilise a smartphone device (or similar) to contribute new data into an open survey on hedgerow characteristics, simple field experimental measurements and images/videos, all whilst utilising the GPS built into the device."

Both these initiatives produce accurate and up-to-date inventories of hedgerow structures. Furthermore, there can be a reasonable assumption that implementing these approaches now across wider areas could lead to options for further upgrading technologies in the future to monitor of carbon uptake and storage or other quantifiable parameters.

When establishing new hedgerows with the aim of gaining maximum co-benefits of supporting a diversity of birds and other species it is important to consider which endemic species will thrive best in local conditions. Many governments have agricultural or rural information offices to help advise land owners with lists of species such as that provided by Pirie (2020) for the Scottish Farm Advisory Service. There is also a government funding scheme[88], which is followed up with inspections to ensure that new hedgerows meet minimum width and planting densities along with, apart from the exception of beech hedges, they must include a diversity of at least three endemic species such as hawthorn, blackthorn, dog rose, holly or elder. This incentive was available for a few years, but to really make any traction with NbS to assist in decarbonisation then governments and other funding bodies must show committment for the long term.

[88] The details of this funding scheme for new or replanted hedges is available at: https://www.ruralpayments.org/topics/all-schemes/agri-environment-climate-scheme/management-options-and-capital-items/planting-or-replanting-of-hedges/#603451. However according to latest updates at: https://www.ruralpayments.org/topics/all-schemes/agri-environment-climate-scheme/management-options-and-capital-items/ the funding provisions for the Management or Restoration of Hedgerows and Creation of Hedgerows are not available in early 2021.

18.9. Bioethical considerations and concluding thoughts

Deep ecology, as proposed by Arne Naess and developed in works by writers such as Bill Devall and George Sessions, recognises that technological and industrial societies are the cause of any environmental problems. That instead of being conquers of nature we need to view ourselves as integral to nature. Therefore NbS is critical to restoring health to our sick world. Myers and Frumkin (2020) identify many overarching themes such as systems thinking, our relationship with nature and stewardship, reducing vulnerability and urgency. There is also an emphasis that ethical concerns necessitate consideration of future generations of people, equity within and across generations and genuine respect for all other living beings.

The establishment of urban hedgerows and restoration of lost rural hedgerows together with regenerative farming practices as described in Waller (2019) goes a long way to achieving a range of positive outcomes regarding carbon capture, halting the decline of biodiversity and producing an environment conducive to improved human health and wellbeing. Government financial incentives are just that – a useful tool to initiate such restoration. This chapter has illustrated some methods to engage the wider public in the subsequent management and monitoring of this local solution to the global problem. This participation is essential to enable more people to take responsibility for nature stewardship. In the past whole communities would work together to build monuments for their different religious activities. In the twentieth century stadiums for spectator sport fanatics and giant stages and halls to idolise musical stars became replacement foci for worship. The internet of the new millennium is leading humanity to a cyberworld of fantasies.

In a report titled *What near-term climate impacts should worry us most?* Quiggin, Townend and Benton (2021) repeatedly note that many current climate models and experts foresee imminent health impacts from heat stress, drought and flooding causing associated food supply problems in areas such as south and south-east Asia. The capacity for NbS, through schemes such as planting hedgerows, must be recognised as an imperative to include in strategies to reduce atmospheric carbon and limit the impact of climate change. The Gaia model suggests that our living planet has self-regulatory mechanisms akin to homeostatic systems in mammals. Evolutionary psychologist Nigel Barber (2020) commenting on Sir David Attenborough's documentary *A Life on Our Planet* drew this conclusion: *"Nature is*

capable of healing itself. It can be encouraged to do so while humans are still present on the planet, or we can wait and let it do so after our species goes extinct…"

Now the time is right for the humble hedgerow to bring us back down to Earth and draw us towards a greater spiritual awareness and appreciation of the wonderful creative, sustaining and healing power of nature. Without employing NbS, and working with nature rather than opposing it, we may be gambling on the future for humanity. With a relatively low cost, minimal risk of adverse effects yet with wide ranging and significant positive benefits to human health and nature as a whole – with high stakes at risk, hedgerows appear to be a safe bet.

18.10. Ethics

Ethics. Approval and consent for this work was given by The Provost, American University of Sovereign Nations.
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19. Ancient Solutions for Water Rejuvenation

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19.1. Abstract

The term 'bioethics' is a relatively a new concept coined to draw attention to that fact that rapid advances in science and technology and rapid industrialisation led to the degeneration of environment and its values. Hence, the principles of water ethics play a very important in maintaining a healthy planetary environment and will ensure promising health care in contemporary times. Our history had shown evidences that both floods and droughts were regular occurrence in Ancient India which led to water scarcity. Hence, every region had developed its own traditional water harvesting systems on the basis of factors such geographical and cultural uniqueness. This culminated into each region saving rain water for severe calamities. Various archaeological evidences suggested that Indus valley civilisation had magnificent systems of water harvesting and sewage drainage setup.

The best example of water engineering can be traced back to the settlement of Dholavira which laid down a slope between two water channels to store water. The natural slope of the land helped in storing the floodwaters of the river Ganga. The various traditional techniques of conserving water were: Jhalara, Talab, Taanka, Johads, Kund, Nadi, pond and reservoir systems etc. We need to understand that water is still in the same quantity on this planet. It has been misplaced due to climate change which resulted in frequent flood and drought across planet. Indian Kings understood the importance of water rejuvenation which can be seen clearly in the design of their forts and palaces.

We can adopt these methods to save water which sustains the growth and development of various on organisms on Earth. Rajendra Singh of Alwar district of Rajasthan also known as 'Waterman of India' has contributed immensely for water

[·]pp. 351-361 in *Planetary Health and Bioethics,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

management and conservation in the 21st century with the help of ancient knowledge. He and his colleagues devised several methods like storage tanks and check dams to save water through indigenous methods. Keeping his principles in mind, we can keep a cordial relationship with water to preserve it today and forever. The world has been scourged by the outbreak of Covid 19 which has led to acute shortage of water. There is an urgency to adopt a holistic and wholesome approach to save water and use it judiciously.

19.2. Water rejuvenation

Water rejuvenation is an important strategy to tackle water scarcity in India. This especially so due to global warming and climate change, with rainfall patterns changing frequently. The Indian government has started exploring the traditional methods of water conservation across the country as they are eco-friendly, being not just highly effective for people who depend on them but also works for the environment. The ultimate goal is to harvest every drop of rain whenever and wherever it falls.

It is evident from history that flood and droughts were regular occurrences in ancient India. This is the reason why every region in the country has its own traditional water harvesting techniques that reflect the geographical peculiarities and cultural uniqueness of those regions.

The practice of water conservation is rooted deeply in the science of ancient India. Archaeological evidence shows that cities of the Indus valley civilization had an excellent system of water harvesting and drainage. One such example is of settlement at Dholavira which recently accorded world heritage site by UNESCO. It is laid out on a slope between two water channels, and is a great example of water engineering. In his book *Arthashashtra*, Chanakya mentions irrigation using water conversation methods. Sringaverapura, near Allahabad, had a sophisticated water harvesting system that used the slope of natural land to conserve flood water from the river Ganga. Chola King Karikala built the Grand Anicut or Kallanai across the river Cauvery to divert water for irrigation (it is still functional) while King Bhoja of Bhopal built the largest artificial lake in India.

Evidence of stepwells dates back to the Indis Valley Civilization between 2500-1700 BC. Initially constructed as crude trenches, they slowly evolved into engineering marvels between the 11th - 15th centuries. In 2016, Stepwell Atlas, mapped the

coordinates of around 3000 existing stepwells in India. In Delhi alone there are thirty-two stepwells. Stepwells are multi-stories subterranean structures with significant ornamental and architectural features. They served as cool retreats for travellers as the temperature at the bottom was often five-six degrees lesser. Stepwells helped create friendliness in common spaces as well as providing water for communities. They are an ingenious system for rainwater harvesting and served as water reservoirs. Revival of stepwells could be a significant step in our fight to overcome water shortage.

The government emphasises the need to use India's historic water management systems for solutions to these problems. States can leverage new technologies to modify traditional water systems for local requirements. In a nation where 600 million people – around half the population – face severe water shortages daily, traditional water-harvesting solutions are a harbinger of hope. With India's water table rapidly declining, stepwells can help refill ground aquifers and harvest runoffs. With the starting of rainy season in India, millions of litres of water can be collected in just three months. The figures are incredible - one hectare of land can collect a million litres of water, even in Jaisalmer, which had the driest condition of the world. The city itself flourished despite receiving just 50 millimetres of rain in a year, thanks to harvesting every drop.

Regions had their own unique systems of water harvesting, based on catching rain and community management. Ladakh had zings, the Himalayan region had guls, Bihar had its ahar payne, Meghalaya had bamboo drip irrigation, Kerela had water harvesting structures actually built into the Ghats while Tamil Nadu had cascade tanks. Every region values its water conservation legacy.

Drawing upon centuries of experience, Indians continued to build structures to catch, hold and store monsoon rainwater for the dry seasons to come. These traditional techniques, though less popular today, are still in use and efficient. Here is a brief account of a few of the unique water conservation systems prevalent in India and the communities who have practised them for decades. This use was long before the debate on climate change existed.

19.3. Jhalara

Figure 1: A jhalara showing clear steps to reach water at different levels.

Jhalaras (see Figure 1), are typically rectangular-shaped stepwells that have tiered steps on three or four sides. These stepwells collect the subterranean seepage of an upstream reservoir or a lake. Jhalaras were built to ensure easy and regular supply of water for religious rites, royal ceremonies and community use. The city of Jodhpur has eight jhalaras, the oldest being the Mahamandir Jhalara that dates back to 1660 AD.

19.4. Bawari

Bawaris (see Figure 2), are unique stepwells that were once a part of the ancient networks of water storage in the cities of Rajasthan. The little rain that the region received would be diverted to man-made tanks through canals built on the hilly outskirts of cities. The water would then percolate into the ground, raising the water table and recharging a deep and intricate network of aquifers. To minimise water loss through evaporation, a series of layered steps were built around the reservoirs to narrow and deepen the wells.

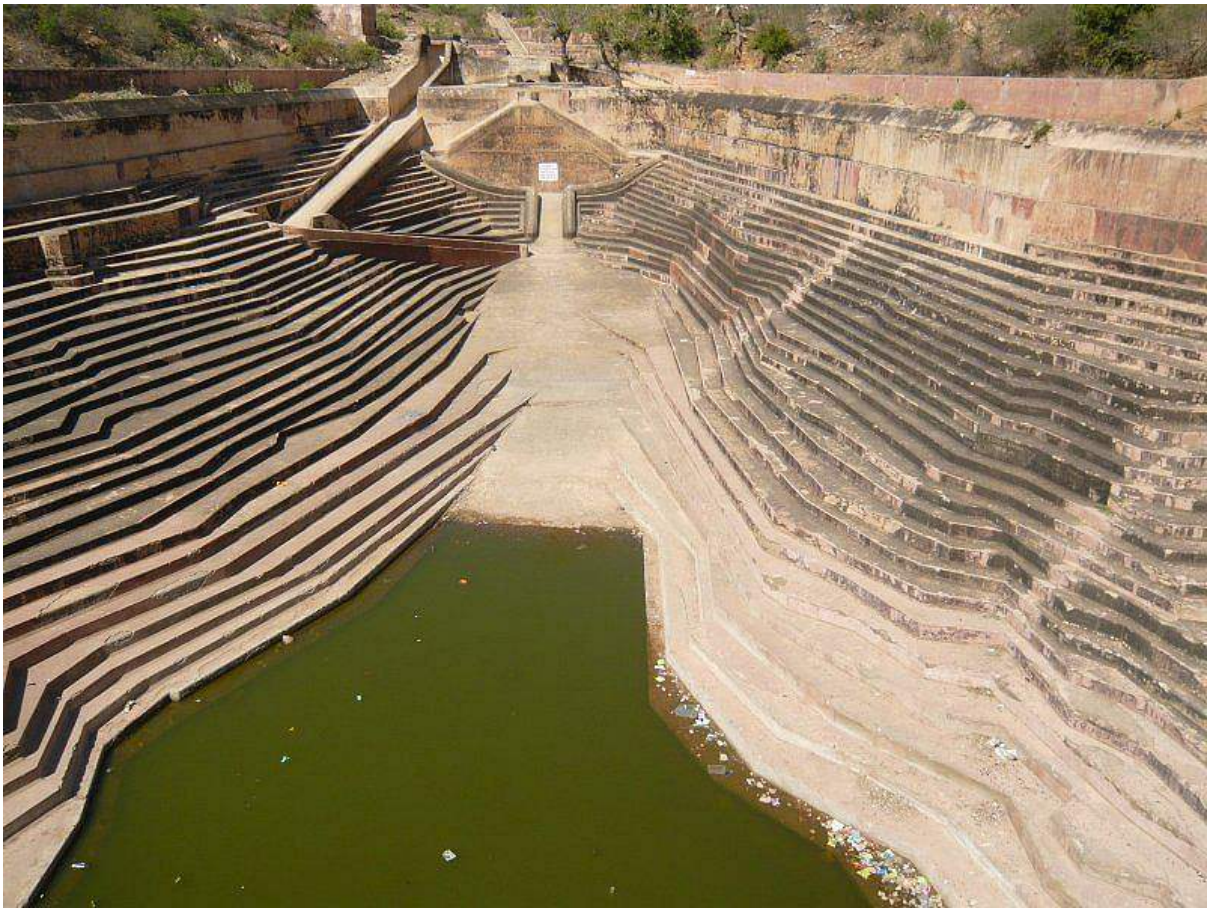

Figure 2: A bawari showing narrow terracing reaching deep into the reservoir.

19.5. Talab/ Bandi

Talabs are reservoirs that store water for household consumption and drinking purposes. They may be natural, such as the *pokhariyan* ponds at Tikamgarh in the Bundelkhand region or man made, such as the lakes of Udaipur. A reservoir with an area less than five *bighas* is called a *talai,* a medium sized lake is called a *bandhi* and bigger lakes are called *sagar* or *samand*.

19.6. Taanka

Taanka wells (see Figure 3), is a traditional rainwater harvesting technique indigenous to the Thar desert region of Rajasthan. A taanka is a cylindrical paved underground pit into which rainwater from rooftops, courtyards or artificially prepared catchments flows. Once completely filled, the water stored in a taanka can last throughout the dry season and is sufficient for a family of five or six members. An important element of water security in these arid regions, taankas can save families from the everyday drudgery of fetching water from distant sources.

Figure 3: The cover of a cylindrical taanka water capture and storage system.

19.7. Johads

Johads are one of the oldest systems used to conserve and recharge ground water. They are small earthen check dams that capture and store rainwater, which are constructed in an area with naturally high elevation on three sides. A storage pit is made by excavating the area, and the excavated soil is used to create a wall on the fourth side. Sometimes, several johads are interconnected through deep channels, with a single outlet opening into a river or stream nearby. This technique prevents structural damage to the water pits that are also called madakas in Karnataka and pemghara in Odisha.

Figure 4: A panam keni made from stems of the toddy palms.

19.8. Panam keni

The Kuruma tribe (a native tribe of Wayanad) uses a special type of well, called the panam keni (see Figure 4), to store water. Wooden cylinders are made by soaking the stems of toddy palms in water for a long time so that the core rots away until only the hard outer layer remains. These cylinders, four feet in diameter as well as depth, are then immersed in groundwater springs located in fields and forests. This is the secret behind how these wells have abundant water even in the hottest summer months.

Figure 5: A kund: traditionally made from lime and ash in some sandy regions of India.

19.9. Khund

A kund (see Figure 5), is a saucer-shaped catchment area that gently slope towards the central circular underground well. Its main purpose is to harvest rainwater for drinking. Kunds dot the sandier tracts of western Rajasthan and Gujarat. Traditionally, these well-pits were covered in disinfectant lime and ash, though many modern kunds have been constructed simply with cement. Raja Sur Singh is said to have built the earliest known kunds in the village of Vadi Ka Melan in the year 1607 AD.

19.10. Zing

Zings, found in Ladakh, are small tanks that collect melting glacier water. A network of guiding channels brings water from the glacier to the tank. A trickle in the morning, the melting waters of the glacier turn into a flowing stream by the afternoon. The water, collected by evening, is used in the fields on the following day. A water official called a *Chirpun* is responsible for the equitable distribution of water in this dry region that relies on melting glacial water to meet its farming needs.

19.11. Bamboo Drip irrigation System

Bamboo Drip irrigation system is an ingenious system of efficient water management that has been practised for over two centuries in northeast India. The tribal farmers of the region have developed a system for irrigation in which water from perennial springs is

diverted to the terrace fields using varying sizes and shapes of bamboo pipes. Best suited for crops requiring less water, the system ensures that small drops of water are delivered directly to the roots of the plants. This ancient system is used by the farmers of Khasi and Jaintia hills to drip-irrigate their black pepper cultivation.

Figure 6: An eri used in flood control enabling irrigation of crops during dry periods.

19.12. Eri

The eri (tank) system (see Figure 6), of Tamil Nadu is one of the oldest water management systems in India. Still widely used in the state, eris act as flood-control systems, prevent soil erosion and wastage of runoff during periods of heavy rainfall, and also recharge the groundwater. Eris can either be a system eri, which is fed by channels that divert river water, or a non-system eri, that is fed solely by rain. The tanks are interconnected in order to enable access to the farthest village and to balance the water level in case of excess supply. The eri system enables the complete use of river water for irrigation and without them, paddy cultivation would have been impossible in Tamil Nadu.

19.13. Ayurvedic Rejuvenation of Water

Ayurveda is an ancient Vedic Science of medicine that is very ecological in its core philosophy. Ayurveda is based on an understanding that the life on the planet is because of five key elements of life that are the building blocks of all life on the planet. These key elements are – fire, water, soil, air and cosmic energy. Now if we delve deeper into this philosophy, the five factors can be divided in to two categories – energy and ecology. Taking an understanding from here, we can translate Ayurved as the science of correcting or restoring ecology in water, soil and air, using the knowledge and energy.

19.14. Success stories

This Ayurvedic Technology of Restoration called "Cownomics©" is being used in India and has been showing a one hundred percent success rate in multiple types of scenarios, some of which are listed below;

1- **Motipur Kaai Lake, Rajnandgaon –** A lake with a daily inlet of sewage from the surrounding colonies had major algal bloom, massive foul smell with huge mosquito and fly populations. This created a significant public health issue due to vector borne diseases. This was restored within a month.

2- **Darripaar Lake, Janjgir –** A lake declared a threat to public health due to a massive microbial infestation in the water, causing epidemic diseases. This was restored in a month.

3- **Mowa Lake, Raipur –** A lake with almost half of the surface covered by waterweed, also causing itching and skin irritation from the water along with a foul smell, and huge mosquito and fly population. This also was restored within a month.

These three different case studies in different geographical locations had different problems, but had sewage, foul smells and mosquitoes in common. All of them were solved using the same Ayurvedic technology of water rejuvenation. This confirms the testimony and demonstrates the relevance of the technology.

India has a comprehensive water management system, but most of the traditional water bodies have become defunct. Reviving the stepwells will enable people to reclaim their traditional resources and spaces of community life. Bansi Devi, who rears cattle for a living in Rajasthan, has already noticed a change. "We had to walk for hours searching for water," she says. "Now I can use water from the revived *baoli* in my village for our domestic use and also for feeding and washing the cattle."

Gram Bharati Samiti (Society for Rural Development), a non-profit in the Jaipur district of Rajasthan, has carried out restoration work of seven stepwells in the villages of Rajasthan, providing around 25,000 people with a more reliable water source- "We have restored seven stepwells where ground water has been recharged and storage capacity has increased," says Kusum Jain, secretary of Gram Bharati Samiti. "Most stepwells can provide ample water for the daily needs of the villagers. It saw a unique coming-in of volunteers from different communities, exemplifying India's religious harmony."

The ecological rationality of these ancient Indian systems must be understood and blended with the challenges of today. The biggest crisis now is climate change. It will bring more rain with fewer numbers of rainy days-this means more flooding in cities. The only way to manage this is to increase the water harvesting potential of urban regions, with lakes, ponds and parks having such systems. Building this is quite simple. It requires you to plan for a pond and a catchment which must be kept clean, it makes you conscious of your local environment. And it requires community participation, from villages to RWAs. We must rebuild our relationship with water now. We can do this by respecting ancient India's wisdom.

These conservation methods are ecologically safe, traditional systems are viable and cost-effective alternatives to rejuvenate India’s depleted water resources. Productively combining these structures with modern rainwater-saving techniques, such as percolation tanks, injection wells and subsurface barriers, could be the answer to India’s perennial water distresses.

19.15. References

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20. Bringing participatory methods to soil science for diverse, global social soil communities

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20.1 Abstract

In recent years, soil science has seen a 180 degree shift from soil as dead matter to soil as a living community. The call for soil security is part of a larger call to ensure food security, while also being linked to biodiversity, energy, ecosystem services, and water security. This paper provides a short commentary on the rising significance and urgent need to look at soil governance with the local and community-focus in mind, and the impacts it has in relation to planetary health. The author recommends that social sciences be integrated into soil health research and restoration work as noted during the 2022 World Congress for Soil Science. This chapter is founded on an ongoing 2-year research project being conducted by the Soil Regeneration Project in Singapore.

20.2. Commentary

In recent years, soil science has seen a 180 degree shift from soil as dead matter to soil as a living community. Mycorrhizal relations, root systems, plant-soil interactions, and soil care are key areas of focus within an emerging transdisciplinary soil science community of practitioners, artists, scientists, social scientists, and farmers. Their work has equally brought urban policy makers and futurists into the discussion, with groups like the Soil Care Network in the UK, the Soil Doctors programme in Thailand, and the rehabilitation and remediation of polluted soils in Japan and Peru.

The call for soil security is part of a larger call to ensure food security, while also being linked to biodiversity, energy, ecosystem services, and water security (McBratney, et al., 2014; Thangavel & Sridevi, 2017). On one hand, it presents a

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challenge to systemically rethink the way food security is measured and managed. As 40% of arable land is now affected by degraded soils, stemming from urbanization and soil sealing, soil acidification, salinization, soil erosion, and soil contamination – practices of intensive farming – the pillar of industrial food production are being reviewed. Secondly, soil security intersects with measures of food security, including food security robustness (Teng & Morales, 2014). Regarding food security as conceptualised by the UN FAO (2021), soil security intersects with the dimension of food utilisation, in which nutrient availability and uptake are ultimately linked to human nutrition. Soil supports biomass production and its ability to filter, store, and alter nutrients in the soil (Lal, 2010 cited in McBratney, Field, & Koch, 2014). In policy terms, the consideration of soil has been embedded in the United Nation's (UN) Sustainable Development Goal (SDG) 15, and the UN Convention to Combat Desertification (UNCCD), linking soil governance to land degradation neutrality (Hannam, 2022).

Furthermore, soil security's link with human nutrition through the microbiome makes up a key part of planetary health (Berg et al., 2020). However, this may be a contentious issue that needs focused engagement via research and practice. Nutrition is a red thread that runs through the plant and animal kingdom, linking microbiota to macrobiota, and from there human nutrition (Hacquard et al., 2015). Plant secondary metabolites are used by plants to alter and communicate with organisms in their microbiomes, modify the rhizosphere, and animal health increases when animals ingest forages with different secondary metabolites, with implications for human nutrition (Clemensen, ry al., 2020; Pang et al., 2021). These close connections are threatened and boxed into commoditised containers with what critics call Big Food corporations' nutritional engineering and marketing strategies in the creation of ultra-processed foods (Scrinis, 2016, 2020).

Therefore, there is a strong need to focus not only on the "universal skin of the earth", that soil is seen to be as an objective measure. It is also critical to understand soil as it becomes used by people - growing, shaping, and changing, and soil as the aggregating function that holds people together as communities relearn to build destroyed ecologies from the ground up, literally. As knowledge of soil health's critical role enters the mainstream, the effects of 50 years of Green Revolution technologies utilising nitrate-heavy agrichemicals is becoming popularly known:

nitrates, as negative ions, leach out of soil because they are highly soluble and are repelled by other negatively charged oxide ions in soil. Proteins on the other hand, which organic matter is rich in, hold "larger molecules with nitrogen, carbon, oxygen and potentially with positively charged sites, [which] could attach to the particles and arrange themselves in the soil in a more stable way" (Brazil, 2022).

20.3. Importance

Food security across South East Asia– by ethical and definitional considerations—involves the search for synergies between similar farming systems and agro-ecological zones within the region. This involves synergising possible economic and logistical movement within the Association of South East Asian Nations (ASEAN), as an economic and regional grouping, and considering all forms of agricultural cultivation, distribution, and access: including urban farming systems, climate-adaptive systems like *taungya* in mainland Southeast Asia, and highland cultivation and organic rice paddy cultivation that integrate duck and fish co-cultures in similar areas such as southern China. Case studies of agroecological approaches that support socioecological systems are highly documented across Southeast Asia and the ASEAN economic region, and have increasingly become a focal point within the Food and Agriculture Organisation's (FAO) work (Ferrand and Le Jeune, 2018), along with recommended pathways for Higher Educational Institutes to include agroecology in teaching across ASEAN (Ferrand and Nelles, 2021a, 2021b).

Since 2012, the FAO Global Soil Partnership (GSP) has used a country-driven process to enable collaborative data consolidation and sharing. It's current work focuses on the mapping of soil nutrients and soil nutrient budgets at all scales, to build resilient agri-food systems. This builds on experiences drawn from compiling four earlier maps: the *Global Soil Organic Carbon Map*, the *Global Soil Organic Carbon Sequestration Potential Map*, the *Global Map of Salt-affected Soils* and the *Global Black Soil Distribution Map*.

The GSP addresses a key element of food security robustness: the creation of facilitated collaborations of knowledge and information sharing. This has occurred not through top-down global assessments, but by supporting "countries… in generating meaningful soil information themselves, ensuring both the sovereignty of national data and the effective bridging of global data gaps". Most of all, this approach

is distinct in overcoming data gaps and fragmentation "in a highly participatory way", where countries are "involved over the entire workflow, from concept development to final endorsement of the global maps" (FAO 2022).

While Singapore conducts and prepares these reports, knowledge of the potential for community gardens to play a significant role in maintaining or improving soil health, soil organic carbon, soil nutrients and carbon-nitrogen ratios, does not exist. We are therefore in the process of a 2-year research collaboration between the Soil Regeneration Project, a citizen-driven initiative and the National Parks Board's (NParks) "Community in Bloom" Branch, that works with community gardens, and the "Plant Science and Health" Branch, Soil Management Laboratory.

20.4. Bioethics

The need for the social sciences to be integrated into soil health and restoration work was noted throughout the World Congress for Soil Science (WCSS) in Glasgow (2022). The principle of interdependence and considering a holisitic as opposed to reductionist perspective engages directly with the bioethical relationship between climate, sustainability, environment, and people and society. Studies of microbial life are invigorating and completely changing the field of soil science as it becomes understood that relationships exist between organisms, and this makes up what we consider as soil. As such, bioethical relationships exist not only at the level of humans, but also within and across all human-plant-soil-animal interactions. It is thus not just that "agroecology is rooted in soils", but that soil is social.

Many unintended consequences have formed from the continued unregulated use of soils for agricultural and other purposes such as reductions in biodiversity and reduced net agricultural productivity. In the recent WCSS in Glasgow (2022), two Working Groups looked at the relation with Sustainable Development Goals (SDGs) - to see how sustainable land management is needed to enable land systems transitions. It was noted that with the burgeoning amount of information, it will be increasingly hard for the IPCC to give its recommendations. Instead, local verification and sense-making of information, as well as the ability to respond to and influence assessments through systematic reviews, are critically needed. According to Liu et al (2011) the principle of proximity is an environmental ethical principle that must be taken into account with communities that are most proximate: being the most

quickly affected, they should have an equitable share of any decision. Further, despite the interest in soil science research, practitioners noted that time heterogeneity makes it hard to implement the results of scientific study. The living lab concept was noted multiple times, as a place where research that is done with stakeholders, can make co-design and co-development part of climate change mitigation.

In addition, it was noted that while at least 84 countries have explicit agricultural soil organic content (SOC) goals, wetland or grassland commitments in land degradation neutrality (LDN) goals, and biodiversity targets, these are not reflected in many countries' Nationally-Determined Contributions (NDCs). Governance is therefore a major point that needs to be addressed, even while governments work towards improving data availability. Work on the mercury levels in former small-scale gold mining sites in Peru attested to the egregious nature of governance despite well-intentioned policy (Velásquez Ramirez, 2022).

The above concerns are explicitly highlighted by groups within the FAO. The Land Portal's data story of country case studies in Benin, Kazakhstan, India, Thailand and Argentina, show that "securitis[ing] the tenure of those living and using land within defined LDN project areas" is a key way to address lack of trust issues arising in informal arrangements between local forest officials and communities, where communites are asked to pay fees far higher than in formal management plans. A longer-term perspective is also needed beyond single LDN projects, "not just allowing for participants (particularly smallholder farmers) to receive the tenure security they need for their lands, but feeding into national dialogue on tenure" (Hayward, 2022). It is also noted that data availability can do little without engaging the local, to sidestep embedded power dynamics between powerful actors that seek to gain from top-down policy reformulations made in the name of vulnerable groups (Hayward, 2022). Likewise, FAO's HLPE has pushed for diverse knowledge systems that integrate indigenous and non-indigenous knowledge in a concept note released in October 2022, ahead of the COP27. What is clear across these discussions is the need for concerted support and investment in participatory land use consultation approaches. This makes it necessary to read country-based and regional strategies with this in mind. Similarly, scientists at the WCSS encouraged the use of means standardised methods as much as possible, choosing open data so others can use it, and participation in national scale expert-assessments. Other panelists noted the

importance of bringing soil science to the larger world through a nested approach where different fields could be studied together: be it social scientists and scientists, working across state and field levels.

20.5. Country case Studies

Several countries have taken a lead in creating national strategies for soil governance. Australia's National Soil Strategy is an attempt to create standards outside of Europe and North America. The European Union has announced a soil health strategy for 2030, to improve soils with cleaned waste materials and digestates, and have all soils in healthy condition by 2050. Ultimately the goal is to make protection, sustainable use and restoration of soils the norm. The policy also proposes to make a "comprehensive legal framework for soil protection granting it the same level of protection that exists for water, the marine environment and air in the EU. This proposal will complement the Nature Restoration Law and, ensure synergies with climate change mitigation and adaptation actions" (EU, 2021). The UK announced a Sustainable Farming Initiative in June 2022. However, the policies do not engage with the limits of governmental intervention in a field that involves individual ownership: by farmers and businesses. In the UK where about 70% of soil is owned by farmers, Ellen Fray of the Sustainable Soils Alliance reportedly "hopes that the government will now act to incentivise improvements in soil health, including monitoring. Current UK policies, including the Sustainable Farming Initiative launched in June, provide payments for some beneficial practices but 'the cost–benefit analysis is quite opaque', says Fray, and there is still no commitment to monitoring soil health." (Brazil, 2022).

The UN Global Soil Partnership has 194 FAO member nations. Its focus is not just maps, but also about training experts in the country to create their own maps. As noted by scientist Damien Field at the WCSS, "we need people who know soil, and who know of soil, and who are aware of soil. We need to decommoditise soil, and connect through value - through community awareness - connecting through practice through ethics and values in systems."

In this vein, Prapa Taranet of the Land Development Department (LDD) in Thailand discussed the Soil Doctors Programme in Thailand, which aims to use an effective extension system to minimize land degradation and ensure a good use of the

land. Soil doctors are smart farmers who help other farmers in the community to improve land and livelihood. This was established in 1992 by the LDD as land degradation was acknowledged by farmers. With few officials then, the department could not respond in a timely manner, and thus recruited outstanding farmers to respond. The department gradually built their capacity in soil science and related topics, and work in partnership with LDD to improve their own lands. This is now being scaled up to the Global Soil Partnership of FAO with training, educational material and soil testing kits to build capacity.

The Soil Doctors Programme views soil doctors as playing crucial roles as producers of food. Many Sustainable Soil Management practices are discovered by farmers or developed in partnership between farmer and researcher. Prapa notes that soil doctors may be land owners, which affects how practices such as the use of vetiver grass for soil erosion control and sediment traps are taken up. Land owners may make better long term decisions linked with land due to their vested interests, and furthermore, soil doctors may become a voice for others in their community.

20.6. Participatory Approaches

It remains to be seen how strong national policies can make a difference in who eventually reaps the benefits of policy work. Policy implementation also needs the network of trust that exists only close to the ground, for farmer role models who are influential within their networks, and cooperative farmer groups that can assess and adjudicate the diverse needs and functions of community lands that they care and depend on. Policy and science may be able to assess, but not to implement, without the essential role of trust and relationship. Participatory approaches are crucial in this regard. It is therefore possible to draw on the rich fields of community psychology, public health, facilitation work and NGO movement-building experiences that practise participatory methodologies at their fullest. To truly address the inequality, that is created through unequal access granted to different communities, research and practice needs to engage farmers, gardeners, and laypeople — and especially women who remain underrepresented in almost all levels of decision-making pertaining to land resources, agriculture, and management. Many of these people are direct supporters and maintainers of ecosystems, but are not necessarily termed “scientists” or “policy resource persons”.

As Waller and Macer (2022) note in the introduction of this book, planetary health needs ”to seek solutions and make recommendations to ensure workable strategies and policies are developed recognizing that declines in human health can lead to further environmental degradation in a downward spiral”; and that “In the face of ideology and vested interests that often seek to ignore, denigrate, and undermine evidence, the Planetary Health approach must seek to sustain advocacy.” (Foster et al., 2019).

20.7. Conclusions

Beside agricultural and forest soils, soil includes a wide segment of urban soil, which makes up the infrastructure of built environments, and is made and constrained by the built environment. Resource circularity has gained significance as companies seek ways of reducing input while using waste. However, the “zero-waste circular economy” is also critiqued for depoliticising the sort of global economic reform needed, for a sustainable economy to grow from the ruins of the current capitalist economy (Valenzuela and Böhm, 2017; Tsing, 2015). The technical and revolutionary language that circularity proponents use, enables only “weak circularity premised on notions of no limits”, neither addressing dependency-creation, nor the agency of countries and people outside the global North (Corvellec, Stowell, and Johansson, 2022). With the aims of food security oriented plans, the use and growth of available human and ecological resources today needs to be the focus. The far-reaching ethical implications of policy shifts and business interests, which include many of which cannot be foreseen from planners’ vantage points, mean strong, responsive networks, and distributed decision-making capacities, are needed. Regional food workers, gardeners, small and medium-scale farmers, and food eaters, all matter in the cultivation of current and future stocks of living, diverse, and popularly-used genetic resources—addressing food security in its 6 dimensions: stability, sustainability, access, availability, utilisation, and not least, agency (FAO, 2021; HLPE, 2020).

Research on urban soil builds on past research on urban green commons–including public-access community gardens and publicly-accessible private spaces–which have been established in supporting social-ecological learning for urban people, empowerment and the reorganisation of cities in periods of adaptive renewal, during release and reorganisation phases (Colding et al., 2006). Linking

these works to important advocacy that blend scientific and community insights is crucial to ensure a planetary health that is inclusive, livable, and just—with a vision of justice where the remediation of destructive, industry-sponsored technologies is front and centre, while protecting against impending corporate capture of biotechnological approaches pertaining to soil, agriculture, food and health, and forestry.

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21. Technological Systems and Public Health in a Post-Covid 19 World

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21.1. Abstract

Modern society derives its strength from the design of institutions and technological instruments. Expert systems and advances in science require a critical analysis. In our age, the imprint of culture is apparent in the tools that make possible the present way of life. It is important to emphasize that technology is meant to serve the public good – a moral claim that must extend to global health – which is a realization that is brought about by the coronavirus crisis. Vulnerable communities suffer from the lack of means to respond to the present public health emergency. The gaps are clear. By tracing the background of the development of modern civilizations, the hegemonic order of the world is revealed. This study explores how integrating modern technological systems into the moral and socio-economic dimension of the community can empower people in a post-pandemic world.

Key Words: *Technological Systems; Covid-19; Global Health; Post-Pandemic*

21.2. Introduction

In this new inquiry, the technological ramifications of the coronavirus pandemic to global health will be examined. Pandemics are widespread disease outbreaks that have killed millions in the past. Significant disease outbreaks recorded in history include "the Spanish Flu, Hong Kong Flu, SARS, H7N9, Ebola, and Zika" (Qiu et al. 2016). Pandemics have been described in terms of the severity of the disease, the rate of transmission from human to human, demographics, and the number of people affected. A hundred years after the deadly Spanish Flu pandemic that killed 40 million, an unprecedented impact to the global economy has been felt during the

·pp. 372 - 383 in *Planetary Health and Bioethics,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

Covid-19 pandemic. Experts, however, have doubts if the coronavirus crisis will bring down modern civilization. The reason is that present-day civilization is technologically sophisticated (Mackenzie 2008).

The order of things in the world cannot possibly allow a bitter ending to the way of life of the modern humans. Nevertheless, some scholars have described the current pandemic as a serious existential threat (Nayeri 2020). Covid-19 is less deadly but is more contagious compared to the previous human coronaviruses (Wang & Chang 2020). It is reported that the Covid-19 samples obtained from swab tests have high viral loads after hospital admission, while SARS-CoV viral loads peak at 6-11 days after the symptoms manifest, giving enough time to isolate people before transmission. The basic reproductive rate for Covid-19 is estimated to be 2.5 (Wu et al. 2020). The said findings from the literature indicate the urgency of vaccinations in order to re-establish the global economy. Without the vaccines, Third World countries will find it difficult to re-open, thus exacerbating global poverty.

Karl Marx (2013) begins his greatest work, *Capital*, with an explanation of the meaning of a commodity. A commodity is an object that possesses material value. In this way, a commodity is something that can be sold because of the pleasure or enjoyment that can be derived from such a good. The problem is not with any commodity *per se*, but the commodification of human labor. In his philosophy, Marx is reacting to the way the capitalist strips human beings of their value or worth by means of reducing them into objects or cheap commodities. Marx's reflections have had a great influence in the field of social and political criticism, including literary criticism through the works of Georg Lukacs and through the Frankfurt School, when it comes to the analysis of society and its defects. In this paper, the analysis of technology, human progress, and civilization takes into consideration the influence of Marx, whose insights lead us into the rejection of the idea that the world functions only in terms of the economic consequences of human action. In a large way, the pursuit of the public good in the midst of the Covid-19 pandemic should be guided by the principles of justice and equal dignity.

21.3. Technology, Human Progress, and Modern Civilization

Modern civilization involves technological progress. The invention of the computer chip preceded all advances in Artificial Intelligence (AI). The steam engine made

possible the economic growth and industrial progress of the 19th century. The many complexities of socio-political structures also accompany the economic development of nations. The nature of such progress characterized the ability of individuals to dominate and separate themselves from their natural environment. While Herbert Hodges (1947) focused on the way societies are formed or created, including the discoveries of things that helped the early settlers build a human habitat, a very subtle force is working in the background. Such explains how and why modern civilizations came into being. Technological power may be the missing criteria that Hodges failed to identify in his work. It is this power that determines the actual form and purpose of society. The same power is operative in terms of the capitalist-driven internet culture that millions of people embrace. Now with the advent of globalization the interconnectedness of countries is hastened by internet fiber-optic cables. The world moves because of the power of connectivity. Information is the dark matter that links everyone and makes everything possible in the internet age.

The advances in science and technology have created great wealth, but this wealth is not equitably distributed across the world. It is enjoyed only by a few powerful countries that control the hegemonic order in global politics. Unequal global structures influence policies on world trade and migration, including the management of health care systems, with the exception of Cuba. Development in modern medicine and medical research are the envy of the global poor, such as better health care systems and the improved lives of people in the First World. While billions of dollars are invested by the US, Japan, China, and the UK in research and development, none of that is happening in countries such as Malawi, the Philippines, or Bangladesh. For this reason, millions are left behind in the indicators for human development, e.g. health, education and longevity. However, the reasons for this cannot be blamed on the global poor. As a matter of fact, structural injustice is the common culprit when it comes to the inequalities suffered by people across the globe. This can be traced to colonial history whose impact persists due to the weakened internal structures in transitional democracies.

Samuel Huntington (1996) writes in the *Clash of Civilizations* that culture rather than the concern for the truth is the determinant of world history. The differences in the way people live, their values and moral norms, result in wars and long conflicts. People embrace a particular set of beliefs that guide their perspective on justice and

equality. Such a thing is not just epistemic. For Michael Walzer (1983), there cannot be a singular definition to the actual meaning of justice. The Rawlsian liberal tradition insists on the value of autonomy and respect for liberty as being the foundation to the basic structure. However, political theory's encounter with multiculturalism has changed the course of history. John Rawls (1993) recognized this in his *Political Liberalism*. Furthermore, the debate about culture and human freedom also extends to modern technology. Huntington believes that the development of humanity is due to the distinct values of peoples. Meanwhile, it can be argued that the tools people use help define their sense of identity and in this way, their outlook in life. However, as a heuristic device, our understanding of culture goes beyond anything technical. Culture plays a fundamental role to self-understanding. While it can be said that culture precedes modernity, new values also arise because of the influence of the introduction of modern devices and instruments.

Huntington (1996) also thinks that "spurred by modernization, global politics is being reconfigured along cultural lines." This means that peoples and countries who live by the same moral codes find themselves united by a common goal or enemy. The concept of the nation state, in this way, is a question of the technology of power rather than an account of old conflicts or political ideologies. A huge part of the modern technological era is the reality of powerful countries acting like overlords due to their hegemonic advantage. Liberal values are viewed as opposed to traditional beliefs. This is most apparent in the diversity of societies. The Cold War and the arms race that followed were a struggle for world dominance. In the long-term none of that mattered except possibly in the unresolved conflict between North Korea and the democratic South.

Modernity grounds everything on human reason. Modernity came with the advent of the natural sciences and subsequently the Industrial Revolution. That shift in the civilized world gave rise to capitalism and the concept of private property (Baines 2003). Scientific ideas are man's most significant tools. The modern man has forced his natural world to reveal its secrets for his own benefit (Tassi 1982). With science, man became able to predict, control, and utilize nature to suit his purposes. Albert Einstein's letter to President Franklin D. Roosevelt that revealed the theoretical possibility of making a powerful bomb by means of a nuclear reaction, subsequently that bomb ended the Second World War. Later, Robert J. Oppenheimer

was appalled by the destructive nature of the product of modern physics and many of the scientists involved in the Manhattan Project consequently campaigned against nuclear proliferation. Now, technological knowledge provides the foundation upon which our technological systems are built. Discoveries and inventions serve as the symbols for genius and ultimately, the triumph of science over nature. Capitalism took advantage of the same.

Max Weber (1992) explains how modern Europeans, through the protestant work ethic, have overcome the Dark Ages to emerge as a progressive civilization. Protestantism values the importance of life here on Earth. The Reformation in Europe challenged not only the power of the Church but also the will of God. Worldly success is increasingly seen as a true symbol of salvation. Europeans relied on the thesis that faith must be defined in human terms. The traditional Church authority is viewed as dogmatic. The protestant ethic implies that Europeans understood how to apply all of mankind's God-given talents to productive use. The point of such productivity is technological development. Every modern society has attained tremendous economic progress through its technological might.

However, the advances of modern civilization are now in serious doubt. Our modern systems are defenseless against the rage of a hungry world. The World Health Organization (WHO) has reported that 5.2 million children died in 2019 from preventable diseases even with the advances made in the modern science of medicine (WHO, 2020). The extremely poor are concentrated in the most depressed parts of the world, notably in Sub-Saharan Africa. The World Bank (2020) reports that around 600 million people still live on a daily income that is below two dollars a day. In countries such as the Philippines, urbanization has created greater problems because of the lack of basic provisions for the poor in the cities who live under the bridge, sleep on the streets, and are most of the time involved in petty crimes. Corruption in governments also contributes to the poverty of people. The lack of empowerment of the poor makes them an easy prey to various abuses and exploitation. While opulence is widespread, it is not actually equally shared.

One positive development in the last decade is the fact that China has lifted more than 700 million of its citizens out of poverty. China opened its economy to global markets and capital in 1980 while maintaining the communist grip on society and in politics. It was the work of one man, Deng Xiaoping. The Chinese premier saw how

Mao's *Cultural Revolution* impoverished China and understood the role of technology in advancing greater economic progress. Deng believed that a backward technology in agriculture was to be blamed for the lack of development of a country that at one time in history ruled the world in global trade. China, which is now the second biggest economy in the world, is using Western technology to power its many large factories. So, Deng welcomed capitalism. That position, however, in the mind of Deng, did not need to extend to politics and the controlocracy that was to define China long after he left office. Notwithstanding, two of the greatest trade-offs are the environmental problems that China is currently faced with and the alleged human rights violations that the Chinese regime has been accused of.

The success of Western nations may be partially attributable to a protestant work ethic, but their triumph also depended on a policy of domination that has exploited indigenous peoples and vulnerable persons. The technological gap makes obvious the massive disparity in terms of human well-being across societies. In the past, our foreign invaders only wanted land to settle in before they start to control the local population. In modern times, powerful states also want total or absolute control of the Earth's atmosphere. Climate change destroys the lives of the poor in the Philippines. Severe weather patterns actually devastate poor regions and places because of a lack of infrastructure. In fact, the affluent lifestyles of the people in the West have a serious impact on an already diminished condition of the poor in the Third World. The United States had refused to sign the Kyoto Protocol in 1997 because it did not want to curtail the acceleration of its vital industries. Recently, former US President Donald Trump withdrew from the 2015 Paris Accord, a move that was immediately rectified by President Joseph Biden on the very first day that he assumed office.

Today, the internet has taken over the modern world. Invented inside a war room, it is the true crucible of modern civilization. Thomas Friedman (2005) explained how big companies and capital ventures had invested in underwater cables to prepare for a future that was based on a mere click of a mouse. A man living in the confines of his house at the South Coast of the United States can rest assured that the Apple laptop he has ordered online will be sent to his home. The same gadget is being assembled in China under the supervision of tech engineers while most of its components consisting of semiconductor chips are shipped from a factory in the

Philippines or Taiwan. The internet, just like other wonders in the technological age, was born in the US. The United States of America is arguably the only remaining superpower in the world. America's biggest exports are not cars or machinery. Its greatest export is its culture. Its true power comes from the American culture. The way things are in the world is shaped by the American way of life. This includes the use of social media, Apple, Amazon, and liberal democracy. However, the world is waking up to a reality that exemplifies the troubles of the American way of doing things. That is not to say that it is always a bad thing to be influenced by Western culture. For many decades, the US has utilized modern technology to stay as the dominant influence in global affairs.

While modern technology propels nations to growth and progress, it also contributes to the great socio-economic divide among nations. Nothing is more obvious when it comes to the technological divide than in the area of health care. Advances in medicine are usually available in First World societies but the same cannot be accessed by the poor due to the lack of resources and a backward health care system. The problem is not only technological, but socio-economic as well. Some of the actors involved in the health care industry, even in developing countries, are focused on making profit first. This means that the marginalised segment of the society who is not able to afford the quality treatment that is available in modern, albeit expensive, hospitals. In practice these only cater to rich patients. Health care puts pressure on the budgets of national governments, but regrettably the budget priority for developing nations, in most cases, is debt repayment.

21.4. Technological Systems and the Public Good

People need to understand why uneven structures are apparent in every state and society. Herbert Marcuse (1964) explains that "human reason has been reduced into a closed operational universe of advanced industrial civilization with its terrifying harmony of human freedom and oppression, productivity and destruction, growth and regression." Marcuse thinks that capitalism dominates society by means of its technological devices that come to exploit and subjugate the human subject. Sweatshops, for example, deny the worker his or her true subjectivity or inner freedom. Man is reduced into an object that serves the purposes of industrial production. Human life is quantified and its meaning, reduced to the economic. The

curtailment of human freedom is most obvious in the way modern capitalism deprives workers the things that define a dynamic human existence.

Conversely, Marcuse also believes in the transformative role of modern technology. In this sense, it can be said that persons possess the capacity to critically analyze prevailing social pathologies and resist them to avert a catastrophe (Maboloc 2016). Every man plays an important role in the making and re-making of the society. Social media, for instance, is a useful political platform. In the Arab Spring, it had a major role in organizing protests that led to the toppling of dictators in Egypt and Libya. However, a caveat may be necessary considering that the Syrian Civil War has not been concluded even after the deaths of almost half a million civilians. Modern tools may be critical in the way societies confront our present-day challenges, but the decisions of people will matter in the end. Modern technology shapes the values of people and how social institutions can radically respond, rightly or wrongly, to the signs of the times.

Technological systems are about instrumentation. Andrew Feenberg (2000) has illustrated the distinction between "primary" and "secondary" instrumentation. The first refers to the basic technical function of our tools while the latter takes into consideration all the contexts of social relations with respect to the function of the device. Our devices are objects that are assigned a unique kind of role. Cellular phones are created to allow human beings to communicate to each other. The mobile device enables the process in which two individuals from a distance can truly interact. Secondary instrumentation, meanwhile, speaks about the type of goal that is not written in the gadget but is imbedded in society and its complex systems. It can be said, for instance, that technological objects are intertwined with the meaning of the public good. They can serve both political and social purposes.

By public good, we mean that type of good that is to the benefit of everyone in society. The goal is to be able to promote and protect the public good. For this reason, our devices have a role to play in the greater scheme of things. Feenberg believes that modern devices can be integrated into the socio-economic system of the community. As such, human devices are not just simple tools. Gadgets possess an intrinsic value that empowers people towards democratization in society. The internet can assist in performing such a difficult task. For example, automated elections could diminish the possibility of fraud during electoral exercises. Making government transactions

online should result in transparency and provide an efficient mechanism to reduce, if not eliminate, corruption. Societal interests, in this way, can be integrated into the devices we use.

Profit should not be the priority since the value of human life is what matters in this world. Modern technological systems must work with that moral goal in mind if humanity is to survive. The right motive in terms of creating and distributing any resource is the promotion of the good of humanity. When it comes to living in the time of this pandemic, online technology has proven its worth by enabling many people to do their work. Apps can serve in virtual interactions that unite people despite their diverse backgrounds. Apps can be considered as an enabling type of technology. Innovation is important. New systems should also reflect good values and help realize the moral requirement of the equal respect for human dignity. For instance, AI can help in keeping a factory worker safe. Modern robots and unmanned delivery devices can keep people away from the spread of a disease. Food factories can use robots in the processing of food to minimize the spread of infection. The employment of technological systems will require human ingenuity and henceforth, there will always be a need for physical bodies as part of the structural backbone of any industry. In the end, what matters is that people use the most efficient device that can both protect and preserve human well-being.

The pandemic has become a technological war with a moral consideration for the good of others, especially human well-being. We must realize that the Covid-19 vaccines will not be enough to put everything back to normalcy. What a vaccine can guarantee is improved protection of people through herd immunity. The protection of human beings entails huge costs on the part of governments. The private sector, including large pharmaceutical industries and big multinational drug corporations, will naturally want to profit from the vaccines. In this regard, there must be an ethical approach in terms of combating the virus. Vaccine research, as a modern technology, is not created outside nor stripped of its human dimension.

The point is, the vaccines must not become a tool for capitalists. Global cooperation must ensure that public health policies will serve the interests of justice and equality. Rich nations must put aside their national interests and consider as a priority the interest of all humanity. While capital markets can drive the price of any product up due to speculation, vaccines must be treated quite differently. The reason

is that the vaccine is created out of a moral necessity. Every pandemic is a moral crisis. This is because it involves a threat to the existence of people who, while aware of the risks and danger coming from the virus, still want to live their lives in such a way that appears as if they are oblivious to the suffering of others, including the reality of death.

Technological systems can shift the approaches to generating patterns of growth in human life. Modern diseases cannot just be dealt with like any enemy. Society must understand how a disease emerges. Society fights the malady in this respect using the power of integrated science. Science is not just about facts. Precisely, we want nature to open itself up to us so that we can have a better or fuller way of understanding human life. The coronavirus pandemic has not only killed people. It also threatens our way of life and the values that come with it. Consumerism is rooted in the desire of man to project an image of himself in which all the satisfaction derived from an object is equated to the meaning of human life. This pandemic has the potential to make us more mature, so that we can possess a deeper way of understanding human freedom.

The value of freedom is founded in the meaning of our humanity. We must be in solidarity with countless others in the world. The coronavirus has forced many people to reflect on what truly matters in life. What this pandemic has done for the world is to call our attention allowing us to take a pause in life and rethink how our lives in this world must proceed. For a long time the meaning of truth has been dictated by man's ulterior motives and plans. For the first time in modern history, experts realize that they cannot precisely calculate all the risks and dangers that could indicate a coming end to human life. For Daniel Mishori (2020), the strategies employed to address the pandemic are reflective of "extreme biopower" and the tendency of modern states to dictate the meaning of the concept of public health. The state has become an instrument that represses people and their basic freedoms. The role of experts has become a matter of imposition and not a question of legitimacy.

Everything that is good will take time. Individual responsibility is preferable to strict rules that deny people their capacity to choose. We have to recognize the suffering of others and choose to live our lives in the interest of the public good. The promotion of the public good is not just the job of the modern state. Individuals must contribute to it to make things work. The problem with modern politics is that it

reduces everything into self interest. It wrongly thinks that human life has meaning only in so far as one can make certain calculations. The purpose of human life is not just material. Precisely, it is about how we see, to the fullest extent, the value of our freedom. The coronavirus is teaching human beings the true value of life by reminding us that untimely death is possible even with the great medical advances that we can enjoy. Life, after all, is an emergency and suffering happens at random, but there has been no progress in human history when it comes to accepting these basic facts (Camus 1947).

21.5. Conclusion

Modern technology, human progress, and the advent of civilization are intertwined. The modern ways of man have also hastened the spread of the virus and by implication, the threat to a modern way of life. The virus brings into the open the internal weaknesses of even powerful states. While man has put so much faith in the power of technology, modern capitalism cannot save him from a post-modern apocalypse. This chapter has attempted to show what sort of world we must desire after the pandemic. Technological systems must adapt to a perspective that seeks not only a return to normal, but a way out of the unequal situations of people. Modern technology plays an important role in making our planetary systems sustainable in the future.

Public health is a moral concern. Modern technology must be open to better ways of doing things after the pandemic, including reforming unjust socio-economic systems. The management of health care should be fair. The coronavirus has made manifest the many inequalities of disadvantaged people at the margins of society. This powerlessness has tremendous implications on the meaning of the public good. It is unacceptable that poor people suffer from a malady when modern medicine has the tools to be able to deliver the human well-being. In this sense, modern technological systems must be designed or integrated to our moral aims.

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22. Environmental education and indigenous people

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22.1. Abstract

This paper introduces some of the features of environmental education that can foster a deeper understanding of indigneous peoples, and also apply wisdom from indigenous knowledge systems (IKS) into international cross cultural environmental education.

Keywords: *Bioethics, education, Indigenous People, Indigenous Knowledge*

22.2. From birth to death love of life is a gift

We directly enter the environment when we become a human "(in) being", and from that minute until the minute we pass away, our journey of environment education continues. Some of that education is informal and some formal.

The gift that we receive when we are born into this world is love. This is the essential human value for the 21st century, as it was for every century in the past. While love is a gift that few are deprived of, a deprivation that is in itself an insult to the humanity that our flesh embodies, it is a norm for all forms of life for the new life to be given a good start (Macer, 1998). The ultimate gift that we can share with others is also love.

Each human person is composed of about 100 different species, and at least 17 of these species are the same between all human individuals. Our world is diverse with more than 10 million species, and more than 4 thousand indigenous groups. This linguistic, cultural, and religious diversity is a great resource for education, yet it is generally underutilized.

Indigenous Knowledge Systems (IKS) are critical, and we have to ensure they survive and the wisdom is applied in many areas. De-colonised educational

pp. 384 - 391 in *Planetary Health,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

curriculum is valued in all wisdom traditions. It can continue to shape a healthy spirituality for humankind. Diversity and pluralism can be rejoiced.

Disaster Ethics is part of Environmental Education – We have been warned about threats such as tsunamis, deforestation, floods, weather and fire, for example. Tsunami warning stones were placed on the sides of hills to indicate where the waves reached and warned future generations not to build below the stones because of future tsunamis. These were intended to be open data.

22.3. Diversity is critical for education

We need to acknowledge that we can look at things in different ways and reach different conclusions. Sometimes the objects are the same and sometimes they are different. One of the lessons of indigenous knowledge is accepting that we are one with Nature. How can we move to True Love and Environmental Conservation? The International Covenant on Civil and Political Rights and the International Covenant on Economic, Social and Cultural Rights starts: *"All peoples have the right to self-determination. By virtue of that right they freely determine their political status and freely pursue their economic, social and cultural development."*

How can we apply this as we attempt to de-colonise education? I prefer not to use the term "post-colonial" as there are very few spaces where the colonizers have actually left! So hopefully we can educate the descendants of both colonizers and indigenous peoples, and all, in a holistic approach that derives from our living in nature.

We can also ask whether universal ethics is even desirable. Different societies have different goals, as do different people. This diversity is to be valued, and at the outset it must be made clear that the type of universal ethics that is being discussed in this book is one that will maintain diversity. If our capacity for diversity was lost it would not succeed.

Diversity is part of what we call being human. It is what could be called an integrated cross-cultural approach to ethics. We should never expect all people to balance the same values in the same way all the time. Nevertheless, there are numerous benefits if basically similar values, or principles, can be used by all people and societies, and harmony and tolerance are two. Protecting our world is even more a common value (Macer, 1994).

Even if universalism is not possible, all would agree that tolerance of cultural diversity is generally welcome. The limits to tolerance are already broadly outlined in international covenants such as the Declaration of Human Rights, and the International Treaties against abuses of human rights. One of the basic factors is whether groups with little power are oppressed, in which case the international community may attempt to restore order. There are also international treaties on environmental protection outlining some of the limits of damage to the common environment that will be tolerated by other countries, such as the convention on ozone-damaging chemicals, and on deep sea dumping. We also have economic treaties, such as GATT, defining the limits of unfair trade. However, as will be discussed later, economic priorities conflict with environmental protection, and we need better resolution of this conflict in practical bioethics.

There are diverse ways to approach ethics and a whole field of research in bioethics celebrates this (Macer, 1998).

1. Descriptive ethics is the way people view life, their moral interactions and responsibilities with living organisms in their life. Studies suggest that most people, including most indigenous people, balance ideas such as Loving good, Self-love, Love of others, and Love of life, in a relational based bioethics. In other words, we balance ideals of: Doing good versus Not doing harm, and Individual autonomy versus Justice to all. There is a long heritage of different ways of balancing these ideals is seen in biology, medicine, society, and religion..

2. Prescriptive ethics is to tell others what is ethically good or bad, or what principles are most important in making such decisions. It may also be to say something or someone has rights, and others have duties to them. We accept different laws in different countries.

3. Interactive ethics is discussion and debate between people, groups within society, and communities. Such dialogue skills are necessary to live harmoniously with others. We can we discuss diversity without judgment, but with mutual respect, and simply to learn from each other in a spirit of indoegnous communitarism.

22.4. Examples of Goals of Education

In education we need to consider a variety of viewpoints from anthropocentric, biocentric, ecocentric and/or cosmocentrism (Rai et al., 2010). The pursuit of a good life is a goal that all persons can hope for. A good life (eu-bios) should be understood in a holistic sense, and is clearly more than just a contented life, free of want and fear (Macer, 2022, Chapter 12 in this volume) . Let's consider two action plans for education. :

1) Regional Action Plan for Bioethics Education in Asia and the Pacific (Seoul, 2006, mainly agreed by academics convened by UNESCO and Eubios Ethics Institute)

Goals of Bioethics Education in Action Plan of UNESCO Conference in 2006 in Seoul…

Research has shown that there are a number of goals of bioethics education including:

a) Knowledge

- Developing trans-disciplinary content knowledge
- Understanding the advanced biological concepts
- Being able to integrate the use of scientific knowledge, facts and ethical principles and argumentation in discussing cases involving moral dilemmas,
- Understanding the breadth of questions that are posed by advanced science and technology
- Understanding cultural diversity and values

b) Skills (capacity building in skill acquisition should be multi faceted or many sided). The goals include:

- Balancing benefits and risks of Science and Technology
- Being able to undertake a risk/benefit analysis
- Developing critical thinking and decision making skills and reflective processes
- Developing creative thinking skills
- Developing foresight ability to evade possible risks of science and technology

- Developing skills for "informed choice"
- Developing required skills to detect bias in scientific method, interpretation and presentation of research results

c) Personal moral development

- Understanding better the diversity of views of different persons
- Increasing respect for all forms of life
- Eliciting a sense of moral obligation and values including honesty and responsibility
- Being able to take different viewpoints to issues including both biocentric and ecocentric world-views rather than only anthropocentric perspectives.
- Increasing respect for different people and culture, and their values
- Developing scientific attitudes, reflective processes, and an ability for holistic appraisal, while not ignoring the value for reductionist analysis.
- Gaining knowledge about bias in the interpretation and presentation of research results, benefits and risks of technology and bioethical issues, and how to detect bias
- Exploring morals/values (values clarification)
- Promoting values analysis and value based utilization of our scarce natural resources

2) Thinking for the Future: An Action Plan for the promotion of philosophy teaching in Asia and the Pacific (Manila 2010, Ministers/Ministries of Education + Academics)

The goals of philosophy education include:

a) Understanding and a search for wisdom.

To this end it encourages:

- Development of trans-disciplinary knowledge
- Clarification of concepts
- Enhancement of the ability to integrate knowledge, principles and argumentation in rational discussion

- Understanding the power of questions
- Broadening intellectual horizons
- Knowledge of cultural values in different communities
- Search for meanings
- Living a better life

b) Development of capacities for:
- Quality thinking and reflective processes
- Wise judgment and decision making skills
- Formulating appropriate questions
- Creative thinking
- Foresight
- Reasoned choice
- Interpretation, construction and communication of knowledge
- Respect for reasons and evidence
- Better understanding of reality

c) Development of a disposition to:
- Use knowledge and skills for good
- Increasing respect for all forms of life
- Take into account the interests of others and the environment in the spirit of solidarity
- Have empathy and compassion
- Be tolerant, inclusive, and reasonable
- Understand better the diversity of views of different persons (listen to others)
- Respect different points of view, people and culture, and their values
- Reflect upon values
- Consider alternative possibilities and world-views
- Build and improve other virtues

22.6. Evaluation and Resources

Developing evaluation methods for effectiveness of bioethics education is urgently required in many dimensions such as: knowledge, skills, and personal values. There

is a need for needs to be continued research on into appropriate assessment methods for the curriculum, as well as research into appropriate assessment methods for student learning outcomes, and research on appropriate assessment of practices including student, professional and public attitude towards bioethical issues (Macer, 2008). Evaluation should be authentic, comparative and ongoing to give a better estimate of the way bioethics is received in each group. Rather than being dogmatic we need to rejoice in diversity and reward the use of wisdom from many sources.

Over the past two decades I have been coordinating efforts to gather the collection of free and open teaching materials in different languages, in the book, A Cross-Cultural Introduction to Bioethics (Macer, 2006). These are available in a dozen languages including English and some are in Spanish. The files are available in MS Word so teachers can modify for each culture and class. A number of efforts have been fruitful over the past fifty years as we encourage more environmental ethics education (Baker et al., 2019).

A recent project is to develop a SDG Curriculum for Sustainable Development *https://www.eubios.info/sdg_curriculum_resources*

The Sustainable Development Goals (SDGs) are a collection of 17 global goals set by the United Nations General Assembly in 2015 for the year 2030. The SDGs are part of Resolution 70/1 of the United Nations General Assembly, the 2030 Agenda. The goals are broad based and interdependent. The 17 sustainable development goals each have a list of targets that are measured with indicators. There are 169 targets for the 17 goals. Each target has between 1 and 3 indicators used to measure progress toward reaching the targets.

Partner Organisations for the SDG Curriculum project are: Accredited Universities of Sovereign Nations, American University of Sovereign Nations, USA, Eubios Ethics Institute, Japan, New Zealand and Thailand, International Peace and Development Ethics Center, Thailand, Sikh Human Rights Group, UK, and the DST-NRF Centre in Indigenous Knowledge Systems, University of KwaZulu Natal, South Africa. More are welcome.

22.7. Conclusion

How do we form a loving and mature society full of well informed and balanced persons? Bioethically mature means a person, or a society that can balance the

benefits and risks of alternative options, and make well-considered decisions, talk about it, and love!

Our Oneness with Nature is the True Love that is a foundation of Environmental Conservation and Action together. Bioethics truly is the bridge to the future (Potter, 1971), the foundation of human responsibility to plants and animals (Jahr, 1927), and is the result of our love of life (Macer, 1998). We still have so much to learn from indigenous peoples and practices.

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23. Teaching to nurture nature in Education, Health and Environmental Education for Planetary health

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23.1. Abstract

The planet Earth has its own splendour and beauty and a myriad of species, with its flora and fauna. Teaching students about the environment is essentially from a scientific perspective. Teaching occurs in separate disciplines of health, environment and education more from a scientific perspective without integrating the affective human dimension. Our relationship with nature is presently experienced as one of separation because of the way we perceive knowledge about nature. Three important aspects are discussed within the framework of Education in Human Values Program. They are; *Relating to Nature; Valuing Nature; Being with Nature.* When human values (UNHABITAT, 2006) (love, peace, non- violence, right conduct, and truth) are the basis of the foundation for facilitating environmental education, transformational teaching takes place. Political agendas, government policies and public offices are more rigid and the breakthrough for transformation is complex and challenging while education has the potential to foster stewardship for the environment.

Findings of a study of a Human Values based Water, Sanitation and Hygiene program implemented by the United Nations Human Settlements program (UNHABITAT) in cooperation with the Society of Preservation of Water implemented in few Southeast Asian countries are reported. The findings revealed that teaching for the environment goes beyond separate disciplines and has to involve head, heart and hands. There has to be significant changes in the way we teach for the environment which can result in permanent awareness about caring for the environment. Students' attitudes, knowledge and skills have to go through various processes such as receiving, responding and valuing, thus transforming students' affective processes

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to bind their connections with nature which can bring significant transformation in their attitudes, knowledge and skills.

Key words: Human Values, Spirituality, Environment, Nurture, Nature

23.2. Introduction

Jacques Delors highlighted the four pillars of learning in his speech held on 7th November 2011. They are; *Learning to know, Learning to do, Learning to live together and Learning to be*. It is important according to Delors that students have to learn discriminative or judgement capacity; to choose between *"singular or universal, tension between tradition and modernity, between the spiritual and the worldly"* (Delors, 2011, p.326). The spiritual aspects of nature and the self are rarely visited in formal educational curricula and our interconnections with nature have therefore taken a different trajectory as is reflected in today's conditions with the environment. From a historical perspective the most common factors perceived with man's interactions with nature was *"human situations-namely culture, cultural arrangement, humans, human activities, physical environment and living environment"* (Boyden, 2004, p. 32). *"The biophysical changes that are rapidly taking place are across six dimensions; disruption of the global climate system, widespread pollution of air, water and soils, rapid biodiversity loss, reconfiguration of biogeochemical cycles, including for carbon, nitrogen and phosphorus, pervasive changes in land use and land cover; and depletion of resources including of fresh water and arable land"* (Myers & Frumkin, 2020, p. 7). The earth has interlinked components in the ecosystem with exchange of energy and matter (Rao, 2004).

The main focus of this chapter is on our interconnections with nature. The life giving earth has not been recognised for what it is worth because the *self* or the human cognises the external world objectively. Our interactions with nature start with our relationships with nature. There are three factors that provide our continuous relationship with the environment;

- Relating with nature;
- Valuing Nature
- Acting with responsibility as Stewards of nature and "Being" with nature

23.3. Relating to nature: Self and the Inter- Connections with Nature

This section explores the importance of learning about the self and the mental health benefits that one can attain from being in close proximity with nature. Our existence and connections with planet earth starts from a young age and our pleasant memories are not related to experiences of a single object but we think in terms of contexts such as a day by the riverside, or a visit to the part, or our trekking experience. A scene set in the sunset involves the setting Sun, trees or oceans and possibly the wind, thus encompassing a number of elements together. Sometimes our memories remain as visual images of our interactions with nature as we watch with awe the beauty of a flower or a butterfly. Children enjoy nature as it is their innate nature to explore, be curious and to learn. They enjoy and experience nature before they are join formal classroom education to take part in activities to conserve and protect the environment.

Our relationships with nature are both experiential and reflective, combined with a feeling of inter-connectedness. Our health depends on the health of the planet. Our knowledge of the environment is contextual, cultural, traditional, spiritual and emotional which are all human dimensions of nature. Educational contents for the environment include the historical pasts, present and the future predictions of the earth which has a lot of information but they cannot transform us. Learning is on-going as our social realities change around us. Thus many years of accumulated wisdom have their roots in culture, languages, religion and history of the world. If the future generation is to value the environment, it is important to note that the self-nature connections have to be valued as a significant aspect of schooling. In essence, protecting nature protects our health and learning about the environment remains life-long, depending on our social realities and does not commence and terminate at the Institutional phase. Children learn by listening, observing, imitating when they are young (Boyden, 2004). Historically, Boyden reflects on the innate conditions of mankind which were part of human life such as;

- Individuals were part of a care giving, care receiving network
- Conviviality was a feature of everyday experience
- There was considerable variety in daily experience
- There were continual changes of interest taking place in the environment
- Most people were regularly involved in creative activities and most of them practised learned manual skills everyday

- All people experienced a sense of personal involvement and sense of purpose in daily activities
- Most people experienced a sense of belonging to a community and to a physical locality (Boyden, 2004, p. 17).

Children are able to reconnect their whole self with nature and learn to admire and be in awe through their natural curiosity. However, the increase in urban living has decreased the frequency of being intimate with nature.

23.4. Contemplative practices and expansion of the self or being

According to Vedanta philosophy as explained below by Mishra (2019) there are three types of sheaths; *Anatomical sheath,* the physiological, psychological and *intellectual sheath* and the *spiritual sheath*. The physical or anatomical sheath is our biological body which depends on the larger environment. The next is the respiratory, circulatory, endocrine, excretory etc which enable the functions of the body. The mental sheath or the third sheath is related to our subjective experiences including awareness, feelings and motivations. The fourth sheath is the intellectual sheath which is the basis of reasoning and judgement. The final sheath is the experience of being aware of oneself (Mishra, 2019). The physical being is dependent on the environment for nourishing itself so that it can sustain life and hence our dependency on the environment cannot be questioned.

The process of observing nature, receiving the information, analysing, synthesising the experience and evaluating the process of their value positions and the values inherent in nature, and responding to the values by understanding and accepting the values will help students to value nature and take responsibility.

In human personality intelligence is the only factor which depends on knowledge, that seeks to know more and be fulfilled by it (Tirtha, 2011). The distance between the mind and intelligence causes a divergent of what the mind approves of and they become obstacles to three emotions; love, hatred and fear (Tirtha, 2011). Such a mind cannot work harmoniously with the world around it. That is why spirituality helps in integrating the mind and our purpose of life (Thirta, 2011). We use intelligence to discover and innovate and is employed for external purpose (Thirtha, 2011). There is limited interest in people to explore how the mind

works. The mind can respond to what is needed without prejudices if the mind allows to (Tirtha, 2011).

Hence expansion of the mind is expansion of the self (Tirtha, 2011) which is enabled when one is interconnected with nature He also stated that religious pursuit guides one to search for god whereas spirituality helps to bring an inner growth and is no more distant to the individual. Spirituality helps the mind to generate a sense of fullness. This inner sufficiency once cultivated gives a person the sense of fulfilment and does not demand materialism to fulfil the needs and desires (Tirtha, 2011). Clugston (2002) emphasized on the need to engage in contemplative practices and experience our interconnectedness and interdependence with the living world which encompasses cultures, animals, agriculture, seasons and the "unfolding cosmos" (p. 168). Contemplative practices have become a major necessity for the general wellbeing of students.

23.5. Relating to nature

Students can be trained to increase their awareness using nature (outdoors) or in classrooms using visualisation techniques. These exercises and students' value positions have enabled students and teachers to elicit and reinforce the values of love, peace, truth, right conduct or actions and nonviolence, through discussions of how nature sustains our living and the interconnectedness of various systems. Arne Naess, a deep ecologist philosopher, stated that a relationist perspective is important and he considers himself as a stream and hence is able to adapt to make small changes compared to a fixed position (Naess, 2000). Arne Naess's engagement with environmental matters was on the foundational value of 'gratitude' (Arne Naess, 2000). The inherent nature of the self is similar to the values that hold the Earth together, one which is harmonious and organised.

Malik explores the fact that the world which we experience is;

> *"that same whole become aware if itself, what corresponds to it therefore are simply prior phases of its own development. These go beyond sentience for the very reason that sentience has revealed itself as the form of the body, the reflection and registration of organismic activity, integral to the biosphere and rooted in a physio-chemical environment. The object of the mind is, therefore, its own self in becoming, and the subject is no less than the world come consciousness of itself.*

> *Subject and object are identical, and fact corresponds to theory just so far as the theory is what the fact itself has become in bringing itself to consciousness. This conclusion reveals itself in reflection upon science and experience in general at the philosophical stage"* (Malik, 1995, p. 51-52).

A science class teacher who teaches chemistry, biology, physics and mathematics components does not touch on the purity of water in their own local contexts and its life giving quality. The reductionist analysis of its chemical or physical properties is likely to miss the greater whole of the vitality associated with something as essential as water.

Ancient teachings teach us of stories of a saint who praised with high awareness of the different elements in nature and his narration was as such;

> *"I bow to you who is manifest as this earth, the fifth element in creation; as water that flows to sustain all, the fourth element; as the third element, fire, the second element, wind and the first element, akasa [ether]". (Taittiriya Upanishad). "All entities therefore from molecules to human beings, and on to social system – can be regarded as wholes, in the sense of being integrated structures, and also as parts of larger wholes at higher level of complexity"* (Rao,2004, p.42).

Systemic thinking is embedded in such narratives of the science of formation of elements. Malik (1995) studied the observations made by man on evolution and the fine balance between the elements and the environment. Evolution, according to Malik, is a process of co-creation of the organisms with the environment (Malik, 1995). Every ecosystem is not independent by itself but is linked to larger systems just as the earth is to the stars and galaxies (Malik, 1995). There is inherent intelligence in the Universe or otherwise scientists and observers would not be able to validate their observations (Malik, 1995). When there is observation and refection, there is a possibility that it can reveal our nature as explained by physicists who assert the oneness of the Universe and its origin from the big bang (Malik, 1995). Malik compares this to a universal morphe which regulates itself and the fields it encompasses (Malik, 1995).

Our memories therefore provide a gestalt experience, but our knowledge remains in fragments as we look at the extrinsic worth of plants and trees, dividing their worth for each part of nature according to the value they provide us. These anthropocentric perspectives have allowed humans to conserve and preserve plants

as they have become part of our cultural and traditional heritage. With internalised values, humans are able to protect and care for the environment rather than preserve the environment because of our dependency on it. There are declarations made by large agencies on the protection of sustainable resources because of their depletion which stems from an anthropocentric view.

When nature is seen as apart from us, the integration of values in subjects can enable teachers to facilitate moral reasoning patterns based on a higher set of values such as love and care (UNHABITAT, 2006). Students can then tackle a number of problems such as inequity, food wastage, wild life trade, and other rampant issues. Integrating values in issues enable students to reason and take value positions without imposing on their opinions so that they can internalise facts, knowledge and skills to solve issues (UNHABITAT, 2006). Integration of values in the subject helps students to understand dependency of life on nature and the importance of maintaining the quality of the environment. Unfortunately, environmental issues are discussed without connecting learners to the larger biodiversity of species, the transitional features of earlier beauty of landscapes and the excitement and mystery of playing with natural elements.

23.6. Inculcating the sense of care in students

Speaking of caring for children, Noddings stated that "If educational institutions take effort to help "maintain and enhance" a sense of caring for them, all possible practices to be examined without assigning the nurturing of caring to one or more institutions (Noddings, 1984, p. 172-173). Questions which arise in every aspect of human life have to be addressed in a combined effort by every teacher, parent, and anyone who is part of their lives (Noddings, 1984). Noddings reflects the relationships between the carer and the cared for during teaching moments and explains this as an essential feature for education and every other aspect of a child's life (Nodding, 1984). The process of caring is inherent in children as demonstrated in their lives during play and in games as they imitate adults.

David Sobel has elaborated on the importance of students relating to nature during their early childhood. He elaborated on the need for movement and direct experiences students have to have so that they enjoy walking, jumping and playing around (mind-body link). They are able to live with their imaginative stories in

nature, reconnecting with the trees, rivers etc and not study them but learn to experience them. Care givers can show how to care for the environment so that they learn to have a natural empathy for animals. The sense of space and learner's exploration of things, love for objects, constructing things (miniature objects from twigs and stones) brings out a sense of challenge, excitement and accomplishment as they reconnect with nature (Sobel, 2008).

The cultural and religious practices provides the significance of how communities protected and conserved water in their own spaces. Teaching students to value water in various cultures and significance of water in all religions help them to value nature (UNHABITAT, 2006).

Teaching students to care for the environment is relating students to learning skills and internalising values such as patience, time, effort, sacrifice, love, responsibility, accountability and responsibility. The curriculum does not address these values in normal teaching unless the assessment or evaluation includes the affective components or the teacher cares for the environment.

23.7. Valuing Nature

Value concepts are experienced, filtered through affective processes, motivated and prized and acted on. Affective - emotional processes are involved in valuing nature. When values are internalised, the learner has been able to respond to the five stages as stipulated by Krathwohl's taxonomy (Krathwohl, Bloom & Masia, 1973). They are; receiving, responding, valuing, organisation, characterisation by value set (Krathwohl, Bloom & Masia, 1973). Intrinsic motivation is an important affective process (Russ, 2011). This dimension helps to involve cognitive and affective personality functions which are embedded processes within the act (Russ, 2011).

23.8. Internalising Values

The solutions to the problems with the environment or nature lie not in technical solutions but in the spirit of how man conducts his or her actions.The provision of water in developing countries is often initiated by many non-governmental agencies globally. Access to water by many needy people has been addressed as follows:

> *"Many services run on a shoestring of hope by volunteers, religious groups, or dedicated, poorly paid officers succeed because they mobilise the enthusiasm and*

> *engagement of their communities, while other projects backed by extravagant budgets and massive expertise turn to dust in a bureaucratic desert that stifles individual and community spirit….The Millennium Development Goals themselves are built around a shared understanding of what we as human beings owe to one another and are informed of the principles of fairness, justice and the obligation of the individual to pursue the mutual good that characterises religious and ethical systems the world over."* (UNHABITAT, 2006, p. 15)

A study was conducted in Thailand on the implementation of a Human Values based Water education program in 2009-2011 which was reported in "Sustaining the Blue Planet: Global Water Education Conference, 13-17 September, 2011. On page 66 of this report the HVWSHE program was validated due to its implementation in parts of Southeast Asia (Dzikus, 2011). A study conducted by Parahakaran (2013) in Thailand using Human Values based water, sanitation and hygiene education program which used Jumsai (2003) model for communities had inspired several teachers across Thailand, LaoPDR and Indonesia. The model is used to sensitize human factors such as love, peace, non-violence and truth in humans across any cultures. When interviews were conducted with teachers, several affective processes were activated. The team that worked on the United Nations Millennium Project identified both Human Values and Human Rights as the foundation for achieving the targets on water and sanitation (UNHABITAT, 2006, p. 15). According to the report, when people need access to water and sanitation it is a moral and ethical imperative. It is not solved by just technical expertise or financial resources because they rest on the motivation and qualities of many people. In addition the expansion of the human heart is what helps a community thrive.

Further to the implementation, during the interviews with teachers, a teacher responded that when they refer to the use water from within the Science and Mathematics domain their students are more interested and therefore she had integrated the context of water to teach about logarithm. Another teacher stated that teaching strategies were important as a teacher has to know about the techniques and an example quoted was the use of water across Mathematics, Art, English etc., in which the teacher concluded that methods, knowledge and techniques must be woven together to engage children (Parahakaran, 2013).

Teachers also mentioned that using story-telling, music, silence, and group activities, all of which enhanced student learning. The enablers for teaching and learning outcomes were: related to the social dimensions through service to the community; Spiritual and cultural dimensions such as knowing the significance of water in festivals and religion as well as current practices; knowledge of current facts and data. The enhancement of learning through the development of knowledge and skills using cooperative learning approaches, values such as love and unity encouraged students to pursue in their commitments and persist in their habits to preserve and conserve. Other enablers were; awareness of an individual's connections with nature, reflective teaching as an important enabler for both values integration and elicitation. Other values that respondents stated were on the Values Program, which helped in increasing the respect for water as a fundamental element. The striking difference was that the Values Program highlighted the values inherent in water. In addition respondents stated that human values have a direct relationship to one's own awareness and growth, and how well students feel interconnected with the environment. Interconnections with nature can be taught both implicitly and explicitly (Parahakaran, 2013).

23.9. Acting with responsibility as Stewards of nature and Being with nature

The following is a summary of a report from a Doctoral dissertation by Parahakaran (2013) from the project (Human Values based water, sanitation and hygiene program) implemented by the United Nations Human Settlements Program (UNHABITAT) in Thailand. It was a joint collaboration by the United Nations Human Settlements Program (UNHABITAT) with the Society for Preservation of Water (Thailand). Teachers from three countries (Thailand, LaoPDR and Indonesia), after training and workshops in a Human Values based water, sanitation and hygiene program in Thailand had implemented in their own schools between 2004 and 2007. The current author of this chapter and researcher interviewed the sample of teachers on the implementation of the teaching pedagogies for Education in Human Values. The sample consisted of twenty one teachers from Thailand, LaoPDR and Indonesia. In depth interviews on each component of the HVWSHE program was incorporated in the mixed model study by Parahakaran (2013). The three emergent sub themes that were prominent from analysing the data after interviews conducted with

teachers were; *interpersonal relationships, motivation* and *teachers as reflective practitioners*. A brief explanation of the themes is reported below.

Interpersonal relationships (largest number of responses)

The school had integrated classes every Friday in Thailand as a whole school program every week on human values based water education. The subjects were taught by a team of teachers and the topics were on themes rather than subjects such as 'Water' or 'Nature" so that all of the subjects (Science, Humanities, Arts, Social Sciences, Mathematics) could be integrated. Teachers' statements were analysed and the coded themes are presented below;

"*unity of society working together in peace and love, care given by teachers, the willingness to share knowledge and experience, the formal and informal interactions, loving relationships with students, sharing the success and the issues related to teaching approaches, finding solutions together, enhancement of interpersonal skills and the ability to contribute as much as possible".*

Motivation

The emergent theme on *motivation (second largest theme)*, was derived from statements made by the respondents. They stated the following;

"students need motivation, they were engaged in their lessons, cultural connections enhanced affective development, students had the confidence to be role models"

Reflective practitioners (third largest theme)

The third theme that helped the effectiveness of the program was on teachers who were *reflective practitioners*. They stated that *"they increased their capacity to reflect, they found students' awareness to be permanent, enhanced concentration, reduced the negativity around, and they could enter the child's representation of the world"* (Parahakaran, 2013).

The arts and humanities hold a certain link to connect us to the natural surroundings. Teaching science and technology which do not hold the "life substance or inherent values of the self together" may lead to greater degradation of the environment. The beauty of poetry, music, art and written descriptive works are sometimes perceived not as significant as the sciences or technological

innovations. However, they can touch parts of the human being and reflect values in nature that science is blind to.

23.11. Conclusions

The findings reveal that teaching for the environment has to take on interdisciplinary approaches and involve the head, heart and hands concepts. There has to be significant changes in the way we teach for the environment which can result in student transformation. Students' attitudes, knowledge and skills have to go through various processes such as receiving, responding and valuing, thus transforming students' affective processes to bond their connections with nature. Policy makers for education have to make significant changes in the curriculum such as bringing the disciplines together to teach about our beautiful Earth and support the discussion on whether there is a need for revised assessment procedures.

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24. The Importance of Being in Nature and the Rights of Children

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24.1. Abstract

Humans have evolved in co-existence with nature. A healthy childhood usually includes time spent in the environment. We depend on nature for our food, shelter, clothing, and our psychological and physical well-being. This essay will explore some reasons why it is important for children to be in nature.

Keywords*: Environment, Bioethics, Biodiversity, Education,. Children*

24.2. Environmental Education

When humans destroy the natural environment, the planet and all creatures inhabiting the planet, including humans, suffer. Around the world successful societies have learned to value the co-existence and interdependence of humans and other creatures as being dependent upon the well-being of the environment and the planet as a whole. Environmental education is context specific and dependent upon cultural understandings of and interactions with the natural environment (Baker et al., 2019). UNESCO and UNEP (1978) have declared that the ultimate aim of any environmental education *"is to enable people to understand the complexities of the environment and the need for nations to adapt their activities and pursue their development in ways which are harmonious with the environment"* (UNESCO & UNEP, 1978, p. 12).

pp. 405 - 433 in *Planetary Health,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

Within the framework of the goals linked to environmental education, the general consensus indicates that there are three distinct types of environmental education: education in the environment; education about the environment; and, education for the environment (Baker et al., 2019; Fien and Gough, 1996; Kassas, 2002; Lucas, 1980; Strife 2008; Thomas, 2005). Education in the environment provides direct contact with the environment and focuses on increasing participants' awareness of specific environmental issues. The fact tpo simply be in nature is a right. Education about the environment encourages behavioral change and action not only by enhancing the participants' knowledge, but also by encouraging critical thinking and participation in informed debates about environmental issues. This is more linked to the right to education. Finally, education for the environment aims to promote a willingness and ability to adopt lifestyles that are compatible with the wise use of environmental resources (Baker et al., 2019).

Environmental literacy can include not only the narrow definition of literacy as *"Knowledge and understanding of a wide range of environmental concepts, problems, and issues"* (MAEOE, 2019, p.1), but also *"A set of cognitive and affective dispositions"* (MAEOE, 2019, p.1). Thus, literacy can include knowledge of the need for conservation of nature as well as a love for nature (Macer, 1998), which is often referred to as biophilia. A broader interpretation of environmental literacy includes biophilia, a term coined by Fromm (1973), as the affinity to love nature. Such a definition may or may not include environmental stewardship, which refers to actions to protect nature. The gaps between acknowledgment that climate change is real and acting to reduce the anthropogenic changes to our environment, need to be reduced through people who have increased environmental literacy and biophilia. These individuals act so that they become better as environmental stewards in order to diminish the diverse adverse effects humans are having on the environment, which ultimately affects the wellbeing of the planet, including children and all humans, through natural and man-made disasters.

In current society we may even argue that it is a right that children acquire the tools to become better environmental stewards through actions they can take, such as recycling plastic, understanding the purpose of compost, planting trees, and taking

care of those trees as they grow. This, in turn, is a vehicle for them to enhance biophilia and become lifelong stewards of their environment.

A basic and yet fundamental question has emerged as awareness of climate change has increased: how can we save lives now and in the future by increasing the efficacy and the prevalence of environmental education? We are currently living in a unique time in the history of the planet in which the activity of one species—the human species—threatens the continuity of life on earth as we know it as well as the survival of humans and countless terrestrial and marine species (Tiexeira, 2013).

Global awareness of environmental issues has increased worldwide in the past several decades (Bennett et al., 2018). It is vital to promote environmental literacy and awareness of environmental problems facing the world, while also promoting environmental stewardship (Bennett et al., 2018).

24.3. What to include in Environmental Education?

In order to understand the importance of early childhood environmental education, it is first important to acknowledge the current state of the environment and biodiversity on earth as well as to acknowledge that this is a worldwide, rather than a regional issue. It is also vital that we examine and acknowledge the role early childhood education plays in helping to develop adults who are true stewards of the environment.

Environmental conservation has long historical roots because it has a positive impact on health of humans and the ecosystem in which we live (Olivan et al., 2013), as we can see through many cultures and religions. Research published by NASA indicates that carbon dioxide (CO_2) volcanic eruptions, deforestation, land use changes, and fossil fuel burning all contribute to climate change (Stevenson, 2007). The same study by NASA indicates that although chlorofluorocarbons (CFSCs) had a deep impact on the climate in the past, these are now highly regulated. NASA also indicates that CO_2 concentrations have increased since the Industrial Revolution by more than one third and that atmospheric carbon dioxide levels have increased by approximately 43% from 280 parts per million to 400 parts per million in 150 years. To summarize, the Intergovernmental Panel on Climate Change (IPCC), with more

than 1,300 independent scientists from around the world operating under the UN, concluded with 95% certainty that humans are responsible for the current state of global warming (Palmer, et. al., 2006).

Climate change has resulted in global warming and natural disasters that are becoming both more frequent and more powerful (UNISDR, 2011). In fact, from 1900-2010 reported and recorded natural disasters increased by more than 500%, peaking in the first decade of the 21st century with the average number of people affected reaching over 300 million and the average cost in 2010 at $100 billion per year (UNISDR, 2011). "The average global temperature has increased by about 0.8 degrees Celsius since 1880. Global warming is an ongoing process; scientists expect the average global temperature to rise an additional 0.3 to 0.7 degrees Celsius through 2035" (EESI, 2019). In fact, 2019 was the second warmest year since humans started tracking temperatures (Freedman, 2019; NOAA, 2020).

24.4. Development of Biophilia

Fromm (1973) is credited with originally proposing the term "biophilia" as *"the passionate love of life and of all that is alive"* (p. 1). Wilson (1984) proposed the theory of biophilia through research indicating that humans have an inherent love of nature. According to Wilson (1984), biophilia is *"the innate tendency to focus on life and life-like processes,"* up to and including the consideration that *"the degree that we come to understand other organisms, we will place greater value on them, and on ourselves"* (p. 2). It is still a matter of debate whether biophilia as proposed by Wilson is real or not (Kellert & Wilson, 1993). The hypothesis puts forth the inclination of humans to affiliate themselves with life as inherently biologically based —part of our evolutionary heritage as a species. The same theory indicates that humans have a self-interested basis for a human conservation of nature. Although it is evident that many humans destroy nature, it has been suggested that this is the result of an unnatural estrangement of humans from nature because it is an inseparable part of our biological, social and spiritual heritage to love life (Macer, 1998).

I would argue that it is a right of every child to learn what is like to hug a tree, to plant a seed, and look into the eyes of an animal. Research indicates that if students receive exposure to environmental education early in life, they are more likely to develop biophilia and engage in activities that demonstrate environmental stewardship such as recycling, garbage collection, and animal protection (Davis, 2009). Owens et al. (2020) have shown that environmentl education can create greater biophilia in students in order to empower those students to become better environmental stewards, so that they could share a passionate love of nature, life, and the environment as Fromm (1973) and Wilson (1984) argued.

Wilson (1984) states that when people spend time understanding other organisms, they will be more likely to place increased value on these organisms, thus promoting biophilia. Kellert and Calabrese (2015) in *The Practice of Biophilic Design*, promoted three overarching ideas: indirect experience of nature; direct experience of nature; and, experience of space and place as ways of applying the principles of biophilia into artificial constructs or human-built environments. Indirect experience of nature includes ideas that evoke natural elements such as paintings or photographs of nature, natural materials, and the intentional use of colors. Direct experience of nature includes elements found in the natural environment such as light, air, water, plants, animals, and more. Orman (2017) reviewed the development of biophilic design as a method to improve human happiness.

Bioethics, as the love of life, is also intrinsically linked to the concept of biophilia (Macer, 1998). Many programs to help promote bioethics education have been developed and introduced around the world (Macer, 2006), as mandated by the Universal Declaration on Bioethics and Human Rights (UNESCO, 2005). According to the declaration "Article 23: *...States should endeavor to foster bioethics education and training at all levels as well as to encourage information and knowledge dissemination programmes about bioethics.*" The mandate for bioethics education was also part of the 1997 UNESCO Declaration on the Human Genome and Human Rights, following the mandate for environmental education in the Tibilisi Statement (UNESCO and UNEP, 1987). Although there is no such UN mandate for biophilia education, the concepts clearly overlap. Beatley (2011) has called for biophilia cities, and the

concept of biophilia design is part of the vernacular in mainstream modern architecture and urban planning.

Some environmental education is included in bioethics education. For example, The Eubios Ethics Institute bioethics educational materials have been used in numerous school trials in twenty countries around the world to address topics related to environmental ethics for nearly two decades (Macer, 2016). Also, in 2006 a "Joint Plan of Action for Regional Networking in Bioethics Education Towards Better Bioethics Education" was adopted by the participants at the UNESCO Asia-Pacific Conference on Bioethics Education (UNESCO, 2006). The action plan includes the mention of environmental ethics, with the view that "Bioethics" includes environmental ethics. For example, goals agreed by participants include: "Increasing respect for all forms of life," and "Being able to take different viewpoints to issues including both biocentric and ecocentric worldviews rather than only anthropocentric perspectives" (UNESCO, 2006, p.2).

These can be considered as essential to biophilia. Orr (1993, p. 148) stated that *"the capacity for biophilia can still be snuffed out by education that aims no higher than to enhance the potential for upward mobility."* If biophilia is an innate capacity to love nature, questions may arise about the necessity of teaching it. However, education in the anthropocentric era may be driving people away from a possibly innate biophilia, even to the extent of biophobia. Concurrently, commitments by governments have most often not translated into the inclusion of ecocentric and biophilic concepts in curricula. A top-down pedagogy of education may also factor into the loss of innate biophilia.

Sollogub (2016) reviewed studies that have been conducted about human connectedness to nature and found that people who are connected to nature benefit in multifarious ways. Cho and Lee (2018) researched and revived the biophilia of elementary school students through their environmental education program. Additional research shows that these benefits can increase happiness, and result in a significant reduction in stress that includes symptoms of attention-deficit and hyperactivity disorder (Nisbet and Zelenski, 2011). Cognitive function is also enhanced in children with increased exposure to nature, who are also found to

possess greater self-confidence and exhibit fewer behaviors commonly associated with aggression (Tam, 2013; Sollogub, 2016).

Exposure to nature also increases the connectedness to nature along with the drive and desire to protect the environment, thereby also increasing the proclivity toward conservation (Sollogub, 2016). The more people have biophilia, the more they will protect the environment; and, as a result, the more other people will be able to enjoy nature, which in turn cyclically instills in more people a stronger desire to protect the environment (Sollogub, 2016).

24.5. Measuring Biophilia

Although many people have researched and written about the importance of biophilia, there have been few researchers who have closely examined how to concretely measure biophilia. One example is Kellert (1985), who applied questions to measure the affinity to animals as a method for measuring biophilia. White and Stoecklin (2008) also discuss ways to promote biophilia through education.

Letourneau (2013) reviewed prior efforts to measure biophilia and developed a Biophilia Attitudes Inventory. This inventory included seven dimensions: Dominionism; Ecologism/Scientism; Humanism; Moralism; Naturalism; Negativism; and, Utilitarianism (Letourneau, 2013, p. 59). The same researcher then developed a series of questions used to ask university students to measure biophilia.

"Connectedness to nature" is a term related to biophilia that is frequently used. The Connectedness to Nature Scale (CNS) developed by Mayer et al. (2004) is claimed by the researchers to predict human eco-friendly behavior. Mayer and Franz (2004) provided empirical evidence of Leopold's (1949) notion that connectedness to nature results in better environmental behavior of humans who have greater connectedness to nature. Other researchers have used the scale to measure affective connections by using questions to indicate human environmental sensitivity (Ernst & Theimer, 2011; Johnson-Pynn et al., 2014). The CNS consists of 14 questions, with a 1-5 Likert type scale.

In this dissertation, the CNS was, therefore, one option as a metric for the analysis to be conducted. Ogburn (2017) assessed the impact of an expeditionary

science program called MYLES of Science (MYLES) that immerses teens in nature and teaches environmental education and field science. She tested 57 MYLES students for pre- and post-connectedness to nature scores. To collect this data, the Connectedness to Nature Scale (CNS) and three open-ended questions were used. The CNS has reverse scoring for Q4, Q12, and Q14 (Ogburn, 2017, p. 19-20):

"Please choose one answer and fill in the blank with that answer

1=strongly disagree; 2 3=neutral; 4 5=strongly agree

1. I often feel a sense of oneness with the natural world around me ___.

2. I think of the natural world as a community to which I belong ___.

3. I recognize and appreciate the intelligence of other living organisms ___.

4. I often feel disconnected from nature.

5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.

6. I often feel a kinship with animals and plants.

7. I feel as though I belong to the Earth as equally as it belongs to me.

8. I have a deep understanding of how my actions affect the natural world.

9. I often feel part of the web of life.

10. I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'.

11. Like a tree can be a part of a forest, I feel embedded within the broader natural world.

12. When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.

13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.

14. My personal welfare is independent of the welfare of the natural world."

24.6. Environmental Stewardship

There are significant barriers to helping children to develop as environmental stewards, including the inadequacy of the top-down educational models that are

predominant. Bennett et al. (2018) reviewed the importance and the measures of stewardship, while Blancard and Buchanan (2011) reviewed the methods and measures of environmental stewardship for young children, and referred to four stages of environmental literacy: awareness, concern, understanding, and action.

There are some approaches to developing environmental stewardship that principally aim to increase environmental stewardship through practical, hands-on activities methods. Selby (2017) discussed a systematic approach to urban environmental stewardship based on the premise that *"This means that our perception of nature can be altered and improved to help motivate and empower the everyday person to protect the sources of our good life"* (Selby, 2017, p. iii).

Sullivan (2015) increased the awareness of children at an elementary school by designing and creating ecological areas for green outdoor spaces and by preserving, protecting, and enhancing existing natural areas to foster the development of physically, mentally, and socially healthy children. Her goal was to identify and design a conceptual master plan for a prototype schoolyard using place-based education in Knoxville, Tennessee. Positive impacts from urban after-school environmental education programs have also been noted (Bruyere et al., 2012). This is consistent with my personal observations as well.

Dungan (2015) found that increased sense of environmental stewardship also promoted the general mental health of students. Her research identified the six key themes that encapsulate the potential connections between mental health and environmental education at school. The six were: literacy; stewardship; school ground naturalization; safety; resilience; and, school culture and pedagogy. She argued that health can be improved with a worldview based on inclusivity, as opposed to the increasingly prevalent separation from nature that has resulted from global urbanization. Montgomery (2015) reached similar conclusions, finding that increased time in nature reduced nature deficit disorder.

24.7. Holistic Understanding of the Environment through Environmental Education

The environment includes many components. Although environmental scientists are aware that we have not yet recorded many of the species on the planet, it is estimated that there are almost ten million different species. It is commonly accepted that there are very complex ecological relationships between plants, animals, microorganisms, and humans. Green (2004, p. 2) wrote that a *"holistic curriculum seeks to establish relationships between mind and body, disciplines, persons and the natural world."*

Since the mid 1990s, the term "environmental education" has increasingly been included with concepts such as "education for sustainable development" (ESD), "sustainability education," and "bioethics education" (Macer, 2006). More recently, the terms "climate change education" and "education for sustainable societies" have also been used (Baker et al., 2019). This shift in terminology is indicative of the conceptual reconstruction which is *"underpinned by the complexity of the social and political changes occurring throughout the world as consequences of environmental crises and the different perspectives through which they are understood in different contexts"* (Barraza, et al, 2003, p. 347). Accordingly, the language used by the international community and the UN itself when referencing programs, activities, and publications within the broadening scope of environmental education also influences and reflects these changes. The fact that the UN has continued to renew calls for environmental education is evidence that there is a global mandate for environmental education, and that these new terms are intended to encourage governments to enact policies to include environmental education in national curricula and public campaigns.

The UN Decade of Education for Sustainable Development 2005-2014 (DESD; UNESCO, 2005) and its affiliated Climate Change Education for Sustainable Education (UNESCO, 2010) initiatives added the social, economic, and cultural components of the environment, thereby reaffirming environmental education's place within the sustainable development and sustainability agenda. UNESCO and United Nations University (UNU) were the lead UN agencies tasked to work with many countries,

academics, NGOs, and schools on the UN Decade of Education for Sustainable Development (UN DESD) and the Climate Change Education for Sustainable Education (Baker et al., 2019).

The importance of environmental education is well documented (Riordan & Klein, 2010; Thomas, 2005; Story & Torres De Oliveira, 2004; Curti & Valdez, 2011, Phelps et al, 2008, Hale, 1993 and Jennings, 2008). The essential role of the environment is also an essential part of many traditional indigenous practices—including many of those in Indonesia—even though it is typically not referred to as environmental education, nor documented in writing (Jones, 2000). In fact, the environment is considered as the *"key to ensuring economic, cultural and ecological vitality"* (Jennings, 2008, p.24) and *"essential to [the] process of social change"* (Hale, 1993, p.131). As such, environmental education has the potential to play a vital role in changing behavior and creating action, which is favorable to a sustainable future of the planet (Baker et al., 2019).

Traditionally, environmental education has focused on educating children in the hope of helping them to increase their environmental awareness and literacy in order for them to ultimately affect positive change in solving environmental problems throughout their lives (Ozsoy, 2012). In 1969, Roth presented one of the earliest definitions of environmental literacy as *"someone who possesses the basic skills, understandings and feelings for man-environment relationship"* (Ozsoy, 2012). However, according to Ford (1986) and McCrea (2006), nature studies date back to the early 1890s and the roots of environmental education date back to the 1920s.

Other researchers have defined environmental literacy as people who are able to recognize the relationship between society and the environment (Bybee & Deboer, 1994). Later definitions have built upon this by incorporating the concept of humans who can not only understand, but also communicate environmental strategies and who possess the skills to take actions to help protect and improve the environment (Hungerford & Peyton, 1997). As indicated by Rothburg and Olsen (1991), most researchers agree that people who are more aware of environmental issues and human behaviors that impact the environment have the knowledge and the tools to behave in more environmentally sustainable ways that will help to solve the planet's

problems. From this research, it can be surmised that implementing effective environmental strategies on regional, national, and international levels when people lack basic environmental knowledge and basic knowledge of actions they can take as individuals is difficult, if not impossible.

The importance of environmental education is highlighted in studies that indicate that environmental education is necessary to educate people so that they can help to preserve the planet first from their individual behavior, then widening out through local community activism and expanding to demand actions from both private corporations and governments that will help to safeguard the environment (Tiexeira, 2013). Studies also indicate that early childhood environmental education can have an impact on life-long buying patterns (Strong, 1998).

Marcinkowsiki (2010) pointed out that there is a highly complex and long history dating back nearly five decades within the environmental education community as relates to both challenges and opportunities. Articles by Dugh (2012) and Prince (2010) highlight the importance of including environmental education as part of early childhood education. Research also indicates that if biophilia (a human tendency to interact or be associated with nature) is not developed in early childhood, biophobia (a fear of or aversion to interacting with nature) can result (Orr, 2002). Additional research shows the importance of early childhood environmental education to creating sustainable societies (Pambling et al., 2008).

The link between early childhood exposure to nature and playing with things found in nature such as sticks and stones and future development of biophilia or biophobia has also been studied (Vadala et al, 2007). Furthermore, the importance of incorporating play into early childhood education has been studied and identified as an important variable (Edwards, et al, 2014).

A study carried out in Turkey—a middle income nation—indicates that educating children about nature is crucial because it helps them to understand the role humans play in the larger scheme as well as the multifaceted and complex interactions between humans and other elements of the environment (Erdogan, 2011). The same study revealed a statistically significant relationship between environmental education and the environmentally friendly behavior of the

participants. Further research concluded that including outdoor activities at school serves as a de-facto interactive laboratory that helps children to better understand nature and the role they play in nature (Carrier, 2009).

Significant research carried out through multiple studies over many years indicates the importance of early environmental education in developing life-long behaviors, skills, and patterns (Ernst, 2014). Related research by McCain et al. (2011) supports that early childhood education impacts social and cognitive skills, which have life-long implications for both the learner specifically and society in general.

Holism, the concept that parts of a whole are interconnected in such a way that they cannot exist independent of the whole, has long been an important foundational element of environmental education (Tilbury, 1995). This approach has been used by developers of early childhood environmental education curricula in seeking to identify what interests children; and, then, to involve the children themselves in observing, identifying, analyzing, and cooperatively brainstorming solutions and strategies to problems that plague the environment (Barraza, 2001).

24.8. Influences of Cultural and Familial Norms on Environmental Education

The culture and society in which environmental education programs are delivered affect how programs are structured. Globally it has been demonstrated that there have been positive impacts, for example, as shown in a comparative study of Mexico and New Zealand (Aguirre-Bielschowsky et al., 2012). Also, research conducted in the United States indicates that the focus on academic standards along with state testing policies limits schools' and teachers' ability to develop educational experiences that take place in nature (Louv, 2005; Stipeck and Byler, 1997). Research by Davies (1996) reveals that societal perceptions of outdoor settings as being linked to physical activity instead of broader spectrum learning affects schools' and teachers' willingness to conduct learning in outdoor environments. The importance of getting outside of the classroom is supported by research by Charkravarthi (2009) and Ernst (2014). In fact, studies carried out in the United States indicate that around half of preschoolers don't even have one parent-supervised outdoor play

opportunity per day (Tandon et al., 2012). This illustrates the importance that cultural and familial norms play in children's exposure to nature.

The theoretical foundations of this intervention on students to influence their parents is founded on what is now widely accepted. In 2001, for example, a group of scholars studied the hypothesis that children could, in fact, learn and retain conservation principles in school environments and transfer this knowledge and affiliated principles to their parents (Vaughan et al., 2003). Their study in the town of Quebrada Ganado in Costa Rica found that teaching children, in effect, has the ripple effect of teaching the entire community (Selby, 2017). The study was based on a 21-question test that itself was based on Scarlet Macaw conservation and natural history. In this intervention, three groups were given the test at three separate times (one pre-test and two post-tests). The groups were then evaluated on how many questions they answered correctly and how much they improved. In the UK, Damerell et al., (2013) also observed that not only did environmental education of children improve adult knowledge, but it also had a positive impact on adult behavior.

Bosworth et al. (2012) indicate that the dominant paradigm of human relationships to nature is anthropocentric. On the other hand, a holistic understanding of our relationships with nature would be more ecocentric than anthropocentric. D'Agostini (2016) explored this concept in finding that more ecocentric environmental attitudes could be cultivated in a Michigan "Green" School.

Other studies also found that active learning is promoted by participation as in, for example, the use of hands-on games (Macer, 2008a). For example, Gilbertson (2012) found that role-play could increase the connectedness of children with nature. In Gilbertson's study, the students in the role play group had more tendency to be connected in an ecocentric and intrinsic manner. O'Brien (2016) described a study in which students were encouraged to make art based upon their experiences in nature, with a focus on endangered and less common animals and plants in Ontario, Canada. The arts-based projects included creative writing, batik, animation, dance, performance, photography, and poetry. In another study, Dossah (2017) used arts projects to promote environmental awareness in Ghana, with one of the key projects being the development of a song. Furthermore, research by Bruni et al.

(2017) in Southern California indicated that class art activities had a greater impact on learners than the outdoor activities that they assessed.

Davis (2009) reviewed a number of papers that unanimously emphasize the importance of starting environmental education at a young age. At the same time, his study also highlighted a gap in the literature on the evaluation of these studies. Research by Epstein and Miller (2011) suggests that although teachers' experience and belief systems around nature are important in the delivery of environmental education programs, it is more important to focus on overcoming teachers' perceived beliefs about carrying out education in natural settings than it is to influence their beliefs about the environment itself. In other studies teachers sited further barriers to environmental education in a natural setting including access to open space, time, transportation, additional supervision needs, and potential parental resistance (Ernst & Tornabene 2012; Ernst, 2014).

In one study carried out in the US, research indicates that teachers' perception of additional safety hazards around children's education in nature and their adherence to rules impacted their willingness to afford children with additional play opportunities outside (Renick 2009).

Iozzi (1989) indicated that because early childhood experiences affect many lifelong beliefs and behaviors, exposure to the environment is crucial in early childhood. Biophilia (a love or affinity with the environment) is strongly affected by the amount of time children spend in the environment in childhood (Tilbury, 1994; Wilson 1996). This is supported by research by Phenice and Griffore (2003) indicating that interacting with nature in ways that are both positive and frequent is vital in children developing an understanding of and respect for the environment.

The lack of environmental literacy is considered to be one reason why people are not better environmental stewards (Macer, 1998; Bennett et al., 2018); at the same time, on a macro level, individuals' lack of environmental literacy inhibits the formation of national and international environmental policies (Burchett, 2015). The literature review in this chapter clearly demonstrates that there are gaps in our knowledge about the impact of environmental literacy programs. In the United States, for example, the Environmental Literacy Council, Children's Environmental

Literacy Foundation (CELF, 2020) and the National Oceanic, and Atmospheric Administration's Environmental Literacy Grant's Program (ELG) are existing entities attempting to improve environmental education in the nation (Burchett, 2015).

24.9. Assessment of Environmental Education

As Baker et al (2019, p. 24) wrote, "*It is often difficult to agree upon how to assess teaching and learning in ethics. Measuring gains in students' knowledge and understanding—especially changes in attitudes—is an uneasy task.*" Considering that there are various instruments used to measure educational outcomes, the data gathered from different countries is not always comparable or reliable; especially, when considering subjects that are linked to environmental understanding and behavior, which many not be part of a common core curriculum. There have been a number of attempts to develop school curricula for the age group relevant to this research study (e.g., Pierce, 2017), and the pre-test and post-test comparison is a basic evaluation strategy.

The evaluation of ethics in educational research (Macer, 2008b) is less common compared to the evaluation of test scores in areas such as literacy or mathematics. It is clear that behavioral changes and the adoption of value systems cannot be captured and measured through quantitative analysis alone; thus, a combination of qualitative and quantitative methods can be used (UNESCO, 2004). Additionally, students can be tracked longitudinally over time, or assessed at one specific point in time, depending on whether the aim is to assess long-term or present outcomes.

As an example, past research has attempted to quantify the effect of ethics courses on students' moral development. For example, in psychological research, ethical reasoning can be measured. In this vein, developmental psychologists have used psychological instruments to assess the level of "moral maturity" and the stages of "moral reasoning" among students. Kohlberg's Typology—one such example—assigns six stages to moral development, with each stage being increasingly complex (Macer, 2008). Such instruments are imperfect, with some being more statistically reliable than others. The efficacy of courses on ethics are often measured using such tools, and environmental ethics can be evaluated according to this methodology.

As an additional point of consideration, assessments of ethics programs are sometimes difficult when ethics topics are not assigned the same grades as science content. Grading can play a role in the importance placed on ethical concepts, thus effecting the validity of scores measured. When student assessments place little priority on ethical learning, students may not understand their importance.

Interpreting results from the monitoring and evaluation of programs depends on the initial objectives. A critical question to consider is, "did the program produce outcomes as intended?" If, for example, an objective was to "increase students' exposure to environmental ethics issues," one desired outcome would be an increased number of students engaging in environmental ethics discussions. Other questions that can be considered include:

- Did the teachers teach in the way the curriculum intended?
- Did students' knowledge, attitudes, and skills change (as intended)?
- What was the overall quality of programs?
- Was the program implemented as intended?

Although the formal teaching of environmental issues still lags the teaching of more traditional topics, environmental education is increasingly being seen as a formal subject; thus, having a method of monitoring and evaluation will be necessary to improve and expand environmental education (Baker et al., 2019).

There have been similar calls around the world for teaching environmental topics, including environmental ethics. The World Commission on the Ethics of Science and Technology (COMEST, 2009, p. 4) stated that, *"The main aim of the teaching of Environmental Ethics is to develop the students' ability to identify and analyze ethical issues in policies and actions related to environment, nature, and nonhuman forms of life in order to be able to make ethically correct decisions and to act ethically.*

As a result of studying Environmental Ethics students should:

increase their awareness of environmental-ethical issues;

be able to provide ethical justification for decisions regarding the environment, nature, and nonhuman forms of life;

be able to apply ethical principles to policies and actions related to the

*environment, nature, and nonhuman forms of life" (*p. 4).

24.10. Environmental Literacy as a Right

According to the definition of environmental literacy (See the Appendix), the concept can include the narrower definition of environmental literacy as *"Knowledge and understanding of a wide range of environmental concepts, problems, and issues"* (MAEOE, 2019, p.1), as well as *"A set of cognitive and affective dispositions"* (MAEOE, 2019, p.1), and *"The appropriate behavioral strategies to apply such knowledge and understanding in order to make sound and effective decisions in a range of environmental contexts"* (MAEOE, 2019, p.1). Thus, a broad interpretation of environmental literacy includes biophilia, which is both a disposition to love nature and a desire to act to protect nature. The gaps between acknowledgment that climate change is real and actually acting to reduce the anthropogenic changes to our environment (Macer, 1998), are critical questions in the literature, and also critical questions to the reduction of human impact on the environment.

Research indicates a significant gap between access to environmental education based on socio-economic conditions. A lack of curricula dedicated to environmental education is still prevalent in developed countries (Wolf & Macer, 2022). However, the gap between access to environmental education in developed countries versus developing countries is both apparent and widespread (Aguirre-Bielschowsky et al, 2012).

The role that schools play in developing children's interest in the environment has long been an area of reflection. Research indicates that children educated in schools with an environmental policy that also involves children in environmental activities are more likely to develop positive attitudes toward the environment (Bennett et al, 2018). Further research indicates that schools in developing countries with more economic constraints are hindered in offering even the basics of education, let alone more in-depth programing such as environmental education (Almeida & Cutter-Mackenzie, 2011).

Additional research suggests that one of the major challenges faced by Mexican schools was the gap between the availability and quality of environmental education

in privileged versus less-privileged schools (Barazza 2001). These issues are also faced in many schools in other developing countries (Baker et al., 2019).

Furthermore, educational spaces have long been identified as essential in the success of any academic endeavor (Sobel, 2008). Also, the fact that natural settings and allowing children to learn in nature have not been a primary focus of childhood education has been evidenced in research including that of Miller et al. (2009).

Ways of fostering biophilia in children toward animals were reviewed by Skinner-Winslow (2016). The ways they highlighted include not just education, but also exposing children to other spaces and environments, such as zoos. Hancocks (2012) suggested several specific strategies to improve the design of zoos including: having new specialist design teams such as landscape architects, geologists, and ecologists design and create authentic animal enclosures which *"demonstrate sustainability, biophilia, and welfare values to share with visitors"* (Hancocks, 2012, p. 5).

Rakotomamonly et al. (2015) found that environmental education improved both children and parent's knowledge about lemurs in rural Madagascar, and made them have more positive attitudes towards their conservation. This study found that there was a significantly different attitude on the part of children who took part in the program toward lemur conservation even one year after the education program, compared to children who had not been in the program.

One of the primary reasons for the apparent apathetic attitude to biodiversity loss among the general population may be the lack of practical exposure that people living on an increasingly urbanized planet have to plants and gardens (Beumer and Martens (2015). Cooper (2007) showed how activities exposing children to schoolyard flora could promote interest in nature and increase their interest in and desire for conservation. For example, it has been proposed that planting trees may increase human awareness of the importance of plant biodiversity. Prihantoro (2015) emphasized the need to plant trees: *"This thing we need to do in school is not just to give the lessons to students but we make it work through the reforestation activities in the school, we not only fix the infrastructure but also create the condition of the school environment that is green and beautiful so that students can learn with cool conditions*

and make students able to think clearly, and ready to compete strongly in the global world as entrepreneurs. Save the world... Go green…" (p. 83). A comprehensive framework for fostering a dialogue about the potential role of domestic gardens to enhance overall green infrastructure and the conservation of biodiversity and ecosystem services was proposed by Beumer and Martens (2015). This study found that experiencing urban biodiversity has the potential to positively affect the loss of global biodiversity, because people are more likely to advocate for the preservation of biodiversity if they have had direct contact with nature.

Similar studies show that exposure to environmental issues and possible solutions early in childhood dramatically increases the likelihood that those children exposed to such knowledge will become more conscientious environmental stewards throughout their lives (Bennett et al., 2018). However, designing and delivering an environmental education program that maximizes the children's participation and learning, while also assessing the children's learning and outcomes, presents numerous problems.

24.11. Conclusions

There are several NGOs and initiatives to promote the right to beng in the environment as a children's right, through an Additional Protocol called "The Child's Right to Nature and a Healthy Environment" to be codified in the Convention on the Rights of the Child. [92]

One language is that civil and political rights are first generation rights, while economic, social, and cultural rights are second generation ones. Rights of the so-called third generation include concepts like solidarity, the right to peace, and the rights to a clean environment. Some third generation rights have been already codified by the adoption of the international standards.[93]

Some of these groups[94] include the IUCN Environmental LawCenter,

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92 www.RightToNature.org

93 https://www.coursera.org/learn/childrens-rights

94 https://www.ohchr.org/Documents/HRBodies/CRC/Discussions/2016/AnneliesHenstra_2.pdf

EarthCharter Initiative, Children and Nature Network,[95] Terres de Hommes International Federation, Stand Up For Your Rights and others.[96] Most people have a feeling of safety when in nature (Macer, 1994), even like a mother's womb. Communication with nature is also seen in indigenous spirituality, songs, drums, going back to basic or primordal feelings of being one with the ther beings in nature.

Among the recommendations we can make are that playgrounds with nature, class breaks in nature, splashing in puddles, climbing trees, planting seeds, jumping on leaves, having a pet animal, and so on, will increase our biophilia and make us better environmental stewards. I have argued that these are rights, and given numerous iullustrations on how we can include these in our formal and informal education.

The World Conservation Congress of IUCN adopted the resolution *"Child's Right to Connect with Nature and to a Healthy Environment"* on 11 September 2012. The significance of the resolution is: 1. a broad international endorsement of the child's right to connect with nature and to a healthy environment.[97]

Appendix: Definition of Terms

Anthropocene: The Anthropocene defines Earth's most recent geologic time period as being human-influenced, or anthropogenic, based on overwhelming global evidence that atmospheric, geologic, hydrologic, biospheric, and other earth system processes are now altered by humans. The word combines the root "anthropo," meaning "human" with the root "-cene," the standard suffix for "epoch" in geologic time. The Anthropocene is distinguished as a new period either after or within the Holocene, the current epoch, which began approximately 10,000 years ago (about 8000 BC) with the end of the last glacial period. (Ellis, 2013).

Bioethics Education: Education to enhance bioethics, namely, the love of life (Macer, 1998).

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95 www.childrenandnature.org

96 **http://ipaworld.org/wp-content/uploads/2016/05/IPA-Play-Environment-Discussion-Paper.pdf**

97 https://www.hrw.org/news/2020/07/01/realising-childrens-right-healthy-environment#

Biophilia: The passionate love of life and of all that is alive (Fromm, 1973).

Environmental Education: Activities and issues concerning education *in, about* and *for* the environment, which may or may not be categorized as environmental education, Education for Sustainable Development (ESD), climate change education, or education for sustainable societies (Baker et al., 2019, p. 137).

Environmental Ethics Education: Education that addresses questions of how to live, how to make environmental choices; and, how to reflect upon the consequences of our activities. (Baker et al., 2019, p. 137).

Environmental Literacy: An environmentally literate person, both individually and together with others, makes informed decisions concerning the environment; is willing to act on these decisions to improve the well-being of other individuals, societies, and the global environment; and participates in civic life. Those who are environmentally literate possess, to varying degrees:

Knowledge and understanding of a wide range of environmental concepts, problems, and issues;

A set of cognitive and affective dispositions;

A set of cognitive skills and abilities;

The appropriate behavioral strategies to apply such knowledge and understanding in order to make sound and effective decisions in a range of environmental contexts" (Maryland Association for Environmental and Outdoor Education, MAEOE 2019).

Environmental Stewardship: groups or networks of ,the actions taken by individuals care for or ,to protect ,with various motivations and levels of capacity ,actors or social/responsibly use the environment in pursuit of environmental and .(2018 ,.Bennett et al) ecological contexts-outcomes in diverse social

Formal Education: Education activities and/or programs that are recognized and endorsed by the government in educational institutions, although not necessarily government institutions, such as government-run organizations and privately run organizations (Baker et al., 2019, p. 19).

Holistic: Relating to or concerned with wholes or with complete systems rather than with the analysis of, treatment of, or dissection into parts (Merriam-Webster, 2020).

Informal education: Activities outside of the government structure that are not recognized by the government, such as care and education provided in homes, usually by families or caregivers (Baker et al., 2019, p. 19).

Non-formal education: Educational activities or programs which are outside of the government structure, but are often recognized by the government, such as community run activities (Baker et al., 2019, p. 19).

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25. The Role of Museums in Planetary Health Bioethics: A Review

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25.1. Abstract

This chapter delves into the museological side of "the way forward" to conservation for planetary health bioethics. Specifically, it highlights the crucial role that museums play – their curatorial or exhibition interventions, conservation operations, development policies, or practices – which present or represent the vital relationship of human and planetary health. While it is not new to stress the significance of museums' link to the environment and environmental education, it is necessary to re-examine recent cases in light of the rapid changes brought about by climate change and the constant call for sustainability. We thus offer a review of some recent works that appraise the museum's role for bioethically considering the health of our living planet in three important areas: the environment, climate change, and sustainability.

Keywords: *Museums, Planetary Health, Bioethics, Environment, Climate Change, Heritage*

25.2. The Role of Museums in Planetary Health Bioethics

Moving forward in planetary health bioethics through museums is not about the museology of the planets. Rather, it is about understanding how to live and love the planet through the interventions and developments of museums. Zywert (2021) claims that we live in a time of social-ecological transformation where it is no longer possible to decouple economic growth and ecological destruction so that we need sustainable real-time futures-thinking economies within planetary boundaries. The lesson of oneness to the earth is a fundamental ontology that can be seen in the

pp. 434 - 451 in *Planetary Health,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

indigenous knowledge of nature (Kahambing, 2021). Planetary health can be sustained through systems thinking where public health can promote a definition of health that co-benefits humans and natural systems together (Iyer, et. al., 2021). This is because "human health is fundamentally dependent on the health of the Earth's biophysical systems'' (Zywert, 2021).

Macer (1998) alternatively proposes a definition that decenters the concern of bioethics in anthropocentric terms and fits planetary health very well: bioethics is "love of life." This embraces the planet, its species, and its cosmological form as a living entity, connecting everything into an integrated whole. Planetary health bioethics, therefore, is not a subcategory of bioethics, but an essential feature of bioethical thinking. Indellicato (2021) says in 'Bioethics and Ecopedagogy' that "the benefit of health will be the building of a *friendly environment*." Elsewhere she mentions the backdrop that "the emergence of ecological problems of living beings implies the development of boundless problems in bioethics" (p. 156). This is why Waller (2021) recommends that 'ecology' education must be "imbibed with the principles of bioethics … at different levels of education." Global health and global bioethics speak of universal vulnerability. From an ecological perspective, it speaks of humanity's health and its relationship to planetary health. Hence, "if vulnerability is a symptom of the growing precariousness of human existence and is exacerbated in certain conditions, the social and environmental context can no longer be ignored in bioethical analysis" (ten Have, 2021, p. 55). Museums can definitely represent this pedagogical cause by showing how to love our living planet.

With the shifting needs and desires of society, development not only takes place in sectors that are business and technology-related. The sector of heritage and museums also modifies its way of operation to follow the trend of development. The roles of museums have been reviewed and reexamined over time. Museums have also experienced developmental changes together with society and proactively react with the effort of being multi-functional (Dabirinezhad, 2013). Therefore, it is essential to understand the shift in the definition of museums since it is always able to reflect the latest directions of their usages and how the functions of museums can suit within the framework of the promotion of planetary health.

By definition, a museum is traditionally an institution that houses "all collections open to the public, of artistic, technical, scientific, historical or

archaeological material, including zoos and botanical gardens, but excluding libraries, except in so far as they maintain permanent exhibition rooms." (ICOM, 1947) The traditional focus is on the purpose of opening to the public for exhibiting its collections. Then it has been redefined as "a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment" (ICOM, 2007). Here, the focus shifts to serve society and consider its development for wider purposes: from understanding museums as presenters of objects to understanding them as tools of explaining lives and societies. The most recent definition in 2019 is much more comprehensive and has emphasized the vital wellbeing of the planet. Accordingly,

> *Museums are democratizing, inclusive and polyphonic spaces for critical dialogue about the pasts and the futures. Acknowledging and addressing the conflicts and challenges of the present, they hold artefacts and specimens in trust for society, safeguard diverse memories for future generations and guarantee equal rights and equal access to heritage for all people.*
>
> *Museums are not for profit. They are participatory and transparent and work in active partnership with and for diverse communities to collect, preserve, research, interpret, exhibit, and enhance understandings of the world, aiming to contribute to human dignity and social justice, global equality, and planetary wellbeing.* (ICOM, 2019)

However, this definition is still riddled with criticism because it has removed an essential term that must be explicit—*education.* Chiovatti (2020) argues that although the 2019 definition may presuppose an 'implicit' pedagogical role, the purpose of education must be clearly indicated. An updated museum definition will be consulted this coming summer of 2022 at the ICOM General Conference in Prague. It is believed that the definition of the museum will be amended to present a better description of the functions of museums which must explicitly state a role in relation to the environment, especially in thinking about climate change and sustainability.

The museum is one of the key institutions that could not and should not be omitted in moving forward and approaching planetary health. David Attard, in this

sense, identified "climate" as "a shared global heritage" as early as 1988 (McGhie, 2020). The roles of museums and heritage in conceiving and presenting topics related to human civilizations have significant impacts on the enhancement and enlightenment of planetary health. This chapter will expound on the relationships between museums – their curatorial or exhibition interventions, conservation operations, development policies, or practices – and the three core areas in understanding and loving the planet: the environment, climate change, and sustainability.

25.3. Museums and the Environment

The term "environment" can be understood with two meanings. Lexically, it is considered ecologically in "complex of physical, chemical, and biotic factors that act upon an organism or an ecological community and ultimately determine its form and survival" or in peripheral situatedness as "the circumstances, objects, or conditions by which one is surrounded" (Merriam-Webster, 2022). The museum sector usually refers to the second definition mentioned above to discuss the atmosphere given to the audience during the exhibition. The importance of this idea has been analyzed by Forrest's (2013) *Museum Atmospherics: The Role of the Exhibition Environment in the Visitor Experience,* which mainly demonstrates the interplay between visitors, the museum, and its exhibition environment. However, since the roles of museums are flexible and multi-functional, the emergencies on global warming and climate change catch the eyes of curators and the sector itself. Hence, unsurprisingly, attention is brought toward the ecological definition of environment. It is still arguable whether the practices of exhibiting will recognize organizations in other fields as part of the museum sector. Mostly because exhibitions are one of the duties of being a museum. If so, overlapping in this characteristic, many organizations, including non-profit organizations exhibit collections of their concerns nowadays can be considered having a role in the museum sector. For example, the Climate Diplomacy (2022) and the Environmental & Society Portal (2021) have presented various exhibitions about the environmental health of the planet to raise awareness from the public. With a broader sense of acknowledging these exhibitions as other forms of presentation, the connection between museums and the environment is no longer as implicit as we assume at the very beginning.

Although we can find in Oliver (1971) that the role of museums in environmental education is an *emerging* one, the idea that museums are interpreters of the environment is nothing new. This idea is common in the 19th century and has been commonly practiced in the 21st century (Barrett & McManus, 2021). Against the common stereotype of 'museums as mausoleums' containing skeletons and the labor of taxidermists, Barrett & McManus (2021) argue otherwise on the complexity of museum cultures, display, research, education, and environmental issues. Part of the effort to incorporate pedagogical mechanisms into the museum is the thrust on understanding the environment as in the case of the High School students visiting the Norwegian Museum of Science and Technology exhibition on radiation-related environmental issues (Henriksen & Jorde, 2001).

Environmental issues are, however, not just topics that lie outside of the museum but the museum itself as a building is affected by environmental conditions. Pavlogeorgatos (2003) lists some crucial environmental parameters such as "pollution (chemicals and noise), the humidity, the temperature, and lighting." Energy-saving strategies have been put in place especially the air-conditioning in museums (Ascione, 2009). These strategies may vary according to different indoor environment qualities (IEQs) (Sharif-Askari & Abu-Hijleh, 2018). Management of IEQs won't be easy as there are conflicting needs of the thermal indoor environment. Hence, practical compromises may inevitably happen (La Gennusa, et. al., 2008) and these arise in the context of environmental design (Bitgood & Loomis, 1993). For instance, "immovable historical relics in some archeology museums of China suffer deterioration due to their improper preservation environment" (Gu, et. al., 2013). Environmental management then needs principles and proper planning so that here, it is critical to emphasize "the role of the building as the first line of defense against environmental instability" (Cassar, 2013).

Concerning the description which implied the relationship between museums and the first sense of the term environment, Conn (1998) defines museums as "sites of intellectual and cultural debate where the prevailing cultural ideas and assumptions of society were put on display and where changes in those assumptions were reflected" (pp. 12-13). He does not clearly stress the role of museums in environment protection or any kind of related issues. However, he clarifies that museums are not limited to indoor venues and he considers them as part of the

environment which are the sites of living evidence, especially referring to open-air museums. Open-air museums are valuable heritage sites with implicit values that associate with the entire human-made environment as well as representatives in the context of the world's ecology (Pedram, et. al., 2018). Conn's statement literally expands the general perceptions about what should be displayed in museums, from the idea of exhibiting single or group objects and artifacts to a wider concept of being on the site with the artifacts, techniques, buildings, and landscapes to experience a certain theme. This immersive experience provides a better context for exhibitions, where audiences can be engaged with the contents deeper within such an environment which is similar to the concept of a theme park. Another important factor, then, in the relationship between museums and the environment is not just built heritage but also the general aesthetics of indoor, outdoor, and even digital space.

In terms of experience, aesthetics may be situated in different contexts and the influence of the environment plays a critical role (Mastandrea, et. al., 2021). The interplay of indoor and outdoor loci of the environment pertains to physical places while cyberspace and virtual platforms pertain to non-physical or more specifically, digital spaces. The physical environment in museums influences visitors' satisfaction (Jeong & Lee, 2006) and forms a suitable learning setting (Maxwell & Evans, 2002). Orhan & Yilmazer (2021) stress the importance of soundscapes to provide harmony of context and the built environment. There are multiple ways to capture students' views through the learning environment (Bamberger & Tal, 2009). Protecting the environment by changing the way of the presentation should be an ideal practice in supporting and promoting planetary health. Open-air museums are recognized as more eco-friendly than traditional museums (Pedram, et. al., 2018). One of the key reasons is that it consumes less electricity. Compared to indoor museums which constantly required monitoring on humidity, light, temperature, and security, open-air museums are presented within a considerably authentic environment, particularly in the way of handling and displaying artifacts or replicas more naturally. Cultural heritage, which becomes one of the display objects within open-air museums, indicates the testimony of human activity of a certain area over time. The development or changes of the area, as detailed as altering the materials of tableware or as enormous as changing in use of the landscape, are records of allocating natural

resources in a specific period. A better sense of connection with the environment has been provided through this immersive experience. This immersion is not limited to physical environments but also digital environments. The communication element proves instrumental in solving appropriate positionings to exhibit digital copies of the original environment in some heritage sites like the Viking Ship Museum in Oslo and the Calmecac Museum in Mexico City (Liestøl, 2021). Quality management can then also benefit from a "locally-focused" yet "digitally-oriented" perspective as well (Palumbo, et. al., 2021).

This shift in orientation to the wider environment makes museums rethink a lot of their role in climatic changes as well as operating on sustainable means. In Kamba's *Environmental Protection and the Role of Museums* (2022), while the protection and role aim for carbon-free societies, there is a large impact on 1) energy conservation, global warming countermeasures, and environmental security laws, 2) energy reduction in the museum from storage environment adjustments due to seasonal changes, and 3) crisis management before and after natural disasters. Amid the changes in the global economic environment, management strategies in museums grapple with enhancing competitive advantage and sustainable development (Tsai & Lin, 2018). All mentioned above might then advocate further discussions on interactions between museums and climate change, and sustainability as well.

25.4. Museums and Climate Change

Climate change is "one of the most significant and fastest-growing threats to people and their heritage worldwide" (García, 2019). Mahfoodh & AlAtawi (2021) contextualize this, for instance, in the Cooperation Council for the Arab States of the Gulf (GCC), where "anthropogenic climate change poses a serious threat to the intangible cultural heritage." Despite this, Bikovska (2021) finds that albeit limited only to 10 museums in English-speaking countries, the museums' Facebook pages did not focus on the causes of climate change and the call to action from audiences. The crucial lesson that museums are critical of showcasing is the fact that climate change is real. How museums educate visitors about it and how they adapt to it is a matter of being agents for social change.

Natural history museums house scientific collections of the natural work as objects of study, which cater to both academic and recreation purposes about "the most diverse types of materials" (Costa, et. al., 2021). However, "most of the current contributions come from scholars covering climate control practices in developed nations" and "the bibliography related to museum environmental and climate management in other regions is comparatively limited" (Elkadi et. al., 2021). Henry & Carter (2021) show that in Michigan, rural areas where climate change is not part of the curricula especially in informal education and outreach, small and mid-sized museums, even if they are not primarily science museums, can help by becoming sources of climate change contents. The responsibility of protecting collections from increasing climate change risks is the responsibility of museums as "stewards of cultural heritage" (Gombas, 2021). Gombas identified that adaptation strategies can be successful if they focus on these required key themes of "institutional mission, values, and policies, research, education and training, physical prevention, and collaboration." These themes provide consistency and identity, which are significant components in understanding cultural patterns and heritage.

Important edited collections about climate change and heritage on various issues have been taken up by Rushfield (2021) who edited *Stemming the Tide: Global Strategies for Sustaining Cultural Heritage through Climate Change,* which covered topics from archaeological sites and resilience to arts and culture. What is important is that this collection is followed up by the inputs from the breakout workshops about cultural and historic urban landscapes, archaeological sites, built heritage, cultural communities, intangible cultural heritage, and museums and collections. McGhie (2021), founder of *Curating Tomorrow,* claims in the final essay from the museums and collection workshop that there are good intentions on climate education but there is also a "Lack of Momentum." Museums must have commitment and action to operate in a "circular economy", reducing Greenhouse Gas (GHG) Emissions and waste with environmental controls for a sustainable environment. Even a simple exercise of reflecting on climate change through artworks can mean a lot to the visitors who must be deemed as participants rather than just guests. In the case of South Florida Museums, multi-scale institutional changes have to be made in changing the museum climate, that is, to integrate environmental issues in the exhibits and educational programs (Riopelle, 2021). An analysis of climate change

impacts on preserving the heritage elements of The Chapel of the University of Seville is one such way to monitor optimal preservation values and find out the most effective strategies like cooling and dehumidification in their case (Bienvenido-Huertas, et.al., 2021).

For museums, then, to adapt to climate change they must also be agents of change themselves. Eid & Forstrom's (2021) collection *Museum Innovation: Building More Equitable, Relevant and Impactful Museums,* treats the museum as "a social innovator" that is "purposeful in turning the static objects and distant histories into forces of good that helps elevate communities and advance environmental and social justice causes." Indeed, in another important collection on museum activism, collaborative involvements, and inclusion, museums are "agents for social change" (Chipangura & Mataga, 2021).

The emphasis on participation and collaboration can be connected to the reimagining of museums in their possible futures. The role of museums for the future covers the diversity and creativity of resituating the field in various fora of conversations, "transdisciplinary alliances," and "strange deviations," which can offer collaborative, even subversive, and nomadic characteristics to the climate action projects (Harrison & Sterling, 2021). Part of the reimagination of possible museum futures is to radically think of museums within biodiversity. Li et. al. (2021) have taken the term 'museum' in the field of evolutionary biology in claiming that "mountains can play the roles of museums and/or cradles in the evolution of biodiversity" in their study of hemipteran insects (p. 1081). The challenge is to extend the imagination beyond biodiversity because the "concepts of cradles and museums have outlived their utility in studies of biogeography and macroevolution and should be replaced by discussions of actual processes at play" (Vasconcelos, et.al., 2022).

In the case of intangible cultural heritage, Mahfoodh & AlAtawi (2021) explore the sustainability of oral folklore through mobile museums, UN partnerships, and national policies. In the context of the COVID-19 pandemic, thinking about a "radical, sustainable future" means preparing to challenge the status quo and "fostering collaborations" (Cobley, 2021). Transatlantic collaboration such as the U.S. and German museums can create "a cooperative network for the future" and the vital point is that while this is between well-established huge natural history museums,

the themes in the framework are also relevant for smaller and even non-science museums (Stauffer & Horstmann, 2021).

In terms of planetary health, soil science is one critical area that museums must take up. As such, "museums, collections, and exhibitions of soil play an important role in educating the population about this finite natural resource that maintains life on the planet, and for this reason, they must be increasingly supported, extended, and protected" (Richer-de-Forges, et. al., 2021). The development of sustainable museums and consequently, of sustainable tourism merely requires "minimum renewable energy potential necessary' in solar and wind energies 'for its transformation" (Calderón-Vargas et. al., 2021). It is, however, not safe to say that countries with strong environmental reputations can guarantee their future-proof security on climate change impacts, especially on cultural heritage and landscape, so that, like Sweden's case, necessary recommendations have to be made (Antonson, et. al., 2021). Antonson, et. al. (2021) have five recommendations. First, the highest national authorities working on climate change, cultural heritage, and landscape and transport infrastructure should clarify the roles and mandates to have planning consistency. Second, the planning should be cross-sectoral or inclusive, representing even the general public, and be clear about the types of cultural heritage that should adapt to the changing climate. Third, standardized methods for heritage risk assessment should be developed, including more accessible advanced Geographic Information System (GIS) tools, to ensure effective procurement and adaptation measures. Fourth, a comprehensive handbook or best-practice manual containing detailed knowledge of cultural heritage and climate change (or climate impact assessments) should be created for various crucial purposes such as providing an essential reference for decision-making authorities and consulting companies. And finally, support has to be initiated by national multisectoral networks that must build knowledge and share experience on practical questions and strategies for solutions to threats.

Climate museums, therefore, are innovations that have been established and opened in the recent decade dedicated precisely to climate change. Newell (2020) highlights five of these each with their own distinct but interconnected missions to step up collective efforts for climate crisis action. Those are, namely, the Jockey Museum of Climate Change in Hong Kong (opened 2013), the Museum of Tomorrow

in Rio de Janeiro (opened 2015), the Climate Museum in New York (opened 2016) (Massie & Reyes, 2021), the Klimahaus Bremerhaven 8° Ost in Germany (opened 2009), and the Klimahuset in Oslo (opened 2020). Although not mentioned by Newell, The Museums & Climate Change Network additionally includes The Museum of Water (begun in 2013), a mobile museum that follows Newell's suggestion including digital museums and networks.

25.5. Museums and Sustainability

Museums and sustainable development have a "bidirectional relationship" (Panagiotis & Stavros, 2021) because they go hand-in-hand for the future. The International Council of Museums (ICOM) supports sustainability by establishing a new working group precisely for such a purpose (ICOM, 2018). However, many museums do not implement sustainability efforts (Hedges, 2021). At the practical level, Hedges (2021) finds that in Arizona museums, museum workers did not implement efforts unless they were "already part of everyday practice," owing to the factors of whether the efforts are challenging or easy to implement. At the theoretical level, Orea-Giner et. al. (2021) suggest that to achieve sustainability, assessment of economic value and socio-cultural impacts can be theoretically approached through a mixed-method design involving tourists' perception and the local community.

Because tourism is a key factor in job creation and value creation, Lukáč et. al (2021) studied marketing communication as a sustainability tool in castle museums. In the value co-creation process, Piancatelli et. al. (2021) find that in Italian museums, the museum atmosphere affects visitors' perceptions and behavioral intentions. The tourists' quality of perception and visit intention both influence customer interests. Lindsay et. al. (2021) would concur on this by setting a sustainability agenda through media coverage of green science museums. Moreover, Evans & Achiam (2021) work on the operational definition of sustainability that aligns with the idea of museums as out-of-school science education. The impact of activities that must raise awareness carried out within museums should be articulated and communicated properly by the institution so that the perception of visitors goes beyond the information provided by the staff (Betancourt & Camargo, 2021).

The idea of cultural sustainability, taken from independent libraries in the UK and the US, suggests that supporting sustainability must not only focus on heritage preservation, but also on the key areas of cultural identity, cultural diversity, and cultural vitality (Loach & Rowley, 2021). In the heritage sector, a bottom-top approach should be incorporated in the museum accreditation system that should include sustainable development. Upon critical review of the role of cultural heritage within sustainable development, the sustainable development themes, and promoting sustainable museum practices, Vikmane & Lake (2021) review Latvia's nine most popular or visited museums. Important museum priorities in the successful incorporation of sustainable development first include cultural sustainability, precisely on the strengthening of national identity and communication technology sustainability. Second, there is financial and tourism sustainability that refers to image-building without sacrificing economic sustainability. These reflect the highlight of Zutshi et. al. (2021) on Corporate Social Responsibility in museums and galleries through the context of social and economic dimensions, along with the environmental dimension. For instance, Panagiotis & Stavros (2021) present the Open-Air Water Power Museum of Dimitsana as an example of how the traditional community values the power of water through pre-industrial techniques in the creation of various products. This example links social and financial stability and the relationship between man and the environment. Third, there is energy and environmental sustainability where efficient energy is being used in infrastructures and sustainable transportation solutions to support eco-cultural resilience. Muñoz-López et. al. (2021), for example, find that an audiovisual exhibition is more sustainable than a printed exhibition. It does not take many physical resources, logistics, or waste. And finally, there is social sustainability in Latvia's museums that builds on social capital, allowing physical, intellectual, socio-economic, and emotional accessibility. In this sense, the heritage sector, particularly museums, can match and achieve sustainable development goals.

What is becoming important in the relationship of museums to sustainability is not to compromise cultural identity. The premium is put on retaining cultural identity amid all different kinds of developmental goals, which then prioritizes cultural sustainability. Branden & Humphrey's (2021) study on museum visitor preferences according to their university members are neutral on sustainability

(even if they practice it) and suggest the need for social inclusivity and post-pandemic measures during COVID-19. Social inclusion in museums is the incorporation of the community's culture so that a wide range of representations must be seen to allow accessibility. Saad, et. al. (2021) speak of The Grand Egyptian Museum as a unique tool of mass culture and sustainability that enables the revival of traditional crafts and creates platforms for local artists through "sophisticated promotional plans" where the community can advertise their own brands. Silk Road Museums' design of inclusive heritage and cross-cultural education also highlight local factors that emphasize "aesthetic arguments of cultural identity" (Huerta, 2021). In mural art or contemporary muralism in Uruguay, the same bottom-up approach is espoused by De-Miguel-Molina & De-Miguel-Molina (2021) who concluded that for sustainability to happen, different actors must take part in the process, that is, "from conceptualization to the conservation." Indeed, Dwyer (2021) claims that the most influential reason among the unique reasons for museums to adopt sustainability is "that museums have a responsibility as community leaders and change-makers."

25.6. Conclusion

In this chapter, we tried to review the roles of museums in planetary health bioethics. This attempt tends to highlight and delve into the important relationships between the museums and heritage sector and the topics of the environment, climate change, and sustainability. Bioethically, museums are able to correspond to the rapid development of society and show our attentions with love to our beloved planet via the interventions or approaches of adaptation in various eco-friendly practices. In order to have significant impacts on the enhancement and enlightenment of planetary health, the sector should maintain and perform its flexibility and its characteristic of being multi-functional. These impacts are required in coping with the complex relationship between environmental issues with pedagogical mechanisms, developmental policies, and management systems. From soil, water, to tourism, history, architecture, and digitalization, the roles of museums cover a wide range of concerns.

Museums should become agents of change and tools for connection in the time of socio-ecological transformations. Sustaining heritage and cultural identity as part

of the environmental resources throughout the process of working toward planetary health is critical albeit difficult. Incidentally, the ethical act of love is not easy and as sustainable prospects and climate change strategies show, a planetary health bioethics through museums needs commitment, collaborations, and endless negotiations from local to global levels. The challenge is to be able to renegotiate the critical roles that museums have in the past and integrate those in future definitions so that a more inclusive scope can be covered but without sacrificing cultural roots. The interactions among the fields mentioned in this chapter are fundamental to the mission of promoting a definition of health that co-benefits humans and natural systems together and thus to have a brighter future in terms of human lives, the environment for society, and the whole of the planet.

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26. Summary

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Starting from the premise that human health and wellbeing is a subset of overall fitness, wellbeing or "health" of the biosphere and planet Earth as a whole, this seemingly eclectic selection of essays show how the ramifications of diverse factors and considerations can ripple like compression waves, through local, regional and even global society. There are impacts on people, other organisms and often on whole ecosystems. It is this universal truth that unites the contributors to promote the ultimate goal of improving how people and societies interact with each other and the living ecosystems we are an integral part of. This demands all-embracing bioethics considering and respecting perspectives from East and West, North and South without discounting established ethical frameworks and theories but also valuing indigenous values and insights.

The building blocks of our complex material and living world were once thought to be a balance of the elements: air, earth, fire and water. These can be seen as symbolic properties that can be used to illustrate aspects of how bioethics or life-organism-ecosystem-ethics or eubios living-ethics can help to transform our thinking and norms.

Air – made up of millions of millions of tiny independent particles with weak forces between can allow for relatively rapid diffusion, can act to cause random

pp. 452 - 458 in *Planetary Health,* Alexander R. Waller and Darryl R. J. Macer, eds. (Christchurch, N.Z.: Eubios Ethics Institute, 2023).

Brownian motion of significantly larger none gaseous particles and when acting collectively billions of interactions or collisions due to pressure differences will make a storm. Ethical shifts likewise may start with small independent thoughts, some of which may appear in random discussions, but as more and more people reflect and act in the same direction this can lead to a tremendous force.

Many years ago Aldo Leopold, Fritz Jahr and Van Rensselaer Potter proposed land ethics and bioethics respectively. Growing environmental awareness in tandem with the recognition of the right for populations and communities to improve their economic and living standards whilst acknowledging there were limits to growth that led to the Brundtland definition of sustainable development in 1987. Thirty years ago this novel term was debated and its implication took a period to dawn in minds before translating into optimistic targets and budding policies. However, now the idea of sustainability is well understood and many industries and businesses claim to be operating in a sustainable manner. Few government critics will hold-back, when opportune, if laws, policies or regulations show cracks from unsustainable foundations. This illustrates how, from humble beginnings, bioethical principles can diffuse into everyday conversations to become part of a new norm.

Fire is a clearly visible energy conversion from a stored potential form releasing light and heat that dynamically excites and moves particles. Ethical insights and debate can also mobilise people to act and live in new ways. In growing numbers worldwide, there are more people adopting vegetarian based diets, more ethical consumers, higher standards of safety such as wearing seat belts and similarly there are condemnations of emotional neglect by parents who in former times may have been merely described “cold” or “austere”. The Covid pandemic and subsequent food and energy crises may act as catalysts to bring on lightbulb moments. Will it, relatively suddenly and universally, be seen as unacceptable to consume unrestrained amounts of polluting energy sources if clean alternatives are available, to be a fast fashion addict or purchase and discard excessive quantities of food? Scientists have shown the global distribution of microplastics that enter the food chain many of which are derived from the synthetic fibres used in much modern clothing and simultaneously there are reports of tonnes of unwanted donated secondhand clothing being poured into landfills in several African countries. Economic constraints along with increasing food prices are leading to many western people re-

assessing their food purchasing and storage practices. Diesel combustion was, only a few decades ago promoted as being efficient and cheap, yet in last decade has been referred to as a dirty fuel compared to gas or electricity. Yet these changes in perspective required evidence, debate and later regulation and legislation. This collection of writings adds to the bioethical debate that will lead to transformed norms of behaviour and laws.

Earth is the substrate that all life on land is founded upon. Soil provides essential minerals, substance to support massive organisms like trees and a potentially everlasting resource to provide food for all humanity if properly stewarded. Satish Kumar proposed (2013) that soil is so important that is should be regarded along with soul and society as a member of a new trinity to enable us to shift towards living in a truly peaceful and sustainable way. Earth is symbolic of substance – and meaningful ethics must be fully grounded to hold sway in public discourse.

According to Wikipedia, "in 1993 the Norwegian physician Per Fugelli wrote: 'The patient Earth is sick. Global environmental disruptions can have serious consequences for human health. It's time for doctors to give a world diagnosis and advise on treatment." That was three decades ago and it is only in 2022 that USA, one of largest emitters of greenhouse gases, has made a significant legislative commitment to make a shift towards renewable energy technology. This timescale for change may not be ideal, but at least change is on the horizon. Therefore, it is important to keep the bioethical discussion, of our responsibility towards the planet and how this impacts on our own health, on the public agenda.

Water is the primary compound on Earth that makes all life possible. It has an ideal liquid temperature range and polar properties that make it a universal solvent and electrolyte. Its thermal capacity makes it an excellent coolant, it's density enables the formation of rivers, lakes and oceans. It is used, along with carbon dioxide from the air being sparked by energy from sunlight, as a reactant for photosynthetic organisms to assemble complex organic molecules. Debates provide a medium to exchange ideas and dissolve differences. Ethical insights can cool heated expressions and promote peace. Complex problems can either be viewed as a whole or be broken down into simpler parts allowing recombination into stable workable new systems. An example of this can be seen in the safeguarding of children. There are many

reasons that children need protection, and ever growing risks of harm to them such as through the internet and social media. Yet applying simple ethical principles of beneficence and non-maleficence, whilst considering rights and responsibilities, it has enabled cross party agreements in governments leading to the construction of accepted legislation. Ultimately this has been shown to reduce the percentage of abused children in many countries.

The above analogy of the classical elements with bioethical considerations is illustrative of the increasing need for multidisciplinary and holistic consideration of complex socio-environmental challenges. In the UK two government agencies: Centre for Environment, Fisheries, and Aquaculture Science (Cefas) and Animal and Plant Health Agency (APHA); are working together to develop sustainable food systems using the One Food approach. Referring to food systems they list several bioethical dilemmas that add layers of complexity to policy considerations and they claim that: *"The One Food project is proposing that new, holistic tools are needed to catalyse wide-reaching food-environment policy change. By working with economists, ecologists, climate scientists and social scientists… …we are looking to form a new 'Community of Practice' around these principles. Bringing previously disparate deep specialisms together around a shared focus – better, safer foods that have less impact on the environment – to calculate benefits of hazard control not only in terms of food and money, but also related to biodiversity and climate-efficiency per unit of food produced….*

….Identifying and controlling hazards, and the impact that they impart, at source may catalyse positive change which transcends traditionally discrete domains and should drive connection of policies which better link water, soil, and air quality with safer and more sustainable food supply. This rather obvious but nonetheless ambitious concept needs new conversations between colleagues who speak different technical and policy languages and who think at different scales and from different directions; it goes to the heart of how we value food and, those environments which make sustainable production possible."[100]

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100 Grant Stentiford, 3 November 2022 *One Food for One Health* https://marinescience.blog.gov.uk/2022/11/03/one-food-for-one-health/

Reading through this *Planetary Health and Bioethics* anthology of observations, descriptions, analyses, evaluations and proposals reflects the diversity of input from different perspectives that are relevant to planetary health. Policies and standards based on scientific study underpinned by ethical consideration is the only sustainable way forward to tackle and overcome many environmental and global health challenges that face us today and in the future.

The illustration of One Food shows multidisciplinary strength of this *Planetary Health and Bioethics* collection. Furthermore these issues do not just concern governments or academics, but each and every one of us has a part to play and as Naomi Portnoy says: "*It feels like this* [Planetary Health] *should be a compulsory subject for all levels of education, from elementary and secondary school to all forms of higher education. Helping children and adults to translate such a huge subject by breaking down the extensive aspects discussed within this discipline into more tangible values is a must*."

Terry Morgan uses the analogy of a business trouble solver to illustrate how ever burgeoning impact of the growing human population puts increasing strain on finite resources and space on our world. This primary stressor must not be ignored and in some minds there a moral duty for us as a species not to irreversibly harm the environment to the detriment of (all) other species. Yet planetary health illustrates how before a possible Catastrophian Age or scenario is reached our health is already being negatively affected by many environmental stressors; not least atmospheric changes that are leading to climate change. Ecologists use the concepts of carrying capacity and density dependent or independent limiting factors to define the population of an organism in the environment. These factors can be either biotic or abiotic and have different limiting potentials. There are added complexities that define human population levels, such as education, disparities of access to resources, and conflicts.

The UN SDGs have targets to end poverty and hunger, improve health, education and access to clean water. They aim for sustainable cities and economic growth, along with energy for all whilst tackling climate change and protecting the environment. But as Terry Morgan argues none of the SDGs directly address the overwhelming demands on the planet that are caused by the ever growing human

population. Surely ignoring this amounts to, what could be described as, a heinous sin of omission – putting the wellbeing and very lives of millions upon millions of both people and other bios or living organisms at risk.

This volume includes several contemporary bioethical reflections. Some positive consequences of the pandemic include greater technological and scientific literacy generally across the globe, reducing the need for travel with more online meetings and educational platforms, there have been impressive innovations in medical care including more interdisciplinary collaborations, mental health has been increasingly treated as equally important as physical health, possibly the reductions in travel and world trade helped a little in temporarily halting the rise in greenhouse gas emissions, but there have also been shifts in ethics.

Changes in some values and since pandemic can be seen in various degrees:

- ethical consumption with reports of greater vegan sales in the west and increases in organic food consumption, along with an Accenture global survey in 2020 reported 60% more environmentally friendly purchases
- conversely fast fashion is an ever growing industry
- Attitudes towards people breaking rules – e.g. reporting rule breakers (not wearing masks) could be due to a growing social conscience of group welfare.
- However there has been mixed support for climate protesters blocking motorways in the run up to COP 27.
- In recent times several eco-biothical issues are more often in public debate – rights and responsibilities of accepting / refusing vaccine – restrictions of personal freedom v public interest / wellbeing of society – duty towards nature and taking action on environmental issues.

Ongoing bioethical research and dialogue in important as there are:

- multiple complex and urgent needs
- with a time pressure to act
- and competing lines of accountability
- with uncertainty
- that is and will cause increasing distress

Surely the above five points apply to all looming organic (including human) and environmental planetary health issues. Some of key findings of research include the roles of communities at all different levels – need for inclusivity collaborations and partnerships, three values of equal respect, fairness and to reduce suffering – aided by use of ethical compass. Many of the essays in this book illustrate a number of these factors and considerations. This diverse collection has encompassed many of the fundamentals of bioethics and makes valuable contributions and starting points for future avenues to follow as we collectively work towards improved ecosystem wellbeing and improved human health.

Justice, equity, inclusivity to achieve and maintain peace are illustrative of key bioethical principles that were explored and illuminated in the first section of this book. Ayoub Abu Dayyeh convincingly argues for clean renewable energy to reduce the potential for conflict and reverse the slow violence associated air pollution. Rodriguez explores how the slow violence of inequality of access to novel technologies on the horizon and how this will impose limits on the life of the majority of people. Waller is an advocate for strong citizen science to spread the net wider, giving opportunity, gaining more representative insights and engagement from this participatory approach. This citizen science, like any research, requires consideration of ethics, which is exactly what Titanyan and Espona have outlined in their proposal for responsible STEM programs in Armenia.

Jahid Shiraz starts the following section with a call for unity between campaigns for nature protection and conservation as the way forward to ensure both human and planetary health. This unity means that past wrongs need to be recognised and may require amends as the harm caused by one society upon another causes long lasting economic and life chance damage over several generations. Lara Lopez-Hernaez illustrates how we must now consider how we treat each other and the planet from insights from decolonising native American tribes. Both and between within nations there are inequalities, which frequently leads to people migrating to obtain better opportunities. These people need to have basic rights protected as Sheriff has discussed in relation to the plight of migrant workers during the Indian lockdowns of 2020. The global pandemic has had serious impacts on many

industries, and caused us to reconsider the vital role so many people play to enable others to live healthy and fulfilled lives. Chakraborty et al have done just that by recognising and calling for safeguarding of Indian farmers. Beyond just the farmers themselves Chakraborty and Macer have extended this to explore how many farm animals have been valued in merely monetary terms which has had allowed culling as a strategy to limit pandemics in agriculture. Would this approach be tolerated or even considered for human populations outside Nazi political movements?

In the third section of this book the spotlight is shone onto some environmental issues that have in many ways been overlooked or at least regarded as not priorities as they do not currently have looming tipping points. Ramaswamy gives us a clear reminder that we cannot take nature for granted or assume that what policies have worked will always be sufficient. The Montreal Agreement has given significant protection and restoration of the ozone layer in recent decades, but can we assume that this will continue to be effective as new atmospheric pollutants build up? The world is facing several environmental challenges such as climate change, declining biodiversity and rising levels or pollution (air, microplastics, or water). Sheriff gives us some cause for optimism as several positive environmental outcomes were seen both following the Chernobyl disaster and during the global Covid pandemic.

Waller discusses some potential health and environmental issues associated with pollution from tin mining as a representative extractive industry. He calls for a move towards circular patterns of consumption along with community education to raise awareness of health risks and environmental ramifications. The potential for nature based solutions to help reduce the concentrations of atmospheric gases that contribute to climate change whilst concurrently helping to maintain or promote biodiversity is increasingly being recognised as a viable option. Hedgerows are just one example argues Waller, but one that does not cost and extensive amount and yet has further benefits of reducing the additional environmental woe of soil erosion and degradation. Soil is the foundation for all terrestrial life and Ng leads us towards a hope for the future with plans for sustainable urban soils.

The closing chapters provide some avenues of hope towards a healthy future environment. This includes recognition of the untapped potential of traditional

technologies such as the water management systems illustrated by Mor and new technologies delved into by Maboloc. The importance of education has been touched on throughout this book but has explored in depth with three different foci by Parahakaran, Macer and Kharestani. Finally it must borne in mind that education must not be confined to the classroom: Kahambing and Lao review the potential for museums as centres of excellence, role models of bioethical standards showcasing exhibitions relevant to Planetary Health.

We started this work in 2020 at the end of the decade of biodiversity, and with the advent of term “planetary health” we see growing reference to both ethics and indigenous peoples in the outcomes from the 2022 COP 27 and COP 15. The book has grown and matured as the world battled the COVID-19 pandemic, one of the greatest health crises known to modern humankind.

As editors we have been privileged to work with such a well-qualified and experienced group of researchers and authors. We would like to take this opportunity to express our gratitude for their inputs and encouragement to complete this work. We also applaud the art and poetry, and we need to apply greater creativity to not only solve the issues of planetray health, but also to celebrate our planet.

We leave the final words of this work to prose and art to inspire thought and action.

Mother earth's health - our ethical and moral obligation

Namukolo Covic

International Livestock Research Institute, P O Box 5689, Addis Ababa, Ethiopia

Email: N.Covic@cgiar.org

Planet earth, mother earth, you provide for us and care for us
As a mother, you have nursed and provided for us, abundantly
As a mother you have provided for us from the beginning of time
From the beginning of our time over thousands and millions of years
Our ethical and moral obligation is to protect your health and your integrity
It is upon your integrity that humanity's survival depends

Planet earth, mother earth, you have provided forests, diverse plants and animals
Diverse plants, animals and ecosystems are sources of all we have
But the diversity from which we have drawn, like fools we are destroying
Like foolish children, we bite the fingers that feed us
Like fools we lose many species of plants and animals every year
Yet it is upon this diversity humanity's survival depends

Planet earth, mother earth, our thirst for the energy in your belly is destroying your health
What baby destroys the mother's health, upon which it depends, for everything
Your health is plant health, animal health and environmental health that we destroy and pollute
Plant health, animal health, environmental health is one health that we must protect
One health gives you our planet, our mother earth the health to sustain your integrity
It is upon your integrity that our survival and of our children depend

Planet earth, mother earth, it is not just our survival at stake but of humanity itself

You are getting hotter, we see frequent droughts and floods, clear signs of our damage
We cannot run, there is no other planet or another mother earth for us
We must run, to enact laws and regulations to protect your integrity
Every man, woman and child has the ethical and moral obligation to protect you
It is upon your integrity that our survival and of future generations depend

Planet earth, mother earth, we must hear the voices of indigenous peoples
Indigenous peoples whose knowledge can help us
Scientists too whose knowledge can help us
We fight and ignore this knowledge endangering your health
We must act urgently; we are already late for the damage we clearly see
It is upon your integrity that our planet's health and our survival depend

Planet earth, mother earth, you have provided for us and cared for us
Planet earth, mother earth, we must take actions and protect you to survive

We don’t have – to be

- Alexander Waller

We don’t have to be
Locked in
Blind to see
A future to strive for
Where mistakes are not sins
Rather chances to learn more,
Revalue, trust, love more
Not driven by avarice
Down a blind alley of malice

We don’t have to be –
Naïve some may say –
But we do have
To behave
In an ethical way
And embrace the day
Where nature’s our partner
Not slave

A Corpse

- Nicholas Bielby

See how the trees adapt their canopies to make a single cumulus of green!
This loveliness of Nature has no plan but is the working out of every tree's capricious struggle, reaching out for light.

Branches and twigs that do not earn their keep die off,
while other thrive – and so trees shape themselves to each other blindly, in their fight for life.

And yet their mazy roots are all meshed with mycorrhizae which interact with them in symbiosis and effect communication for their common weal.

The copse is, then, a sort of commonwealth:
one tree's attacked by insects or a virus – it reacts and that reaction spreads throughout the corpse, forearming others for its health.

The world of Nature is a mesh wherein we have our place.
Yet rise above it, since we understand the curious knit of things:
how fitness is a case of fitting in.

What we're conscious of is not so much that Nature's "red in tooth and claw,"
but that the wonderful complexity of it dies and degrades through entropy to mush –

a mush full of potentialities.
The clouds disperse, dissolve, dispense their rain.
The world is never quite the same again.
New trees, new skies, new possibilities.

Black Elk

"All the wings of the air shall come to you."
- Nicholas Bielby

Young Hiawatha talking to the birds –
I loved it. And when the *Geographic* had
a picture of a red man, in an ad.,
breathing tobacco smoke and ritual words
into the gaping mouth and down the throat
of a grizzly bear that he'd killed, to make
peace with its spirit, I felt something ache
with an unspecified longing in my heart.

Now, glancing at a book called *Angels* and chancing
on Black Elk's prophecy, again I feel
this something: "Anywhere is the centre
of the world, where it is very still – but there are
whispers..." The song of the sun "so beautiful
nothing anywhere can keep from dancing..."

Climate justice

- *Shannon (Sam) Portnoy, The Netherlands*

Trees fall
rivers flood
Our hands
covered in blood

No need to look for
the murderer in this case
We already know
it's the human race

No time left for apologies
No time left for empty words
She's in terrible pain
and watching her suffer hurts

Everything we've destroyed
No wonder she's annoyed,
letting her wind blows us away
She's only trying to survive
day by day

Only if you stop denying
If you stop flying
If you stop lying
So we won't be dying, soon

So we can still watch sunsets
and fall in love with the moon
Surf the oceans instead of
being afraid of drowning

In the tears she cries
while she slowly dies

Blood on our hands
destroying all the lands
she gave birth to

Blood on our hands
is the consequence
of what we do

As killers
Of our own mother earth
Her, dealing with our dirt
Not getting what she's worth

Justice

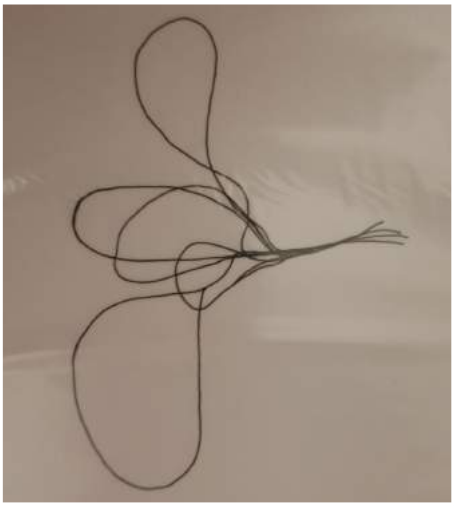
Planetary Health and Bioethics

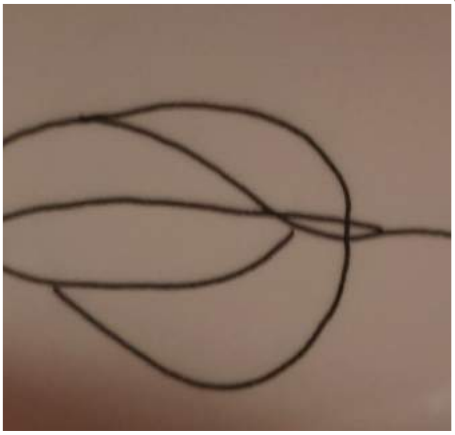
- Bam, Benyapha Wongtai,

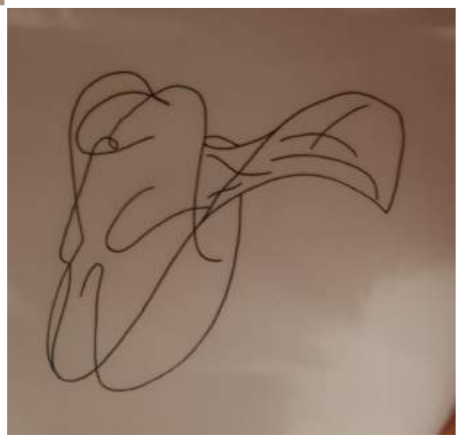
Senior school student, St Stephen's International School Khao Yai, Thailand.

Trees: The essence and future of our planet

- Maniya, Iran

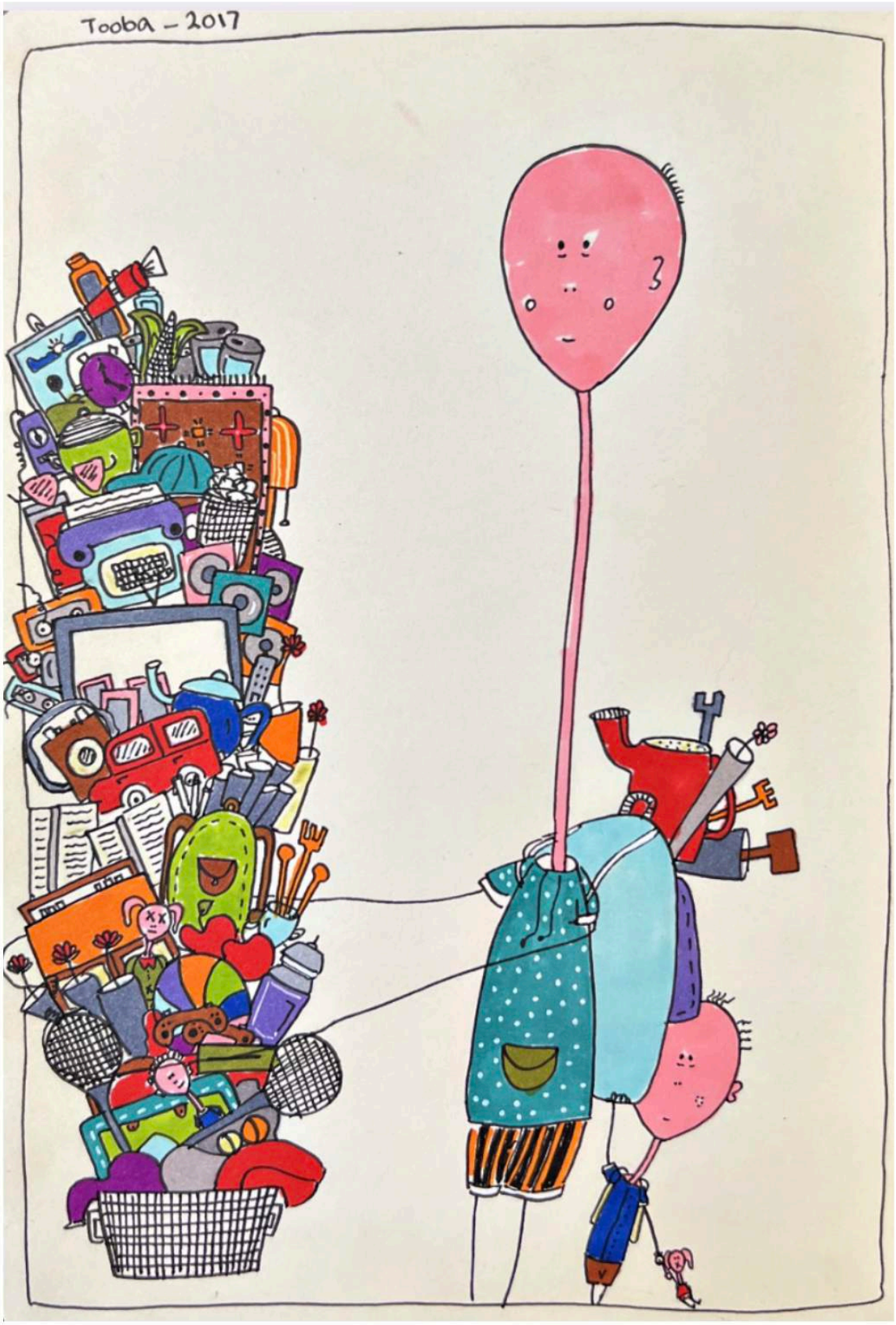






Planetary health demands the end of the clutter of consumerism

Tooba Kharestani, Iran



Author Biographies

Mahta Baratipour is a Senior Research Fellow at American University of Sovereign Nations, and has a Master's degree in Bioethics and Global Public Health from AUSN and a Bachelor's degree in Computer Engineering in Iran, where she is currently also studying art. Her research and action are in the fields of art, bioethics and social sciences. Mahta is Youth Looking Beyond Disaster Ambassador, and her art appears under the name Maniya.

Nicholas Bielby has written award-winning poetry for the Arvon International Poetry Contest and is currently the editor for the *Pennine Platform* poetry magazine and Graft Poetry publishers. He read English under F. R. Leavis at Downing College, Cambridge before transferring to philosophy. Later, he took an MA at Leeds. After graduating he taught at the University of Agra in India before taking up primary school teaching and then latterly, he became a teacher educator at Bradford and at Leeds Universities.

Rhyddhi Chakraborty, FHEA, gained her Ph.D. from Indian Institute of Technology Kharagpur, India and is a Fellow of the Royal Society of Medicine in the United Kingdom. She is currently leading the academic programme of Diploma in Education and Training and HealthCare Practice at CECOS College London, UK. She has more than 15 years of teaching and research experience in bioethics and applied ethics.

Namukolo Covic, PhD., has a multidisciplinary academic background that spans crop science, animal and poultry science, and human nutrition. This has made her uniquely positioned to address dynamics of food systems transformation from different perspectives. She has worked extensively with the government of Ethiopia and other stakeholders in different African countries on different fronts of food systems, development of food based dietary guidelines, nutrition, and nutrition leadership development. She has supported African Union efforts on linking agriculture and nutrition in the Comprehensive Africa Agriculture Development Programme (CAADP process). She has led the Governance Working Group of an Independent Expert Group that emerged from the United Nations Food Systems Summit 2021 (UNFSS 2021), that developed a Monitoring Framework on Food Systems Transformation to guide progress on the Sustainable Development Goals (SDG) countdown to 2030.

Ayoub Abu Dayyeh is a Civil and Structural Engineer graduating from UMIST in Manchester, UK and a Doctor of Philosophy. He was the founding president of the Society of Energy Conservation and Sustainable Environment from 2004 -2016 and is currently the honorary president. Ayoub has been the head of an Engineering Chartered Consultant office for green buildings and energy efficiency studies since

1980. He previously was a part time lecturer on humans and the environment at Alzaytoonah University in Jordan. His main interests are Green Buildings and Environmental Ethics. Ayoub has co-authored many books, including a UNESCO *Philosophy Manual: A South-South Perspective* and *The Political and Economic Challenges of Energy in the Middle East and North Africa.* He was awarded The Green Apple Award, the Golden Prize Winner for the Built Environment in the Middle East, June 2010, and the Environmental Advocate Prize from the Arab Cities Organization, 2015, Qatar, as well as the Best Scientific Book award of 2016 from Philadelphia University, Jordan.

Maria J. Espona is the director of Argentina Information Quality (ArgIQ). She firstly graduated in biology and later completed a masters in Terrorism Studies followed by a doctorate in Criminology. She is an expert in the WMD field, especially in the CBW arena and export control. She has several publications on those topics. She teaches postgraduate courses in Science, Technology and Disarmament, emphasising research methodologies, information quality and intelligence in Argentina and Peru. Maria is currently is the leader of the following projects: TI CBRN Export Control on Dual-Use Materials and Intangible Technologies in Central Asia (ISTC) and CBRN Export Control on Dual-Use Materials and Intangible Technologies in GUAM Countries (STCU). She participated in EU funded projects on CBRN and export control of dual use goods and technologies.

Samik Ghosh has worked for 17 years in social innovation and development impact portfolio. He has diverse experience in multi-year funded program management, monitoring & evaluation and development research, grant management in India, Bangladesh, Nepal and Africa. He is inspired to work on large scale development programmes and projects on Public Health & Nutrition, Climate Impact and Food Innovation, ICT for Social Innovation for Women and Children. In the recent past, he managed multi-country Program Monitoring Evaluation & Learning for Impact funded by BMGF, World Bank, SDC, IFPRI and OXFAM. Prior to this, he was spearheading a large evaluation portfolio regarding innovation in the food sector in collaboration with IFPRI, McGill University, University of South Carolina and Wageningen University & Research. Samik was awarded Master of Arts in Social Work and Community Health and received executive training on Leadership Development Program and Data Ethics. He has published in several peer-reviewed journals and books covering innovation in the M&E approach in Public Health, Food Innovation, Agriculture for Nutrition and Health and Diffusion of Social Network to create farm level impact. He has key interest to work on Social Health and Innovation, Health Promotion, Social Network and Carbon offset for sustainable soil health. Samik has interests in knowing indigenous cultures, food and visiting libraries.

Jan Gresil S. Kahambing is a Ph.D. student at the University of Macau. After his classical and divinity studies at the University of Santo Tomas in the Philippines (2009-2016), he taught at the Leyte Normal University and served as its first Museum Director (2018-2020). His current project is on the philosophy of museums through the lens of Object-Oriented Ontology.

Tayebeh Kharestani is a Senior Research Fellow at American University of Sovereign Nations, and she is completing a M.A. in Childhood Studies and Children's Rights at the University of Applied Sciences, Potsdam, Germany. Tayebeh's motivations include: *Children* by bringing hope to my life; *Change making* by being the change I want to see in the world; *Design* by creating; *Innovation* by thinking, talking and taking action outside the box; and *Learning* by being an engine of my development. Tayebeh has a Master's degree in Bioethics and Global Public Health from AUSN and a Bachelor's degree in Industrial Design from the University of Tehran, College of Fine Arts and Tabriz Islamic Art University, Iran. Her research and action are in the fields of environment, children's rights, public health and raising environmental awareness. Tayebeh is on the Board of Governors of Youth Ambassadors International and she is a UNESCO Youth Peace Ambassador

Tooba Kharestani is a graphic and packaging designer currently based in Tehran, Iran, who graduated with a Bachelor's degree in Industrial Design from Alzahra University.

Teng Wai Lao is a Ph.D. student in the Department of Philosophy and Religious Studies, at the University of Macau. She began her studies at Durham University in the United Kingdom and gained a BA in Ancient History and Archaeology (2015-2018) followed by her MA in International Cultural Heritage Management (2018-2019). Through these studies she has developed interdisciplinary and conceptual skills among the fields in classics, archaeology, and philosophy.

Lara López-Hernáez has a Ph.D. in Educational Psychology from the University of La Rioja, Spain. She works as a professor at the public university of Navarra and her studies deal with the improvement of coexistence in educational centers and mindfulness techniques. Lara is also the AUSN Visiting Professor of Mindfulness and Childhood Psychology, and has a MBGPH.

Christopher Ryan Maboloc is an Associate Professor at the Ateneo de Davao University and a Visiting Professor for Global Justice at the American University of Sovereign Nations. He obtained his masters in Applied Ethics from Linkoping University in Sweden and the Norwegian University of Science and Technology in Trondheim, Norway and completed his doctorate in philosophy, *maxima cum laude*, at the University of San Carlos. He also has a master degree in philosophy from

Ateneo de Manila University. He was the Erasmus Mundus Representative for Applied Ethics students, and was a delegate to the 2007 *Erasmus Mundus* General Assembly in Brussels, Belgium. Dr. Maboloc was also trained in Democracy and Governance at the Konrad Adenauer Stiftung in Bonn and Berlin, Germany. He is a member of The Society for Philosophy and Technology and the Universal Science Education Research Network. He was a *Scholarum Awards* nominee for best newspaper column, and has written more than a hundred social and political commentaries for the *Philippine Daily Inquirer*. He was awarded the *Public Intellectual Prize* in 2020 by the Philosophical Association of the Philippines.

Darryl Macer, Ph.D. (Cantab), Hon.D., M.P.H. is the President of the American University of Sovereign Nations. For several decades he has been the director of the Eubios Ethics Institute in, New Zealand, Japan and Thailand as well as the director of the International Peace and Development Ethics Centre in Thailand. He is a research fellow at the Center for Ethics of Science, Technology and Society, Chulalongkorn University in Bangkok and a Visiting Professor of Bioethics, University of San Jose-Recoletos, Cebu City, the Philippines. He was formerly the adviser for bioethics at UNESCO in Bangkok. Darryl is a prolific author of bioethics papers and books and he has produced many bioethics educational resources. He is committed to promoting bioethics as "love of life" in the fullest and widest sense.

Naomi Portnoy is bilingual European of Jewish heritage growing up in northern England and living in The Netherlands. She began her working life helping homeless adults at an inner city support centre in central Manchester. Having gained significant administrative experience here she took up a career in international academic publishing. She has worked on many journals including Plant and Soil, Journal of Atmospheric Chemistry and European Journal of Epidemiology and been instrumental in the production of numerous books. Her passions include playing the piano and digeridoo (but not at the same time), painting, photography, reading and walking with her dogs in natural landscapes.

Ketan Mor, LL.M MA Political Science is an alumina of University of Delhi. He is currently preparing for the civil services examination to join administrative wing of government. He is a Youth Speaker, Researcher, writer advocating for achieving SDGs. He was honoured with the State's Highest Youth Honour (Vivekananda Youth Award) from Govt. of Uttar Pradesh in the field of Academic Excellence and Smart Learning. He has participated in various International Forums, sharing his thoughts on Indian Indigenous Knowledge System and its role in achieving Sustainable Development Goals. His writings on various aspects of IKS got published in reputed national and international journals.

Terry Morgan is a biologist and Member of the Royal Society of Biology. He lives in rural Petchabun, Thailand. Having moved from medical research into industry, at an early age, he then started his own business, manufacturing and marketing medical devices and travelled extensively worldwide. Terry is a keen gardener and naturalist, who particularly enjoys taking photographs of nature. He has a wide knowledge of the birds of lower northern Thailand. Terry now writes novels about international politics, crime, corruption and fraud in addition to thought-provoking articles and books on scientific and environmental issues.

Suma Parahakaran is a Malaysian. She has a PhD in Education from the University of Sydney, Australia and a PhD in Bioethics, Global Health and Sustainability from the American University of Sovereign Nations (AUSN). Suma is a Visiting Professor in Environmental Education and Bioethics at AUSN, and a Trainer of Teachers (TOT) for the Human Values based Integrated Curriculum for the Environment. She has won gold, silver and bronze awards for collaborative research on Sustainable Education and Borderless learning, including the Endeavour International Postgraduate Research Scholarship from the Australian Government in 2007. At that time Suma was part of the task force for the Human Values Based Water Education project implemented by the UNHABITAT in cooperation with the Society for Preservation in Thailand and SEAMEO-RECSAM in Malaysia. Suma was a resource person for Value Based Water Education, UNHABITAT (United Nations Human Settlements) Regional TOT course on Integration of Human Values-based Water, Sanitation and Hygiene Education (HVWSHE) held at RECSAM in the Philippines in May 2007. Her interests include creating resources for children and adults on both conservation and preservation of the planet Earth.

Alexander Waller is a chartered chemist and fellow of the Royal Society of Biology from the UK. Alex graduated with joint honours in biology and chemistry from Plymouth Polytechnic. He initially worked as a chemist analysing industrial and environmental samples and then did research using zeolites for the removal of dissolved radioactive ions. Since completing a post graduate teaching certificate at the University of Hull, Alex has taught for nearly 30 years in England and different parts of Asia. His postgraduate research in the field of bioethics was inspired during an internship at UNESCO Bangkok. Alex has a masters degree in Education for Sustainability from London South Bank University and a doctorate in Environmental Ethics and Renewable Energy Education from Naresuan University. He currently teaches at a rural international school in Thailand and is a visiting professor at the American University of Sovereign Nations.

Sam Portnoy works in the city forest of Rotterdam, The Netherlands where Sam focuses on ecological maintenance. Next to work Sam is passionate about reading and writing, especially queer feminist literature. Sam is an intersectional activist for

social justice and climate justice. In Rotterdam Sam plays in the protest band called Rhythms of Resistance. Sam loves to explore new places with the family dog and travel by camper van.

Jagannathan Ramaswamy has a Ph.D. in physics, and is the former Vice Chancellor, Middle East University, Ras Al Khaimah, UAE. He is currently based in Chennai, India

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Manuel Lozano Rodríguez is a many times awarded project manager and lead scientist (CSO) in projects related with the smart-cities and finding technological and creative solutions to social issues. For more than 5 years he has been the founder and editor of the scientific journal *Disclosing Social Science* and holds an International Federation of Journalists card. Manuel has published research on a wide range of different topics such as cleaning ladies' welfare, coronavirus, xenophobia, geopolitics and (de)colonization in addition to first-line journalist articles on violent social conflicts. He obtained full grants from the American University of Sovereign Nations (AUSN) for both a Master of Sciences in Sustainability, Peace, and Development and a Doctor of Philosophy in Bioethics, Sustainability, and Global Public Health. He is also a Harvard graduate in Organizational Sustainability. Manuel Lozano Rodríguez is currently a visiting professor at the AUSN and chair of the WeCope subcommittee focused on inequity and corruption.

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Jahid Shiraz Chowdhury is a Ph.D. fellow at the University of Malaya. Before that, he served as an anthropology faculty at Shahjalal University of Science and Technology, Sylhet, Bangladesh. On COVID-19, Jahid contributed a trilogy of works, *The 2020 Pandemic and Social Science: Some Insights from the South*, *Handbook of Research on the Impact of COVID-19 on Marginalized Populations* and *Support for the Future*. He is trying to make a space for Reciprocity in Social research, for which Jahid is engaged with a few further book projects, such as *Reciprocity and Its Practice in Social Science*, *Philosophy to Practice of Reciprocity* and *A Reciprocal Ethnography of the Bangladeshi Rakhain: Seeing with Ubuntu in the New Normal.*

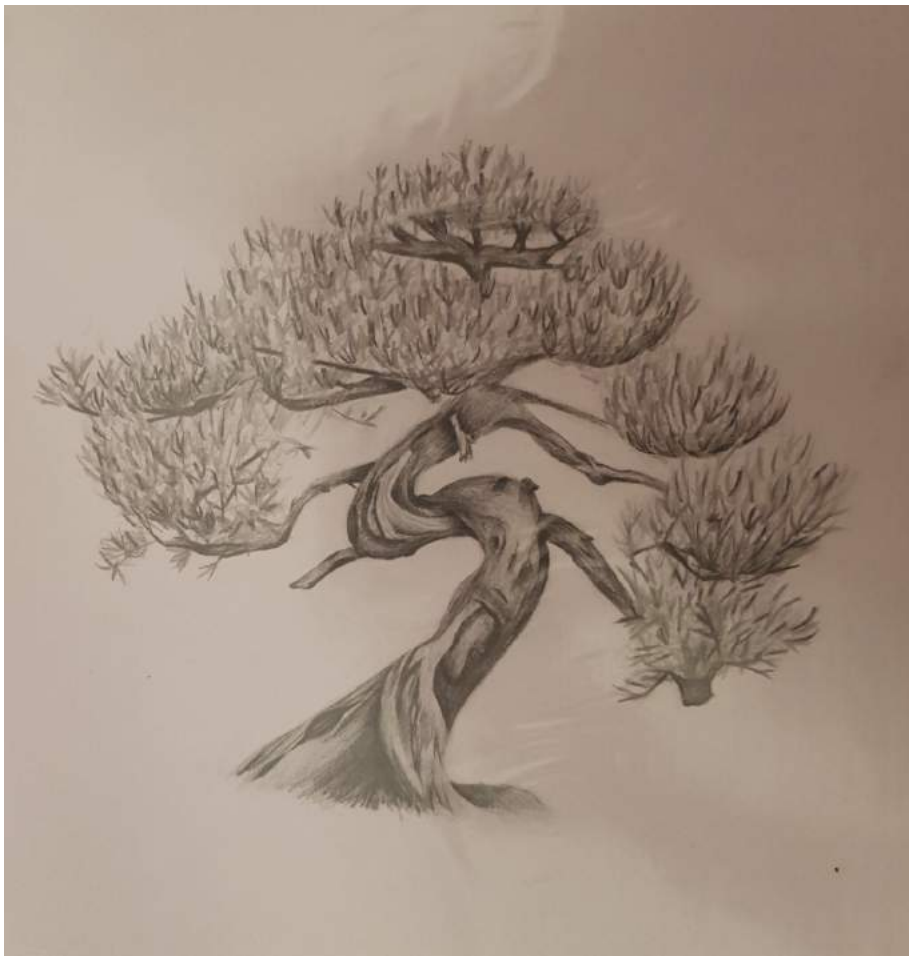
Emilya Titanyan is a legal adviser in export control and commercial law field. She is working at the National Bureau of Expertise of National Academy of Science of the Republic of Armenia. She is also a PhD student at the University of Liege. Her doctoral research is dedicated to the development of the politico-legal concept of a trade control system that could be developed by Armenia considering current issues that the country is presently facing. In the framework of the ISTC – Implemented EU Targeted Initiative on CBRN Export Control on Dual-Use Materials and Technologies, Emilya and a working group conduct outreach activities to promote responsible research for the students, researchers and scientists at universities and specialized institutes. The aim is to raise awareness among stakeholders and to create an enabling environment for the scientific community.

Benyapha Wongtai is a senior school student at St Stephen's International School Khao Yai, Thailand. Benyapha's interests include social enterprise and community activities, being involved in charity events and managing a school shop. She admits to enjoying shopping for food and clothes but also enjoys being in nature. She is studying a wide range of techniques and media as part of her art and design studies.

Nasyrova Firuza Yusufovna gained a doctorate in the Biological Sciences in 1997 and achieved professorial status in 2000. She is the Head of Laboratory of Biosafety, IBPPG TNAS, in Tajikistan, the Deputy-Head of the Bioethics Council under TNAS, and Vice-President of the Asian Bioethics Association. Nasyrova is a genetic biologist with over 30 years working experience. She is the author of more than 120 works, as well as monographs, and copyright certificates in the field of plant genetics, biosafety, food safety and bioethics. Her main scientific interests relate to the study of biodiversity of cereals and their wild relatives, their origin, phylogeny and intraspecific diversity, as well as food safety and bioethics. Nasyrova was formerly a project manager for several ISTC and UNESCO projects related to biosafety and bioethics issues, and currently is Project Manager of EU funded ISTC initiative "Raising Awareness and Responsibility of Scientists in the Life Sciences". Through this work the *Basics of Bioethics and Biosecurity* special course and textbook has been developed for biology, chemistry, veterinary and medicine undergraduate and

graduate students, which has subsequently been integrated into the curricula of Tajik universities.

The latest version of this book (*Planetary Health and Bioethics*) is available to download on: www.eubios.info/books



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