The current status of this discussion paper is: Version 31st of May 2021, 12:00PM IST.

Discussion Document

"Biodiversity means Health: from virus to vultures"

Disclaimer: This draft document was prepared with the financial support of the European Union. Its contents are the sole responsibility of the authors (B4Life Facility) and do not necessarily reflect the views of the European Union. It aims at framing the speeches, key notes, panel discussion and questions posed during a virtual event scheduled on the 4th June 2021, 16:30-18:30. It will then be revised and improved in light of the event itself, as well as written feedbacks received afterwards.

Problem Statement

Health "is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". (WHO)

Typically, we look at health in a human-only context. However, there is increasing recognition of the broader health concept that encompasses other species, our ecosystems and the integral ecological underpinnings of many drivers or protectors of health risks.

The links between biodiversity and health manifest at various spatial and temporal scales. At a planetary scale, ecosystems and biodiversity play a critical role in determining the state of the Earth System, regulating its material and energy flows and its and its responses to abrupt and gradual change. At a most intimate level, the human microbiota – the symbiotic microbial communities present on our gut, skin, respiratory tracts (etc), contribute to our nutrition, can help regulate our immune system, and prevent infections.

Most direct drivers of biodiversity loss include land-use change, habitat loss, overexploitation, pollution, invasive species and climate change. Many of these drivers affect human health directly and through their impacts on biodiversity. Although the COVID19 pandemic, and its dramatic global implications currently hog the news limelight, it's only one of the many examples of how Biodiversity and health management are closely intertwined. In India for instance, Malaria still kills hundreds of thousands of people each year, snakebites are most numerous globally, the burning of natural vegetation and agricultural stubble leads to respiratory problems … The state of ecosystems' health affects water availability and quality; deforestation leads to landslides, floods and droughts that also have health implications. The loss of agricultural or marine biodiversity threatens food security. The loss of many medicinal plants leads to a shortage of traditional treatments and loss of the germplasm[1] reservoir on which so much new search for medicines depends. Nature has many preventive and restorative effects on health. Regular contact with nature can reduce stress and promote physical activity, with a positive effect on mood, concentration and health, and lowering the risks linked to inactive lifestyles. Recent reports from the CBD and WHO confirm that healthy ecosystems are key to disease prevention and should be viewed as a fundamental pillar of cost-effective healthcare. Conserving, restoring and sustainably using biodiversity in India therefore holds significant potential to improve both human and ecosystems health.

[1] Germplasm are living genetic resources such as seeds or tissues that are maintained for the purpose of animal and plant breeding, preservation, and other research uses. Germplasm collection and preservation is important for the maintenance of biological diversity and food security.

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Vision

> *Biodiversity Conservation and Restoration are cornerstones in a transformed and mainstreamed approach, that coordinates usual programmes for human health, with "health of the environment" interventions, the so-called One Health, ecosystem, or in short "eco-health" approaches: more sustainable agriculture, fisheries and pollution control. Techniques already exist to create a greener, cleaner, more biologically diverse and healthier rural and urban environments. India and EU can help build awareness in all related sectors so that biodiversity issues are routinely considered (in medical education, planning, actions, financing and decision making, both public and private), based on better informed, science-based cost-benefit analysis of environmental impacts on collective and individual health . Human health and wellbeing could improve dramatically as a result of more frequent exposure to green spaces, more diverse diets, better range of toxic-free foods (safe and nutritious), as well as a host of associated environmental services (soil formation, water catchment, pollination, pest control, pollution cleansing, carbon capture). Biodiversity and Health shall be treated as inseparable entities not only in large cities and new developments but also in the rural countryside where traditional beliefs and practices can be built on, to improve health and livelihoods of poor rural communities. Ecosystems provide clean water that underpin many aspects of human health. All terrestrial and freshwater ecosystems play a role in underpinning the water cycle including regulating nutrient cycling and soil erosion. Many ecosystems can also play a role in managing pollution; the water purification services they provide underpin water quality. Mountain ecosystems are of particular significance in this regard.*

Discussion

A very large volume of scientific research has shown the important links between biodiversity health and human health[2]. Ignoring biodiversity impacts (positive or negative) in pursuit of other socio-economic dimensions of SDGs could misfire, if not backfire completely.

In particular, both the domestication of livestock and the intensive poaching of wild meat have led to a dramatic shift in the relative biomass of different species of mammals: globally humans account for about 36 percent of the biomass of all mammals. Domesticated livestock account for 60 percent, and wild mammals for only 4 percent. The same holds true for birds: The biomass of poultry is about three times higher than that of wild birds. When those major "lower components of the food chain" get exposed to new pathogens (be it a pig meeting a wild bat, or a fish eating micro-plastics), humans are next in line, and the higher up in the chain, the higher the risk: The highest concentrations often being met in those who feed upon human milk: babies! The risk also goes beyond food contaminants and toxics to non-food-related, and non-infectious diseases, such as asthma and cancers, or hormonal disruptors [ref needed]. Components of biodiversity can also be used as bio-indicators of known human health stressors, as well as in air and water quality mapping, monitoring, and regulation. The loss of diversity from agro-ecosystems is increasing the vulnerability and reducing the sustainability of many production systems and can further aggravate negative effects on human health. . Pollination is essential to food security generally and to the production of many of the most nutritious foods in particular.

[2] World Health Organisation and Secretariat of the Convention on Biological Diversity. 2015. Connecting Global Priorities: Biodiversity and Human Health. A state of knowledge review.

The misuse of chemical inputs, particularly pesticides, has had severe negative consequences for wildlife, human health and for agricultural biodiversity. While the control of disease vectors such as malaria has generated health benefits, the use of pesticides, especially in agriculture, has led to serious environmental pollution, affected human health (25 million people per year suffer acute pesticide poisoning in developing countries) and caused the death of many non-target animals, plants and fish. Reciprocally, the use of agricultural biodiversity to help cope with pests and diseases and to increase soil quality is a win-win option which produces benefits to human health and to biodiversity. On the other hand, harvesting and trade of wild edible plants and animals provides additional benefits but also risks. The annual value of the bushmeat trade (whose estimate for west and central Africa alone ranged between US$40 and 200 million) illustrates the magnitude of risks of transmission and spread of infectious disease and new pathogens.

The COVID pandemic is a sour, most tragic reminder of what human health owes to its natural environment. The two issues can and must be addressed through participative, cross sectoral dialogue, planning, joint actions and monitoring.

Some dietary patterns that offer substantial health benefits could also reduce climate change and pressures on biodiversity. The global dietary transition towards diets higher in refined sugars, refined fats, oils and meats, are increasing the environmental footprint of the food system and also increasing the incidence of type II diabetes, coronary heart disease and other chronic non-communicable diseases. EU could learn from alternative vegetarian or near-vegetarian diets, common in India, and thus reduce global agricultural greenhouse gas emissions, reduce land clearing and resultant species extinctions, and help prevent diet-related diseases.

Last but not least, human bodies, like all complex plants and animals have microbiota without which they could not survive: For each of us, this microbiome contains ten times more microorganisms than cells that comprise our own body! The realization that humans are not merely “individuals”, but rather complex ecosystems is a recent breakthrough in our understanding of human health. Environmental microbial ecosystems are in constant dialogue and interchange with the human symbiotic ecosystems. Several categories of organism with which we co-evolved play a role in setting up the mechanisms that “police” and regulate the immune system. They help regulate the immune system, block inappropriate attack on self (autoimmunity), allergens (allergic disorders) or gut contents (inflammatory bowel disease). Reduced contact of people with the natural environment and biodiversity and biodiversity loss in the wider environment leads to reduced diversity in the human microbiota, which itself can lead to immune dysfunction and disease. Simply put, our immune system INSIDE is dependent on microbial diversity OUTSIDE in order to establish the mechanisms that regulate it. When this regulation fails it can lead to autoimmune diseases, diabetes, multiple sclerosis, allergic disorders like eczema, asthma, hay fever, ulcerative colitis, Crohn’s disease, metabolic syndrome, obesity, cardiovascular disease and even psychiatric disorders. Considering “microbial diversity” as an ecosystem service provider may contribute to bridging the chasm between ecology and medicine/immunology.

While many community-specific links between health, culture and biodiversity have been documented and measured, much of the evidence for a more universal relationship is relatively sparse beyond anecdotal accounts. However, combined, these findings suggest an important opportunity for crossover between health promotion and education on biodiversity. On one hand, areas of high biodiversity (including in India) may still have high numbers of yet-unknown pathogens, noting biodiversity itself may serve as a protective factor for preventing transmission. On the other, biodiversity has been an irreplaceable resource for the discovery of medicines and biomedical breakthroughs that have alleviated human suffering. Finally, the industrial-scale release of pharmaceuticals and Active Pharmaceutical Ingredients (APIs) into the environment (e.g. inappropriate use of antibiotics in plants, animals, and humans cultivating resistant bacterial strains) can have an impact on biodiversity, ecosystems and ecosystem service delivery, and, may, in turn negatively impact human health.

Health and biodiversity strategies could be developed (in EU, in India, globally) with the aim of ensuring that the biodiversity and health linkages are widely recognized, valued, and reflected in national public health and biodiversity strategies, and in the programs, plans, and strategies of other relevant sectors, with the involvement of local communities. What could EU and India do about it, together?

Some possible priorities and solutions could e.g. include:

Problems	**Proposed solutions**
Air, water and soil pollution (industry, human waste, litter, packaging, agricultural wash off and practice) in India can compromise both biodiversity and human health.	Synergize and mainstream associated policies and practical approaches across all relevant minsitries, recognising the fact that biodiversity can also help reduce and clean up pollution. Integrate more comprehensive natural and social accounting, and environmental impact assessments.
Continued loss and fragmentation of natural habitat greatly increases the contact between humans and remaining wildlife and the potential for dangerous zoonoses such as Covid, bird flu, swine fever, macaque malaria etc. to spread.	Strictly protect all remaining natural habitat, maintain or re-establish buffer zones, and natural corridors between larger habitat blocks and carefully zone human expansion and development on the basis of these needs. Monitor potential zoonoses.
Stubble burning results in serious health hazards as well as loss of soil nutrients and ecological decline.	Better mainstreaming with agriculture and climate change mitigation, to create more holistic policies for assessing and promoting a healthier environment.
Misuse and overuse of some medicines and pesticides can cause serious microbial resistance as well as declines in some vital species e.g. vultures, mosquitos.	Strict controls are needed in overuse of eg. Diclofenac, antibiotics and fertilizers. There is a need for greater awareness on these topics.
Loss of biodiversity results in loss of ecological services essential for maintaining human health, including dietary, immunological and mental wellbeing.	Strengthen habitat protection, create more bio-rich green spaces in towns and villages. Encourage children to be exposed to more nature. Promote lifestyles that contribute jointly to positive health and biodiversity outcomes.

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Biodiversity loss causes the loss of many species with medicinal properties e.g.herbs, bacteria, marine organisms.	Pay special emphasis on habitat protection in bio-rich areas such as NE India and Western Ghats. Revive interest in traditional medicine.
Decline of ecosystem health deprives poor rural communities of a wealth of dietary diversity which could otherwise strengthen their immune system against many health problems.	Conservation + Restoration emphasis should be placed on maintaining biologically diverse landscapes. Focus on activities that restore soil carbon and soil biodiversity.
Too much focus on symbolic conservation of flagship species like tigers and elephants fails to conserve smaller but vital species of important plants and bacteria needed for medicinal use, or ecosystem stability.	Focus on HABITATS of flagship species can help save a wide range of ecosystems but the real value of nature is in its diversity.

Format of the event

The event will be in the form of a moderated discussion between a group of experts and the audience. The panel of experts will be invited to briefly share with the audience lessons and recommendations from their own experiences (successful or not) on biodiversity and health-related issues, identifying successful models for closer collaboration between medical and ecological sectors, and the extent to which improved approaches can be adopted to:

- ✔ Find and popularize ‘win win’, “low hanging fruits” solutions that address health and biodiversity
- ✔ Better control the release of pollutants or exposure/vulnerabilities from most critical sectors, based on direct and indirect impacts on human health and ecosystems
- ✔ Better quantify the health advantages of maintaining healthier (biodiverse) ecosystems and landscapes, and ensure this quantification better informs relevant decisions
- ✔ Improve monitoring of potential sources of new zoonoses,
- ✔ Better involve local communities to appreciate and maintain their environment,
- ✔ Inform and empower the way India approaches biodiversity conservation,
- ✔ Reduce reliance on certain medical treatments (where safe and feasible) and move towards a more holistic, preventive approach to mental and physical health, which can learn from traditional practices.
- ✔ Benefit from better international co-operation, T-transfers, data sharing,
- ✔ Develop and socialise a more holistic and mainstreamed approach to environment, health, climate and development.

The audience will also be invited to ask and up-vote additional questions via sli.do Please already download the sli.do App or bookmark sli.do if you want to take part in the discussion, thanks.

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Tentative list of possible questions

- How are conventional agricultural practices impacting biodiversity and what are the knock on effects for human health?
- What is the evidence that tree-based landscapes contribute to better health?
- What sorts of policy reform are needed to ensure that food production systems contribute to food safety while at the same time enhancing human health?
- In what ways can closer contact with nature contribute to psychological and physical well-being?
- Links between reduced biodiversity and some infectious diseases are reasonably well-established, but what is the evidence that biodiversity also affects non-communicable diseases/conditions?
- If there are links between biodiversity and good health, what are the underlying mechanisms and what are the main gaps in our understanding of the link between biodiversity and health?
- Are there biodiversity interventions that can be implemented now that would have an impact on public health in the short-to-medium term?
- How do emerging diseases occur, why do they appear to be increasing in frequency and what should we doing to prepare for, and avoid, them? Since areas of high biodiversity probably have high numbers of pathogens why does conserving biodiversity help to protect us against exposure to, and impact of, infectious diseases?
- The importance of microbial diversity in humans is often overlooked and yet its loss appears to be associated with an increase in several debilitating non-communicable diseases (NCDs). Why are we losing this microbial diversity and what measures should we be taking to reverse this trend?
- How important is traditional medicine in primary health care, how does biodiversity conservation enhance its effectiveness, and what are the blockages (institutional or otherwise) for getting traditional medicine more widely marketed?
- We know that about 75% of pharmaceutical products used in the treatment of diseases originate in nature, so how significant is biodiversity loss in terms of our ability to respond to diseases and microbial resistance in the future? Where should be looking for new antibiotics?
- Water-related infrastructures (dams, irrigation canals, urban drainage) provide valuable benefits for humans but what are the negative impacts that these can have on biodiversity and human health and how can we mitigate them?
- What are the main ways that healthy, biodiverse, ecosystems contribute to air quality (and hence human health) and how can we enhance their impact?
- We know that biodiversity plays a critical role in determining the quality of water and air and that pollution destroys it; but how can biodiversity actually help **clean up** pollution?
- What are the impacts of pharmaceutical products on biodiversity and what are the consequences for health? What should we be doing about it?

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- Around 30% of crops require pollinators. What are the human health implications of the loss of pollinators through pollution and what should we be doing to preserve them?
- How can we reduce agricultural dependence on clearing new land, overuse of pesticides and fertilizers, stubble burning and other threats to environment and health?
- What information is needed to better inform society of what pollution is causing damage?
- For many health components, exposure thresholds or standards have been scientifically established that serve as trigger points for taking action to avoid or minimize disease or disability. Could something similar be developed for "ecosystem change thresholds" that would trigger action if thresholds were exceeded?
- Health and a healthy environment are basic human rights and therefore important indicators of sustainable development. What should governments be doing to do to bring about synergistic approaches that (a) promote biodiversity conservation and the health of humans, and (b) anticipate and address possible trade-offs between biodiversity and human health objectives.