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The Global Environment Outlook-6: Spotlight on Synergy between Health and the Environment

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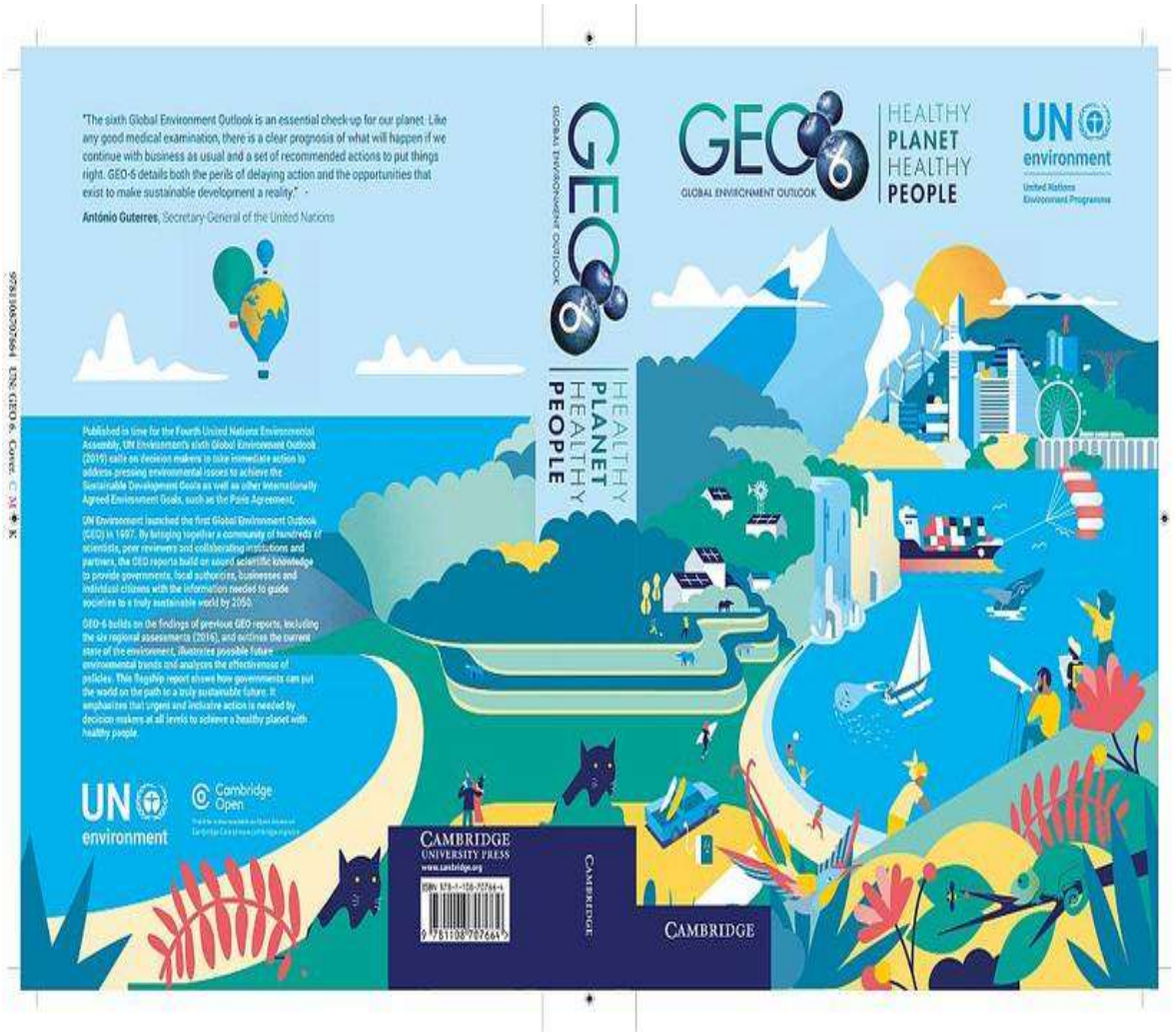

The Global Environment Outlook-6: Healthy Planet, Healthy People (GEO-6), released on March 13, 2019, covers all environmental issues and their link to human health. In this article, Joyeeta Gupta, co-chair of the UN Environment's GEO-6 Report*, provides a summary and draws points that are of relevance to India. For instance, 25 per cent of global disease/mortality is due to poor environmental conditions and unhealthy living circumstances, disasters and freshwater scarcity displace many more people than conflict: in 2016, 24.2 million people were displaced by environmental/water disasters. About 33 per cent of all food is wasted; while meat production requires some 77 per cent of agricultural land. The GEO-6 also shows that current policy is far behind the rising global trends of air pollution and climate change, loss of biodiversity, damage to the land, fresh water and ocean systems; and that much of the damage is irreversible. Though time is running out, she points out that there are still many pathways to a sustainable future, but these would require leadership in addition to bottom-up initiatives.*

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I. INTRODUCTION

As of 2019, the Netherlands, where I live, is dismantling the requirement of compulsorily connecting houses to gas supply in order to prepare the transition towards a low greenhouse gas economy. In 2016, my mother's house in NOIDA was connected through a vast infrastructure to gas

supply. The question is whether it is now India's turn to use more fossil fuels in order to develop or whether such an investment will lead to both ecological damage (i.e. through more greenhouse gas emissions), economic damage (through stranded assets if this infrastructure has to be prematurely phased out[1]) and social damage (through the impacts of climate change on India). The question is – do developing countries have to follow in the footsteps of the North or can they take a shortcut to sustainable development. This is especially pertinent in a country like India which is developing rapidly but also suffering from the impacts of pollution. For example, the pollution in Delhi is equivalent to smoking 10 cigarettes per day[2]! This affects the health of the residents. Only a cynic would calculate the increasing health costs as contributing to national income! It is thus an appropriate moment to reflect on the cost of economic growth for people.

The world focuses on economic growth assuming that it will make life better for all. But a health first agenda may be much more appropriate. Developing under the assumption that one can clean up later may back fire; there is growing evidence that the damage caused to nature is affecting human health and well-being and may seriously compromise the ability to achieve the Sustainable Development Goals (SDGs)[3], both at global level and at the level of a country like India. Globally, poor environmental conditions are seen as causing one fourth of all disease and death and annually displace millions of people; in 2016, 24.2 million people were displaced. Atmospheric pollution worldwide is the number one environmental cause of health problems today followed closely by water-related health risks. In 2018, 1.24 million people died in India from air pollution—which is about 12.5 per cent of all deaths.[4] In 2017, 855,000 people were displaced in Bihar by monsoon floods[5]. The climate-related events since 1980 have cost the global economy $1.2 trillion, about 1.6 per cent of global GDP.

An unhealthy planet affects human health (physically, psychologically, emotionally, and socially), which, in turn, affects the state of the planet. Such impacts are spatially differentiated, and differentiated in terms of age, gender, ethnicity, and income. They have both direct and indirect economic costs to society. However, these costs are often being externalised and existing environmental policy measures are just not good enough to address the causes of

the problem. The growing synergy between health and environment could be used to give increased momentum to policy decisions that ensure that growth does not come at environmental and health costs—which together may undermine the benefits and potential for future development. This calls for changing development pathways and such changes may be easier for those countries that are not already completely locked into an unhealthy growth pattern. This is among the key messages of the sixth Global Environment Outlook: Healthy Planet, Healthy People (GEO-6) launched on March 13, 2019, by United Nations Environment in response to a request from 193 countries (see Figure 1)[6]. The GEO is special because it doesn't just cover climate change like the Intergovernmental Panel on Climate Change (IPCC) reports, or resources like the International Resource Panel, or biodiversity like the Intergovernmental Platform on Biodiversity and Ecosystem Services; but it covers all the relevant environmental issues. This time it also covers related health issues and will be published by Cambridge University Press.

Figure 1: GEO-6: Healthy Planet, Healthy People

Source: United Nations Environment Programme, 2019

As this GEO is the first report emerging after the adoption of the Sustainable Development Goals in 2015, it was decided early on that the report should actively engage with these Goals and the relevant Multilateral Environmental Agreements. The report should also look at ‘leaving no one behind’.

Five questions guide the report: The first focuses on the state of the environment and its causes. The second looks at how people and their livelihoods are affected by the environment in terms of the economy, health, and equity. The third looks at the distribution of benefits, responsibilities, and risks across different countries and peoples. The fourth looks at the effectiveness of policy options and the final question assesses the possible pathways for achieving the long term sustainability goals of society. In this paper, I give my interpretation of the 750-page report focusing, where possible, on India and add supplementary information that may be relevant for India.

II. PROCESS AND METHOD

The results of a report are only as good as the process that guides its completion, the method applied, and the underlying availability of knowledge and data. I would like to briefly explain the process, the method, and the underlying knowledge and data.

In 1997, the first GEO was published by UNEP. On March 13, the sixth GEO was launched. It is an analysis of the state of the global environment. It responds to government requests. In 2014, 193 Governments requested UN Environment to examine the links between a healthy planet and healthy people[7]. In order to ensure that the report responds to policy questions (possibly without touching on politically sensitive issues), a High-Level Intergovernmental and Stakeholder Advisory Group (HLG) has been following the writing process closely. In order to ensure that the quality of the science meets global science standards, a Scientific Advisory Panel watches and advises the authors and the secretariat on how best to conduct the science.

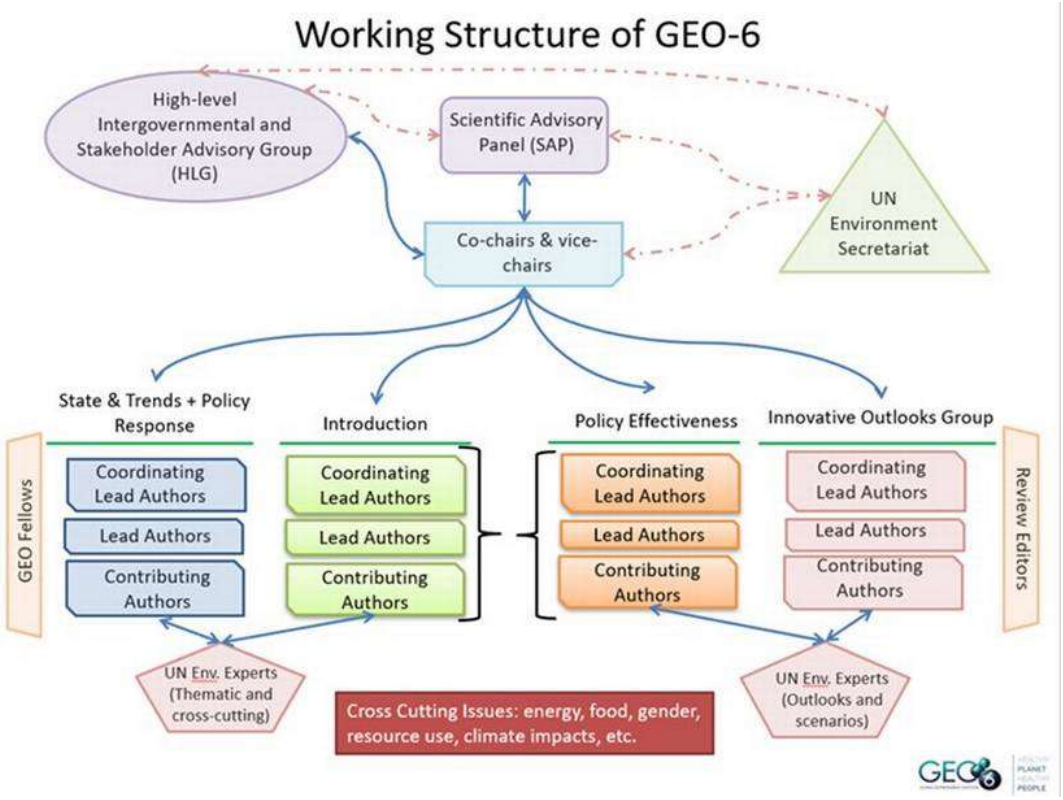
The methods used are checked by an Assessment Methodology Group. Two co-chairs and two vice co-chairs were appointed to lead the process. Figure 2 shows the complexity of the process. The process aimed to produce a scientific report of high quality and a shorter summary for policymakers. A key debate in this encounter between the different groups has been who writes the policymakers' summary; is it the high-level panel or the scientists themselves?

In the end, it was a hybrid situation in which the scholars wrote the first draft in accordance with the advice of the high-level panel, which was closely scrutinised by the high-level panel, and then there was a line-by-line approval of the summary by Governments in January 2019 in Nairobi.

An interesting aspect of the line-by-line scrutiny was the discussion about agriculture and meat consumption. Is agriculture, per se, environmentally problematic or only unsustainable agriculture? Small scale agriculture may not have a major cumulative impact on the earth, but agriculture worldwide has a substantial cumulative impact on land, water, and air. Another debate was with

respect to the recommendation to reduce meat consumption. If meat consumption is a key reason for deforestation and pollution, then reducing meat could be beneficial—however, this may have detrimental impacts on meat exporting countries.

Figure 2: The structure of the GEO process



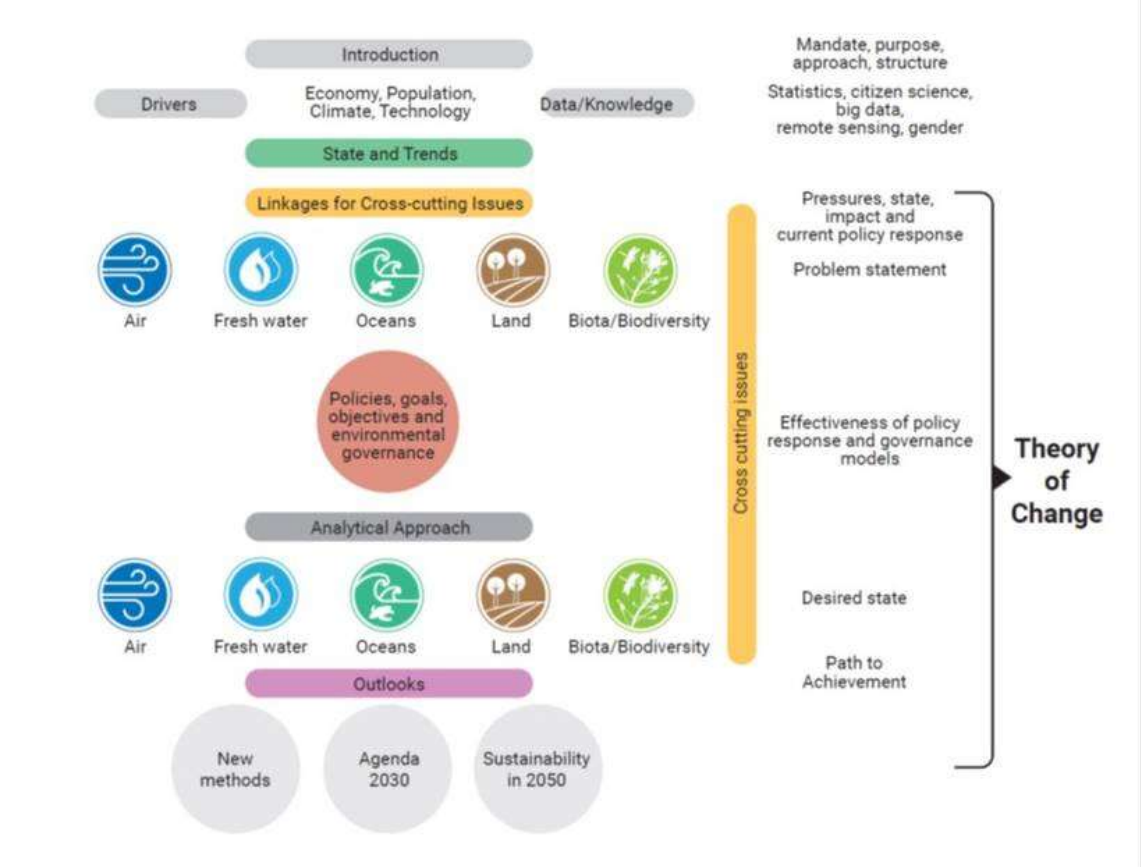
Source: United Nations Environment Programme, 2019

The writers themselves include 250 scholars and experts from all over the world who are willing to volunteer their time to undertake the necessary research. They were nominated and selected based on their curriculum vitae. They do not conduct primary research—they are only authorised to review the existing literature. They have been writing their individual chapters which was sent for review five times and received thousands of comments which had to be addressed as best as possible given the page, time, and data constraints. Their responses were scrutinised by review editors. From all the contributors to the GEO-6—excluding the reviewers—13 are Indian or of Indian origin and participated as authors, fellows, intergovernmental and scientific advisors, and as co-chair.

In terms of method, GEO-6 builds upon the series of regional reports undertaken in advance of this GEO; the ongoing assessments on other environmental and health issues; the publications in the recent scholarly literature that updates the information from the last GEO; and any other data and knowledge that is available in datasets, citizen science, big data, as well as information from indigenous peoples and local communities. It has three parts. The first part applies the Drivers (What causes the problem?), Pressures (What are the direct causes?), State (How does the cause affect the state of the environment?), Impact (What are the impacts of the changed state?), and Response (How can one address the direct and indirect causes, state and impact through appropriate policy measures?) in what is known as the DPSIR method. It applies the DPSIR method to the five system components—air, freshwater, land, oceans, and biodiversity. The second part looks at lessons learnt from policy instruments. The third part looks at the outlooks for the future (see Figure 3).

The GEO is also based on a 'theory of change'. It studies the problem, examines the policy options, looks at pathways of change, and then tries to mobilise people through specialised GEOs, such as a GEO for Cities, a GEO for Youth, and a GEO for Business.

Figure 3: The structure of the report



Source: United Nations Environment Programme, 2019

All this sounds extremely coherent and responsible but in actual fact, the data and underlying information is so scattered that sometimes it is very difficult to draw conclusions. For example, data on the poorest, disaggregated data on indigenous peoples, women and children, and how their health impacts are affected is not always easy to find. Moreover, there is research to show that not all information is 'objective'; for example, female economists are more likely to argue that environmental issues should not be left to the market than male economists and that environmental protection should be considerably scaled up.[8] Furthermore, the writing process is a linear process which begins with chapter one and everyone joins in after that—but in the process, it is often difficult for authors to engage with the simultaneous developments in other chapters. Nevertheless, the report is the best available assessment of all environmental issues given the underlying information, the restriction to carry out primary research, and the cumulative resources available and volunteered.

III. CAUSES OF ENVIRONMENTAL CHALLENGES: DRIVERS

GEO-6 identifies population, urbanisation, development, technology, and climate change as key drivers of environmental problems.

By 2050, the world population is expected to reach 10 billion; India is expected to have the largest population by 2024, approaching 1.66 billion in 2050.[9] Population growth includes more people but also people living longer and both tend to undermine development achievements. The former growth is concentrated where: people are poor; there is high gender inequality; infant mortality is high; access to education and health is limited; and where there is a low carbon footprint per capita. The latter is often accompanied by better access to health services, better income, and increasing environmental footprint per capita. A second driver is growing urbanisation which increases total demand for resources as people are generally more prosperous in cities; however, it may also mean a lower environmental footprint per capita as cities can be more efficient in using resources. The rate at which cities grow, especially in the Global South, may challenge the ability of city governments to plan for and manage the relevant infrastructure. About 30 per cent of the global urban population lacks access to basic services; 65.5 million people live in urban slums in India and are more exposed to environmental risks.[10] Third, the pursuit of economic growth has led to growing withdrawal of resources and growing solid, liquid, and gaseous wastes. This happens in both rich and poor countries. However, in poorer countries, the problems tend to be more local air, water, and land pollution while in the richer countries the pollution tends to be more greenhouse gas emissions. Richer people have a higher contribution to pollution than poorer people. GEO-6 shows that globally, the top 10 per cent emit 45 per cent of global COemissions; the bottom 50 per cent emits about 13 per cent. One per cent of the top 10 per cent emitters in the world come from India;[11] 36 per cent of the bottom 50 per cent emitters in the world come from India. However, in 2013, India's per capita emissions (1.6 t CO/yr/person) were around half of the world's average emissions, and approximately 10 times lower than United States' emissions.[12] The gains of economic growth will need to be pumped into opportunities for the least

advantaged if the SDGs are to be achieved; however, there is growing evidence of rising inequality in societies. Globally, the top 0.1 per cent owns more than the global middle class. Forty six millionaires in India had 10 per cent of the GDP in 2012.[13]

The fourth driver—technology—potentially increases opportunities for better development. GEO talks about India's UJALA programme which promoted demand side management by distributing LED lamps to the poor at one-third the market price, lowering electricity bills and mitigating emissions.[14] However, technology also has unintended consequences that can be negative, for example, by accelerating extraction of resources and (electronic) waste. Finally, the emissions of greenhouse gases has increased so much that we are already committed to a certain amount of global warming which now serves as the fifth driver for many problems (see Table 1). Without additional action, the world is likely to cross 1.5°C in the 2040s, with major consequences for all. If average annual temperatures reach 4.3°C (range of 3.2°C to 5.4°C) by 2100, half of India's population will be exposed to moderate to severe impacts (see Table 1).[15]

Table 1: Drivers of Environmental Challenges

Drivers	Explanation	Some policy options
Population	Increasing worldwide to 10 billion in 2050, mostly in Africa, increasing pressure on resources. Greying population in rich countries increasing pressure on resources.	Reduce (gender) inequality; invest in health for the under 5's; increase access to health. Change production and consumption patterns.
Urbanisation	Demographic shift to urban areas. Urbanisation increases demand because of higher incomes and power.	Invest in rural areas Spatial planning critical for reducing urban footprint Urban environment management essential

	Urbanisation can decrease per capita footprint through concentration; but increase risks to floods and droughts. Growing informal settlements lack services are exposed to pollution.	Encourage the circular and sharing economy. Invest in services for slums to reduce health risks for all.
Economic growth	Increases prosperity but not necessarily equality. Increases pressure on extraction of resources and dumping of wastes. Environmental pressures are differentiated depending on who produces, consumes and invests. Inequality is associated with high consumption of private goods and lower investment in public goods; and a higher growth rate is needed to meet the needs of the poor in unequal societies.	Meeting the needs of 10 billion people in 2050 may require redefining growth as development and well-being. Circular economy, reduce demand, delink pollution from the economy. Address the pollution associated with energy. Focus on which consumption patterns are detrimental to society and phase them out. Reduce inequality and address the poverty agenda.
Technology	Can reduce pollutants per capita while enhancing well-being. Can accelerate extraction and waste. Creates new unintended impacts.	Dematerialisaton, decarbonisation, detoxification, green chemistry, environmental standards. Promote precautionary principle.

Climate change	Temperature increases are already between 0.8-1.2°C since industrial times[16]. Leads to climate impacts. Climate change is differentially caused by different parts of the world and different income categories. Climate change has differential impacts.	Need to focus on mitigation fast; the later the world peaks, the quicker the phase out required leading to stranded assets – assets that which cannot be used. The later the peaking, the more difficult to transform society; Without additional policy, the energy-related Carbon budget will be exhausted in 20 years if we wish to stay well below 2°C. Need to focus on adaptation and avoid maladaptation.

Source: Based mostly on information in GEO-6, Chapter 2

These underlying drivers of unsustainability are interconnected. They are also affected by three cross-cutting issues (i.e. people and livelihoods; changing environments; and resources and materials)(see Table 2). GEO-6 shows that environmental pollution is a major cause of damage to the health of the planet and of human health and equity and can affect prospects for continued economic growth. Especially, environmental disasters have huge consequences for human life, livelihoods, and infrastructure, with existential challenges for the poorest. There is growing evidence that investing in gender equality and education for sustainable development can be a sustainability multiplier. Urbanisation is not only a driver of change, it is also a cross-cutting issue in that growing urban footprints have impacts far beyond the urban context. India is experiencing fast urbanisation rates and has five megacities. In examining issues such as changing environments, three cross-cutting elements become evident.

Climate change is also not only a driver but a cross-cutting issue. It affects all ecosystem components and all sectors of human life. Polar regions are warming twice as fast as the global average amplifying the impacts. Glaciers are melting

fast—1.3 billion people depend on the waters flowing from the Hindu Kush mountains and the quantity in these rivers is expected to change significantly. Across India, the increase in average temperature and alterations in seasonal rainfall patterns are already having an impact on agriculture.[17] Furthermore, 100,000 chemicals are in use, many of which have not been studied for their impacts on humans and the environment, exposing humans to known and unknown chemical risks. Waste and waste water is finding its way into the land and oceans causing new risks. In the meanwhile, 90 billion tons of resources are being used every year to support our lifestyles. Energy systems and food systems are currently unsustainable.

Table 2: Cross-cutting issues

		Explanation	Policy Options
People & livelihoods	**Health**	Health and well-being is associated with access to resources and the environment for life and livelihoods and exposure to risks	Health and environment are highly synergetic. Make coherent policies
	Disasters	Slow onset disasters are 90% of all disasters Between 2005 and 2015, 1.7 billion people affected by environmental disasters, killing 0.7 million people, a damage of $1.4 trillion	Prevention, preparedness, and resilience; Mainstream disaster risk in development & climate policy
	Gender	Causes and impacts are gendered; Policy options are not gender neutral.	Apply a gender lens; Collect differentiated data; Promote gender equality.
	Education	Education still not accessible to many children; Education for sustainable development (ESD) not yet mainstreamed world-wide.	Universal education, including ESD necessary.

	Urbanisation	54% of the world population is urban, earns 80% of world GDP, occupies 7% of land, contributes 70% of GHG emissions and impacts on 42% of the watersheds in addition to using water indirectly through food production.	Design/retrofit cities to enable shared mobility, slum rehabilitation, urban-industrial symbiosis, inclusive green infrastructure.
Changing Environments	**CC**	Affects all sectors and systems (Table 1)	Mitigate/adapt emissions
	Poles/mountains	Covers 20 per cent of the Earth; Poles are warming faster; Releases additional water from stored ice (which has 70 per cent of the planet's fresh water); Releases locked up pollutants; Impacts coastal and mountain regions	Mitigate emissions and mainstream adaptation in development strategies
	Chemicals	>100,000 chemicals in use, most not researched or regulated; Pharmaceuticals and compounds for agriculture/livestock are in water affecting aquatic life and humans; The costs of inaction on pesticide use can lead to health-related costs in Sub-Saharan Africa as high as $90 billion (2015-20)	Policy on standards, use, and disposal of chemicals
	Waste & waste water	Chemical, food, electronic waste accumulating globally; Loss of resources; Waste causes environmental damage; three billion people lack access to waste disposal facilities and millions live and work on unhealthy dumpsites	Waste can be recycled creating a market estimated as $410 billion annually; Circular economy; Clean energy; Improve access to basic services in informal settlements

Resources and Materials	**Resource use**	The extraction industry produces some 90 billion tons of waste, uses energy, deforests land, and pollutes water	Dematerialise; Better rules for extraction; Circular economy; Clean energy
	Energy	Global consumption at 13.5 billion tons oil equivalent and growing; Unequal access with 1.2 billion people without access to electricity and 2.7 billion using traditional fuels leading to household air pollution	Decarbonise; Transition to low carbon energy Focus on clean and renewable energy; clean energy in households
	Food systems	Main cause of biodiversity loss and degradation; Food waste is 36 per cent globally and 55 per cent of global food waste is in rich countries (loss of $750 billion-$1 trillion p.a. and nine per cent of GHG emissions, excluding the impact of land use change). Food also has direct health impacts—diabetes, cardiovascular diseases, etc.	Reduce food wastes Reduce demand for meat Produce more efficiently

Source: Based mostly on GEO-6 Chapter 4

IV. THE STATE OF THE ECOSYSTEMS

GEO-6 then discusses the impacts of the drivers and the cross-cutting issues on the five system components (air, biodiversity, oceans, land, and water). In terms of air, there are three key challenges—climate change, outdoor, and indoor air pollution. As energy and other systems become locked in, it becomes increasingly more difficult to address the climate problem which can lead to serious problems to our health and livelihoods. Growing outdoor pollution, especially in urban areas, is a major risk factor in most developing countries; in India, it causes around 620,000 premature deaths per year.[18] Indoor air pollution in rural households, including India, is causing premature death and morbidity. About 6-10 million people die annually from such air pollution worldwide causing a welfare loss of about 6.6 per cent and three per cent of global and India's GDP, respectively.[19],[20] Air pollution is the biggest environmental cause of the global burden of disease.[21] Greenhouse gas emissions and higher temperatures are also causing health problems.

Furthermore, our way of living has damaged the biodiversity so much that the Earth may well be experiencing the sixth mass extinction event in the history of the planet.[22] Biodiversity is critical to the survival of the human race because declines in genes, species, and ecosystems impacts on our livelihoods. For example, declines in pollinator species has significant impacts on agriculture and adds to the burden of the farmer who already has to cope with a changing climate. Pollinators provide services valued at $200 billion; and their decline can lead to critical losses.[23] Exhaustion of fish species, which half the world's population depends on for cheap protein, can have significant impacts on these people. Destruction of ecosystems also exposes humans to extreme weather events as mangroves can reduce the impact of storms in coastal areas and forests can reduce soil erosion. Furthermore, biodiversity loss is linked to zoonotic diseases which are about 60 per cent of infectious diseases.[24]

The impacts of climate change influence the oceans by reducing the ice cover, warming the water levels, and raising the sea level. It affects the survival of coral

reefs, which are essential for the health of the fisheries, and compounds the problem of overfishing. Furthermore, the rising chemicals and plastics in the oceans can lead to unpredictable long-term outcomes. The coastal regions provide homes and livelihoods for more than a billion people who are now at risk of sea-level rise.

Back on land, which is more or less fixed in quantity, our growing demand is leading to land conversion to other uses. About half the arable land on earth is being used for food production, of which 77 per cent is used for meat production, with resulting land degradation and land and water pollution.[25] However, in 2017, meat consumption in the USA was 40 billion kilogrammes, more than twice the combined meat consumption of India and Africa.[26]

The damage to land in terms of desertification, deforestation, land degradation, erosion, and the increasing pollution (through, *exempli gratia*, the use of pesticides, herbicides and industrial and household wastes) of land has major impacts on the human health and well-being of the 3.2 billion people (including indigenous peoples and local communities) directly dependent on land[27] and arguably leads to damage of about $4-20 trillion annually.[28] For India, just the croplands, pasture, and forest degradation lead to damage worth about Rs. 1.2 trillion ($25.6 billion for 2012 value).[29] A key challenge with respect to land management is the way in which tenure systems of indigenous peoples and local communities are often ignored. This is problematic because these groups have played a key role in not only protecting the biodiversity of the world, they have ensured food security through their traditional lifestyle and knowledge. Traditional knowledge is facing the risk of becoming misappropriated or patented for commercial purposes while excluding the knowledge holders from the benefits, as illustrated by the case of turmeric in India as GEO-6 illustrates. Biodiversity and food security are at risk because of the lack of recognition for tenure rights, and the rights of land inheritance of women, in much of the developing world.

The way land is used also contributes to freshwater pollution—which includes chemical pollutants such as endocrine disruptors (affects fertility of humans and fish), antimicrobial compounds (including antibiotics), and plastics, as well as salt water intrusion from rising oceans. This is exacerbated by pathogens that are being

spread through water not least because of poor sanitation services in different parts of the world, which affects some 1.7 million people.[30] For India, it is a severe problem: 626 million people practice open defecation[31] exposing babies and children to infectious diseases. Add to this changing rainfall patterns compounding existing water scarcity and drought or floods and the recipe for disaster is complete (water is involved in 90 per cent of all disasters[32]). Declining ground water levels and reduced snow storage implies that nature's water storage systems are badly damaged and will have to be replaced by expensive infrastructures which themselves also distort nature's flows. India has become the biggest groundwater extractor in the world[33]. Water infrastructure systems are highly needed. Indian women spend 150 million work days annually on collecting water, misusing their time which is worth about Rs. 10 billion. Likewise, there are significant transboundary water pollution problems worldwide that include India in relation to its neighbouring countries Pakistan and Bangladesh.[34],[35] Transboundary water problems are also present within Indian territory; 85 per cent of the territory shares interstate rives, generating interstate water conflicts.[36]

Table 3 illustrates the key impacts on system components, and provides some data on costs and equity dimensions.

Table 3: Impacts on system components, their costs and equity dimensions

	Health impacts	Some cost figures	Equity dimensions
All Ecosystems	Poor ecosystem health affects human health, livelihoods and wellbeing; 25% of ill-health linked to environmental causes; disasters displace millions; more people than conflict[37]	Ecosystems provided $125 trillion in services in 2011; services are declining in trillions annually	70% of the world's poor depend directly on ecosystems; hence, impacts on ecosystems affects them severely.
Air	Outdoor/indoor air pollution; rising temperatures; No. 1 environmental cause of death (seven million deaths annually) and morbidity	$5 trillion in welfare losses annually; does this include impacts on poor?	Traded goods account for 30% of CO emissions; Especially children, women, older people, and poor people affected and displaced from heat

Biodiversity	Sixth major extinction event including loss of genes and ecosystems; invasive species; and illegal trade in species; could lead to zoonotic disease 60% of infectious disease; affects food security	e.g. Pollinators provide a service of about $200 billion p.a. but are declining; Loss from invasive species estimated at hundreds of billions p.a.; Illegal trade worth $90-270 billion p.a.	Indigenous peoples and local communities (22%) protect 80% of global biodiversity; But these are also the communities disproportionately affected
Oceans	Warming & acidification, coral reefs bleaching, and chemical pollution, reduces fish stocks and food security and livelihoods	e.g. Coral reefs provide services worth about $29 billion p.a; Fisheries provide services valued at about $253 billion; Cleaning beaches costs $735 million p.a.	Small-scale fisheries support 58-120 million people. Affects lives/livelihoods for 1 billion in coastal areas and cheap protein for 3.2 billion people
Land	Degradation, Transformation and Pollution affects land on which 3.2 billion people live; two out of five people lack access to waste disposal services and exposed to wastes; exacerbates health inequalities	Losses from degradation may amount to $4-20 trillion per year[38]	Women are 43% of farmers with 20% of land title. Tenure security for Indigenous and other forms of community-managed land could generate billions of US dollars' worth of ecosystem benefits
Water	Unsafe water kills 1.4 million people p.a.; most environmental disasters are water related. Disposal of antibiotics and other compounds can lead to antimicrobial resistance; Endocrine disruptors affects fertility	For every $ invested in clean water and sanitation a return of $4.3 is possible amounting to 1.5% of global GDP	Cities use more water than rural areas through direct and indirect consumption; but rural areas are affected because the pollution and extremes in rainfall affect them

Source: Prepared based on data in GEO-6; please note that some of the statistics cannot be compared being linked to different years and different methods.

V. LESSONS LEARNT FROM POLICY APPROACHES

GEO-6 examines the range of policy approaches being used to address environmental challenges. A wide range of policy instruments have been adopted to address environmental problems at the global level but these fall short of what is needed. Global treaties require consensus and individual countries whose interests are affected often hamper the treaty negotiations and implementation. The Report also examines, where possible, the achievement of the Goals, Targets and Indicators.

There are lessons from the literature regarding how good policies are designed. At national level, countries could include regulatory instruments such as standards and environment impact assessments, provide economic incentives and enable market-based instruments, provide information, set up voluntary agreements with industry, make spatial plans, enable innovation, and mobilise people to take action. Combining these instruments into a well-designed policy is critical for effectiveness. And clearly such a well-designed policy needs to have a substantive vision accompanied by an inclusive process; be science based; include social, ecological, and economic concerns; assess the policies for cost effective achievement; and monitor and evaluate the policies so that they can be appropriately improved based on an assessment of feedback mechanisms.

However, in industrialised countries policies are conservative in design with respect to global pollutants such as greenhouse gases—because of their possible impact on the economy. In developing countries, the policies are often not fully financed, implemented, monitored, or improved, making assessment difficult. Policies are never neutral and tend to benefit one group as opposed to another: this makes it important to assess how policies affect different groups of people. Countries are, however, increasingly learning from each other and such policy diffusion in theory has the potential for addressing environmental challenges.

A key challenge for policymakers is to integrate the response into the design of the policies for the various sectors—such as agriculture, tourism, mining, forestry, and industry—where, often, the goal is to maximise output and profit and where

environmental rules are seen as constraining opportunities for growth and social equity and gender rules are seen as limiting the opportunities for the big investors. Strategic Environment Assessment, Environment Impact Assessments, Health Impact Assessment and Environment Policy Integration could, if implemented properly, enable more sustainable development; but these are not adequately undertaken possibly because of the perceived impact of environmental concerns as limiting growth prospects. This has led to a situation where environmental policy, both in the rich and poor countries, falls very short of what is needed to address the serious challenges facing the earth. GEO-6 points to the urgent need to re-evaluate our development models and reconfigure society building significantly on the precautionary approach.

VI. OUTLOOKS FOR THE FUTURE

What does the above analysis imply when juxtaposed against future scenarios? Part C of GEO-6 argues that whether we look at the Sustainable Development Goals planned for 2030 or the targets in the range of multilateral environmental treaties that exist, or simply the goal of trying to be fully sustainable by 2050, the existing policies are not enough to ensure sustainability by 2050. Goals on climate change, biodiversity loss, water scarcity, land degradation, and chemical pollution will just not be achieved and will have serious impacts on people. It shows that given the rising demand for resources to meet the consumption needs of the growing world population, the problem will only worsen unless serious action is taken. It argues for not just looking at ways to address impacts and state but also to look at the underlying consumption and production patterns and the inequality that characterises global development. The bad news is that the world is moving in the wrong direction and being locked into unsustainable pathways.

There is some good news. Production of food may increase; sanitation services may improve; modern energy may be within grasp; and health services could lead to a decline in deaths of children under 5—and this may translate into an achievement of the Sustainable Development Goals on food, energy, sanitation, health, and gender—although it is not clear if mere availability will also address the politics of distribution. Other good news could be that there are sustainable pathways which can enhance human well-being; these include a combination of changed consumer behaviour with better production processes. Such changed consumer behaviour could include a preference for sustainable energy and transport, sustainable food, including less meat-intensive diets and reducing food waste, and daily choices that emphasise less plastic and chemicals. However, such changed consumer behaviour does not apply to the people who live a hand-to-mouth existence. On the production front, reducing resource inputs, adopting the precautionary principle to avert irreversible risks, decoupling emissions and wastes from development processes, and reusing wastes within a circular economy could provide some respite from the linear growth model. However, even the circular

economy requires increasing energy and there are limits to reuse. Ecological infrastructure and low input agriculture will be needed. Citizens worldwide are organising themselves to use different innovative approaches ranging from not using plastic straws all the way to contributing to citizen science and moving towards a sharing economy within compact urban areas.

On the policy front, it is critical for states to ensure tenure security and protect rural areas; make standards to phase out the use and disposal of, e.g., single use plastics; make standards to ensure that industry is environmentally accountable and educate consumers to live sustainably. India has many initiatives in the right direction: the national Plastic Waste Management Rule (Amendment) 2018 and the pledge to eliminate single use plastic by 2022, and State laws in Bihar, Maharashtra, Odisha, and Tamil Nadu on regulating and restricting the use of plastic; but these will have to be effectively implemented. It is important to promote niche innovations and local experiments that can be scaled up if appropriate. GEO-6 mentions, for example, that some Indians are experimenting with using the water hyacinth both as a carbon sink and for replacing some forms of plastic, and the integrated air quality forecast system, developed by urbanemissions.info, that uses information from several sources (official reports, academic publications, survey analysis) together with existing open data to predict air quality. These are possible innovations that could be considered for scaling up if they are successful niche experiments. In the short-term, the biggest competition is between the perceived costs to national income and the environment. However, this is very short-sighted as a deteriorating environment can seriously limit the potential for development. There are other trade-offs where land can be either used for bioenergy or for food production; or where more intensive agriculture is needed for food production, while this exacerbates chemical pollution. Achieving environmental goals simultaneously is critical and may reduce the costs of implementation.

VII. CONCLUSIONS: ECOSYSTEMS CAN NO LONGER BE TAKEN FOR GRANTED

The message from the co-chairs of GEO-6 shows that all development is supported by 'nature's contributions to humans', including the rich biodiversity, and the four ecosystem services—the supporting (e.g. moving nutrients), regulating (e.g. cleaning water), provisioning (e.g. providing food), and cultural services (e.g. providing inspiration). We often take these for granted—the pollinators that ensure the productivity of plants; the rainfall that we depend on for agriculture; the slow snowmelt from, e.g., the Himalayas that ensures that the Northern rivers in India are perennial and enable groundwater recharge; the mangroves that protect, e.g., West Bengal from severe storms; the changing seasons that many worship. These services, (valued very conservatively at $125 trillion in 2011[39]) are significantly more than global GDP and also support 70 per cent of the world's poor to access basic resources and enjoy nature's contributions. In the context of India, 480 million poor Indians directly depend on nature's contributions—and this is seen as the 'Gross Domestic Product (GDP) of the rural poor'.[40]

But in the Anthropocene, nothing can be taken for granted anymore. Damage to ecosystems runs into trillions of dollars—and an additional existential and displacement cost to the poorest—which is not always calculated. Indoor and outdoor air pollution is the highest cause of loss of life and morbidity worldwide, which has impacts on the ability to work and earn a livelihood apart from affecting well-being. This is followed by damage from water pollution, loss of biodiversity, ocean degradation, and damage on land—all together having serious impacts on especially the poorest worldwide.[41] The calculated economic losses generally reflect the costs faced by high and upper middle income countries; but the losses in low income countries are a higher percentage of their GDP. Small island states may have lost between one and eight per cent of their GDP between 1970 and 2010.[42] Current knowledge, although increasingly sophisticated in terms of including remote sensing and big data, scarcely does justice to collecting

disaggregated knowledge regarding the equity component of global ecological problems.

What is also clear is that while the emerging economies and poorer countries and regions face urban/rural air pollution and rising temperatures, water pollution, land degradation, and loss of biodiversity, the overwhelming problem of climate change, caused in the past primarily by the rich countries, is not only seen as a driver of problems, as a cross-cutting issue, but also as a continuing source of problems with cascading impacts on all other systems. In terms of consumption, the richest countries have a significantly higher consumption of materials on a per capita basis than poorer countries. Of course, rich people in poorer and emerging economies also have a growing share in causing the problem while the poorer people face the brunt of the problem. However, as India becomes the country with the largest population, its increasing use of resources and emissions of pollutants will require it to also think of its global impact.

The bottom line is that as long as environment policy remains within a relatively powerless environment ministry—without the ability to control the other more powerful ministries of economy, energy, industry, water, health and agriculture—its policies will be underfunded and under supported politically. GEO-6 makes a convincing case for the environment ministry to join hands with the ministries of health but also perhaps those who focus on poverty and gender issues to come together in a show of strength to demand change from the rich and powerful of this generation both within and outside India. There are major synergies between healthy diets, healthy environments, and human well-being; between collecting wastes and reusing them in production processes; between investing in clean renewables and health, and in ensuring tenure security for small farmers and helping them become self-sufficient and promote food security.

What does all this mean for India? India needs to promote a social debate on what kind of world it wants for its children. And this does not have to come at a huge cost. There are estimates that savings in health costs of achieving a 2°C goal can be twice the policy costs of reducing greenhouse gases and achieving a 1.5°C target could lead to a saving of $ 3.3-8.4 trillion for India[43] in health costs; that a green investment of two per cent of global GDP could lead to similar growth rates by

2050; and that achieving a circular economy could be beneficial to society and the economy; that investing in drinking water and sanitation services can pay back many times over. In this regard, the Indian government's 'think tank', NITI Aayog (National Institution for Transforming India), can play a relevant role in promoting development while simultaneously achieving social and environmental goals.

When I was growing up, Delhi was a beautiful, clean city—today, beautiful Delhi is lost in a haze of chemical pollution, the Yamuna is a sewer, the sprawling growth has not taken account of the need for compactness to cope with growing urbanisation, the rich drive in their air-conditioned cars in overfull roads while the poor on the cycles and streets are breathing in the fumes. The capital, with the huge concentration of wealth, knowledge, power, and intelligence, is an environmental disaster zone and shows how the whole country can go this way if there is no consideration of what kind of an India the Indian people—both rich and poor—want to live in. There is need for a timeout to reconsider the growth patterns that Delhi is promoting for the country. A capital city should showcase the values a country stands for and the goal that all other urban and rural areas should aspire for!

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References:

[All URLs were last accessed on March 11, 2019]

1. **Bos, K. and Gupta, J. 2018**. "Climate Change: The Risks of Stranded Fossil Fuel Assets and Resources to the Developing World", *Third World Quarterly*, Vol. 39, Issue. 3, pp.436-453.

2. *Ministry of Earch Science*, Government of India, System of Air Quality and Weather Forecasting And Research. [http://safar.tropmet.res.in/index.php?menu_id=1].

3. **United Nation General Assembly. 2015**. "Transforming Our World: The 2030 Agenda for Sustainable Development", September 25. [http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E].

4. *The Lancet Planet Health.* 2019. "India State-Level Disease Burden Initiative Air Pollution Collaborators, The impact of air pollution on deaths, disease burden, and life expectancy across the states of India: the Global Burden of Disease Study 2017", January 1, Vol. 3, Issue. 1, PE. 26–39. [https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(18)30261-4/fulltext].

5. **Internal Displacement Monitoring Centre, India**. [http://www.internal-displacement.org/countries/india].

6. **Uinted Nations Environment Programme. 2019**. "Global Environment Outlook – GEO-6 Healthy Planet, Healthy People". [https://wedocs.unep.org/handle/20.500.11822/27539]. Return to Text.

7. Resolution 1- 4 adopted by the United Nations Environment Assembly of the United Nations Environment Programme at its first session on 27 June 2014.

8. **May, A. M., et al. 2018**. "Gender and European Economic Policy: A Survey of the Views of European Economists on Contemporary Economic Policy", *Kyklos*, February, Vol. 71, Issue. 1, pp. 162–183.

9. **United Nations, Department of Economic and Social Affairs, Population Division. 2017**. "World Population Prospects: The 2017 Revision, Key Findings and Advance Tables", Working Paper No. ESA/P/WP/248. [https://esa.un.org/unpd/wpp/publications/files/wpp2017_keyfindings.pdf].

10. **Ellis, P, and Roberts, M. 2016**. "Leveraging Urbanisation in South Asia: Managing Spatial Transformation for Prosperity and Livability", South Asia Development Matters, Washington, DC: World Bank. License: Creative Commons Attribution CC BY 3.0 IGO [https://openknowledge.worldbank.org/bitstream/handle/10986/22549/9781464806629.pdf?sequence=17&isAllowed=y].

11. **Chancel, L and Pickety, T. 2015**. "Carbon and Inequality: From Kyoto to Paris", *Paris School of Economics*, November 3. [http://piketty.pse.ens.fr/files/ChancelPiketty2015.pdf].

12. **GEO-6. Figure 12.1.**

13.***Yoda Press*. 2017**. "India Exclusion Report 2016". [http://defindia.org/wp-content/uploads/2017/07/India-Exclusion-Report-2016_Low-Res.pdf].

14. GEO-6. Box 17.4.

15. **Mani, M., et al. 2018**. "South Asia's Hotspots: Impacts of Temperature and Precipitation Changes on Living Standards", World Bank. [https://openknowledge.worldbank.org/bitstream/handle/10986/28723/9781464811555.pdf?sequence=5&isAllowed=y].

16. IPCC, Summary for Policymakers. In: [Masson-Delmotte, V., Zhai, P., Pörtner, H.O., et al. (eds.)]. Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. Geneva: World Meteorological Organization, 2018.

17. **Mani, M., et al. 2018**. "South Asia's Hotspots: Impacts of Temperature and Precipitation Changes on Living Standards", World Bank. [https://openknowledge.worldbank.org/bitstream/handle/10986/28723/9781464811555.pdf?sequence=5&isAllowed=y].

18. Global Burden of Disease report. August 17, 2015. [https://www.downtoearth.org.in/ news/air-pollution-killing-620000-indians-every-year-global-burden-ofdisease-report--40316].

19. **Global Health Metrics**. **2017**. "Risk Factor Collaborators Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016", *The Lancet* , September 16, Issue. 390, Vol. 10100, pp. 1345–1422. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(17)32366-8/fulltext].

20. **Mani, M., et al. 2012**. "An Analysis of Physical and Monetary Losses of Environmental Health and Natural Resources in India", *The World Bank*, October, Policy Research Working Paper, 6219. [http://documents.worldbank.org/curated/en/407041468049195255/pdf/wps6219.pdf].

21. **Global Health Metrics**. **2017**. "Risk Factor Collaborators Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016", *The Lancet* , September 16, Issue. 390, Vol. 10100, pp. 1345–1422. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(17)32366-8/fulltext].

22. **Ceballos, G., et al. 2017**. "Biological annihilation via the ongoing sixth mass extinction signaled by vertebrate population losses and declines", *Proceedings of the National Academic Sciences, U.S.A , July 25*, Vol. 114, Issue. 30, E6089–96. Grifo, F., and Rosenthal, J., (eds). Biodiversity and Human Health. Island Press. Washington, DC. 1997. [https://www.pnas.org/content/114/30/E6089].

23. **Allsopp, M. H, et al. 2008**. "Valuing Insect Pollination Services with Cost of Replacement", *PLoS ONE* , Vol. 3, Issue. 9, e3128. [https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0003128].

24. **Karesh, W. D., et al. 2012**. "Ecology of zoonoses: natural and unnatural histories", *The Lancet* , December 1, Vol. 380, Issue. 9857, pp. 1936–45. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(12)61678-X/fulltext].

25. **Roser, M and Ritchie, H. 2018**. "Yields and Land Use in Agriculture", *OurWorldinData.org*. [https://ourworldindata.org/yields-and-land-use-in-agriculture].

26. **OECD Data. 2018**. "Meat consumption", [https://data.oecd.org/agroutput/meat-consumption.htm].

27. **Le Q.B., et al. 2015**. "Biomass productivity-based mapping of global land degradation hotspots", SpringerLink, November 12. [https://link.springer.com/chapter/10.1007/978-3-319-19168-3_4]. In: **Nkonya E., Mirzabaev A., von Braun J. 2016.** (eds) "Economics of Land Degradation and Improvement – A Global Assessment for Sustainable Development", Ch. 4. Springer Cham. [https://link.springer.com/content/pdf/10.1007%2F978-3-319-19168-3.pdf].

28. **Nkonya, E., et al. 2016.** (eds) "Economics of Land Degradation and Improvement – A Global Assessment for Sustainable Development", Ch. 4. Springer Cham. [https://link.springer.com/content/pdf/10.1007%2F978-3-319-19168-3.pdf].

29. **Mani, M., et al. 2018**. "South Asia's Hotspots : Impacts of Temperature and Precipitation Changes on Living Standards", World Bank. [https://openknowledge.worldbank.org/bitstream/handle/10986/28723/9781464811555.pdf?sequence=5&isAllowed=y].

30. **Global Health Metrics**. **2017**. "Risk Factor Collaborators Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016", *The Lancet* , September 16, Issue. 390, Vol. 10100, pp. 1345–1422. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(17)32366-8/fulltext].

31. **World Bank. 2015**. "India: How Many Toilets Does It Take to Improve Health?". [https://openknowledge.worldbank.org/handle/10986/22631].

32. **Lucard, M., et al. 2011**. "Out of sight, out of Mind". [http://www.redcross.int/EN/mag/magazine2011_2/18-23.html].

33. **United Nations Environment Programme, GEO-6. 2019**. "The Sixth Global Environment Outlook: Healthy Planet, Healthy People", *Cambridge University Press*. (Figure 9.5).

34. **Yasar, A., et al. 2015**. "Quantification and seasonal variation of transboundary pollution and water flow in the streams of Central Punjab, Pakistan", Pakistan Journal of Engineering and Applied Sciences, July, Vol. 17, pp. 30–38. [http://journal.uet.edu.pk/ojs_old/index.php/pjeas/article/view/86/0].

35. **Sood, A. and Mathukumalli, B. K. P. 2011**. "Managing international river basins: reviewing India–Bangladesh transboundary water issues", International Journal of River Basin Management, Vol. 9, Issue. 1, pp. 43-52, [https://cgspace.cgiar.org/handle/10568/40465].

36. **Singh, A. and Gosain, A.K. 2004**. "Resolving conflicts over transboundary watercourses: An Indian perspective", Land Use and Water Resources Research. [https://ageconsearch.umn.edu/record/47957/files/paper04-02.pdf].

37. **Internal Displacement Monitoring Centre. GRID 2018**. "Global Report on Internal Displacement", Internal Displacement Monitoring Centre and Norwegian Refugee Council, May. [http://www.internal-displacement.org/global-report/grid2018/downloads/2018-GRID.pdf].

38. **Nkonya, E., et al. 2016.** "Economics of Land Degradation and Improvement – A Global Assessment for Sustainable Development", *Springer,Cham.*

39. **Costanza, R. et al. 2014**. "Changes in the global value of ecosystem services", *Global Environmental Change,* Vol. 26, pp. 152–8.

40. **The Economics of Ecosystems and Biodiversity. 2010**. "The Economics of Ecosystems and Biodiversity for Local and Regional Policy Makers", September. [http://www.teebweb.org/publication/teeb-for-local-and-regional-policy-makers-2/].

41. **Gupta, J., F., et al. 2019**. "Communicating the health of the planet and its links to human health", *Lancet Planetary Health* , Vol. 3.

42. **United Nations Environment Programme. GEO-6. 2016**. "Regional Assessment for Asia and the Pacific 2016", p. 14.

43. Box 24.1 in United Nations Environment Programme. GEO-6.