30 Foresight Briefs
Special Edition 2017-2022
EARLY WARNING, EMERGING ISSUES AND FUTURES

UN environment programme

***Foresight*... the capability to think systematically about the *future* to inform decision-making and *action* today**

January 2023

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Foreword

Foresight is a powerful tool for leveraging Humanity´s ability to think about and build the Future. It provides a way to think about possible, alternative and desired futures. By doing so, it enables individuals, organisations and nations to prepare for a better future.

This unique collection of foresight analyses, celebrating the milestone achievement of having published 30 Foresight Briefs, over a period of 5 years from 2017 to 2022, is distinctive for some important reasons.

Firstly, it is a novel foresight approach to the Science Policy interface. It takes a focused approach on emerging environmental issues, either hotspots of environmental change or topics, which has potential for emerging issue analysis.

This is a distinctive approach which attempts by providing a "trading language" that is accessible and easy to understand, to bridge the "communication gap" between scientists or scientific community and the policy makers and other civil society stakeholders who have a manifest interest in future analyses.

Secondly, it adopts a novel foresight approach based upon "data" and a systems thinking perspective. The powerful combination of various types of methodologies and frameworks, from quantitative to more qualitative, from very short-term focus to medium-to-long term, from historical to user driven analyses, identification of trends and change drivers, horizon scanning and building scenarios, as well as integrated systems thinking analysis, provides a robust and solid way to do Foresight.

Indeed, Foresight is, as it should be, an approach to future studies. With a long tradition of more than 80 years in the quantitative arena, Foresight benefits more recently from participative foresight approaches and is always based upon expert analysis.

Finally, last but not least, it contributes to Strategic Foresight. This unique collection contributes to Priority Setting in a number of critical domains for the Environment. Moreover, it highlights the essential dimensions of global environmental monitoring and contributes to accelerating the implementation of Agenda 2030 and the Sustainable Development Goals. This is a core component of **United Nations Secretary General´s Our Common Agenda** and a decisive Humanity´s Agenda of Our Time.

In the coming decades, and possibly until the end of the 21st century, which is a time of transition of geopolitics and the environment, Humanity is likely to face significant challenges with a more complex, unstable and uncertain Future. Exploring the capabilities of Foresight for People, Places and Planet, is opportune in this time of dynamic change.

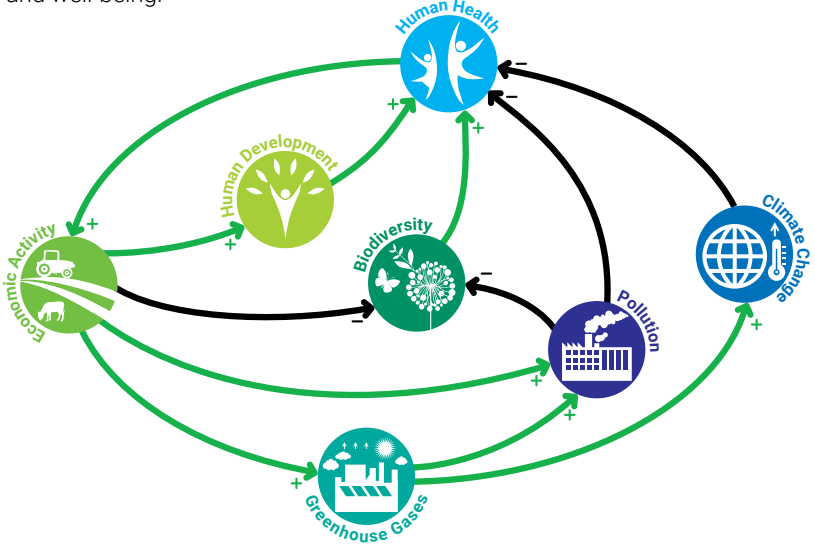
We are happy to share with you possible, alternative and desired pathways essential for the Summit of the Future and for **Our Common Future.**

Alexandre Caldas
Chief, Big Data Branch - Science Division

Photo credit: Shutterstock/Alfa Photo

Introduction

The Foresight Briefs, authored by a range of international experts, are an important part of science based environmental knowledge sharing, highlighting hotspots of environmental change, featuring emerging science topics, or discussing contemporary environmental issues. The public at large and decision makers at all levels are provided with the opportunity to find out what is happening to their changing environment and the consequences of everyday choices, and to think about future directions for policy which they can influence through their policy processes. We have control over many future outcomes in the actions we decide to take today and tomorrow. Much of the dynamic behaviour we encounter is endogenous to our human made and natural systems – generated through complex feedback processes, accumulations, delays and non-linear behaviour. By exploring causality together, through sharing knowledge in different forms on the World Environment Situation Room, we can improve our mental models and paradigms to better understand the complex system behaviour that we encounter. We can also experiment safely with policy changes using foresight systems models to test policies and simulate different scenarios to achieve the future we want. Systemic insights using systems thinking are provided in the Foresight Briefs which demonstrate the interconnectedness of the emerging environmental issues that we face, and in particular the three interconnected mutually reinforcing challenges of climate change, nature and biodiversity loss and pollution and waste that are the key strategic objectives identified in **UNEP's 2022-2025 Medium Term Strategy**, and ultimately, how they all impact human health and well-being.



Growth in traditional economic activity results in increased human development and increased human health which in turn results in a virtuous cycle of more economic activity growth. However, growth in economic activity also results in increased global warming causing green house gases and pollution, as well as reduced biodiversity. These in turn adversely impact human health and this reduces economic activity. Policies that enables economic growth that is also good for the environment will improve human health and further increase economic activity through reinforcing feedback. (+) Influence is in the Same direction (-) influence is in the Opposite direction.

The Foresight Team

"Foresight importantly considers what the future may have in store for us; we have control over many future outcomes in the actions that we decide to take today and tomorrow. In understanding the causal basis of the behaviour we encounter, and what structural changes are needed to change this, we empower ourselves to achieve the kinds of futures we want. " *Sandor*

The Foresight Team, Big Data Branch, Science Division

From left to right: Erick Litswa, Audrey Ringler, Sandor Frigyik, Esther Katu and Pascil Muchesia

"Understanding, planning and recognizing signals with a view to influence change, policymaking and our future ." *Audrey*

"Foresight challenges me to think differently and to be more of an explorer of what the future holds." *Esther*

"I get inspired to go to work because my work exposes me to the emerging environmental issues that are below the surface of general public awareness, and we play an important role in putting such issues on the public agenda. It is also interesting to see how policies or recommendations are developed to address such issues." *Erick*

"While contributing to the production of the Foresight Issues, I get to learn more about the many environmental challenges that the world faces today, which require urgent attention from Governments, Citizens, and other policymakers. It has also accorded me a lot of knowledge on how various stakeholders have a role to play, be it from the Gender aspect, Faith and Religious groups, Citizen science in addition to the fact that all these challenges are tied to the UN's SDGs." *Pascil*

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We thank all our collaborating authors and reviewers for their valuable contributions and also Charles Sebukeera, Mwangi Theuri and Audrey Ringler for their work as the Foresight Team on the Foresight Briefs until April 2020.

UNEP Delivering on the Sustainable Development Goals, UNEP Priority Areas and Global Environmental Monitoring

UN environment programme

Charcoal as a global commodity – is it sustainable?

Photo credit: Catherine Nabukalu

Charcoal is typically made from trees, and is perceived to be a renewable resource, it is used in both low and middle-income countries as well as high-income countries. There is a difference, however, between "renewable" charcoal which is primarily produced through the farming of trees, and "non-renewable" charcoal, produced through deforestation. Even so-called "renewable" charcoal has a detrimental effect on the environment through the use of monoculture, which compromises biodiversity. Alternative raw materials, such as agricultural and other organic waste (sawdust, nutshells, wheat straw etc.), should therefore be used more widely to produce charcoal. Economic activity and urbanization drives the demand for charcoal, which in turn drives the production of charcoal from trees. Charcoal produced from trees reduces forests as well as biodiversity and increases pollution and emission of Green House Gases (GHGs), which amplify climate change and adversely impact human health. Policies encouraging the alternative production of charcoal from organic waste would mitigate the pollution and emission of GHGs from traditional methods, and are therefore more beneficial for both the environment and human health. This approach in turn leads to a more sustainable production of charcoal.

Sustainable Development Goals

UNEP Strategic Priorities

Global Environmental Monitoring

Charcoal briquettes made from coconut shells drying in the sun
Photo credit: Shutterstock/phongwit phojurai

Recommendations

- The global charcoal trade must aim for sustainability, for example, through investment in mixed-species afforestation (Thomas *et al*. 2021) and plantations management to restore biodiversity (de Gouvello 2010). Alternative production technologies (Antal and Grønli 2003) are also critical for improved charcoal yields (Monsen *et al*. 2001). Furthermore, secondary raw materials can provide charcoal that is viable both in cooking and metallurgy (Biswas 2018).
- Innovation and education to reduce the exposure to indoor air pollution when cooking should be targeted at women, who generally face higher risks.
- Innovation and policies aimed at producing charcoal from organic waste materials are urgently required to prevent further forest degradation and loss of biodiversity, and to increase the sustainability of this material.

Secondary raw materials that can provide alternatives for charcoal production
Photo credits: From L to R: Shutterstock/Ant Clausen; Shutterstock/Anastasia Martyshina; Shutterstock/Maxal Tamor; Shutterstock/iamlukyeee; Shutterstock/Lamuka

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/40469/CHARCOAL.pdf

Plastics in agriculture – an environmental challenge

Photo credit: Shutterstock/Hans Verburg

Plastics are used extensively in farming, from plastic coated seeds to mulch film. They also make their way into biosolid fertilizer which is spread on fields. All these products have helped increase crop yields, but there is increasing evidence that degraded plastics are contaminating the soil and impacting on biodiversity and soil health. This can lead to reduced productivity and could threaten long-term food security. As a finite resource which is under pressure, agricultural soil needs to be safeguarded from further degradation. Steps are being taken to improve the production and management of agricultural products containing plastics but there is also a need to look at a more holistic approach to food production, including nature-based solutions. Nature-positive food production systems recognize that biodiversity underpins the delivery of all ecosystem services on which humanity depends and that these are critical for the delivery of the Sustainable Development Goals, the Convention on Biological Diversity, and the Paris Agreement. Nature-positive food production is characterized by a regenerative, non-depleting and non-destructive use of natural resources. It is based on stewardship of the environment and biodiversity as the foundation of critical ecosystem services, including soil, water, and climate regulation.

Sustainable Development Goals

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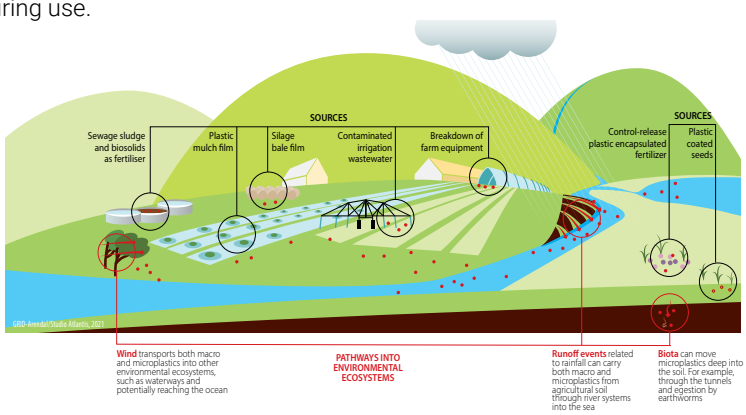
Global Environmental Monitoring

Recommendations

- Promote uniform standards in the use of biosolids that are formulated from sewage sludge.
- Foster innovation in products that do not shed microplastics during use.
- Promote solid waste management.
- Eliminate unnecessary plastics (such as plastic microbeads).
- Promote a rating system that indicates the potential of a piece of clothing or fabric to shed microplastics during washing.
- Promote levy or tax on the sale of clothes that produce microplastics.
- Foster innovation in commercial and household washing machines with a filter capable of removing microplastics during washing.
- Encourage consumers and manufacturers to reduce plastic pollution.
- Promote the development of an international legally binding instrument on plastic pollution, including in the marine environment.

Degrading plastic mulch film that can be a source of microplastic pollution that potentially ends up in the soil and waterways

Photo credit: © Copyright CSIRO Australia



Examples of the sources and transport of plastics and co-contaminants from agriculture production to the environment

Source: UNEP (2021)

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/40403/Plastics_Agriculture.pdf

The shrinking Arctic Sea Ice

The sea ice edge is not a sharp line in the ocean, but a gradual shift from open water to solid ice
Photo credit: Morven Muilwijk

The Arctic is a remote and sparsely inhabited area. It is connected to the rest of the world by our climate system, the atmosphere surrounding our Earth and by global ocean currents. Since satellite measurements started 40 years ago, about half of the sea ice area in the Arctic has been lost. The shrinking summer sea ice cover is a visible manifestation of global warming and affects marine ecosystems, ocean circulation, and potentially weather events further south of the Arctic. The Arctic, with the most fragile of ecosystems, is a hotspot of climate change. A visible sign of change is the steady retreat of the sea-ice cover since the 1970s. Changes in Arctic Sea ice can potentially affect other regions through altered weather patterns and ocean circulation. The ice-free Arctic is creating new business opportunities, political challenges, and threats to the ecosystems and local communities. Improved monitoring and understanding of the Arctic and the Arctic Sea Ice cover are therefore important to ensure sustainable management of the changing Arctic environment and its associated resources.

Recommendations

- The Arctic Sea Ice creates harsh conditions for human operations. As the sea ice is retreating, the Arctic region is becoming easier accessible for commercial activity such as fisheries, shipping, tourism and exploration of new resources and rare minerals on the ocean floor. This new accessibility requires policies which will protect the ecosystems and local communities.
- The unfriendly conditions in the oceans surrounding the two poles requires a focus on ship design and construction, equipment, training, and search and rescue. These are requirement for safe navigation and equally important, to protect the “unique environment and ecosystems of the polar regions” (IMO, 2017).
- Shipping along the Northern Sea Route along Russia’s Arctic coastline, through the Northeast Passage has grown extensively over the last years. This route is shorter than the Suez Canal Route between Europe and Asia but has large environmental risks and operational costs.
- Concerning the sea ice, preventing a dramatic future sea ice loss is a task closely connected with reducing global warming. As global warming is largely a consequence of human activities and emissions of greenhouse gases, the solution is scientifically as straightforward as it is politically complex: cut emissions of greenhouse gases.
- Improved monitoring and understanding of the Arctic and the Arctic Sea Ice cover are important to ensure sustainable management of the changing Arctic environment and its associated resources.

Sustainable Development Goals

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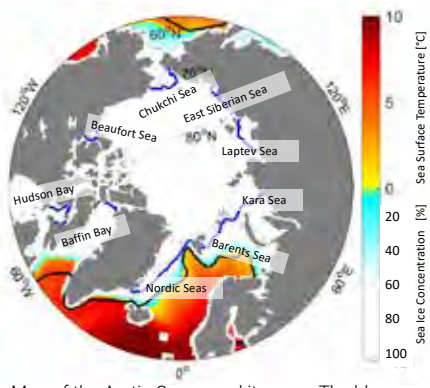
Global Environmental Monitoring

A polar bear is checking out research instruments during the MOSAiC expedition, summer 2020. The consequences of shrinking sea ice for marine ecosystems including seals, polar bears and fish stocks in the Arctic Ocean is unclear.
Photo credit: Lianna Nixon, AWI)



Map of the Arctic Ocean and its seas. The blue line shows sea ice edge in summer, and the winter sea ice edge in solid black. The colors show sea ice concentration and sea surface temperature in summer on a long term (1900 – 2000) simulated annual mean.
Figure credit: Lars H Smedsrud

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/38414/FB028.pdf

The growing footprint of digitalisation

Photo credit: Shutterstock/Gorodenkoff

If the Internet was a country, it would be the sixth biggest electricity consumer on the planet, using up to 7% of the global electricity consumption and responsible for up to 3.8% of global greenhouse gas (GHG) emissions. Since 2010, the number of internet users worldwide has doubled, and the global internet traffic has grown 12-fold. The digital services that we enjoy are sometimes referred to as "dematerialized technologies", but is this really the case? Computers, servers, and other electronic devices require large amounts of natural resources. The energy to run them emits high amounts of CO_2, and programmed obsolescence and the low percentage of recycling are generating e-waste. Most data in the cloud are not used. Without denying the many benefits brought by these technologies, including for the environment, it is important for users, services providers, and policy makers to understand what the impacts are and to learn how we can move towards greener digital technologies.

Sustainable Development Goals

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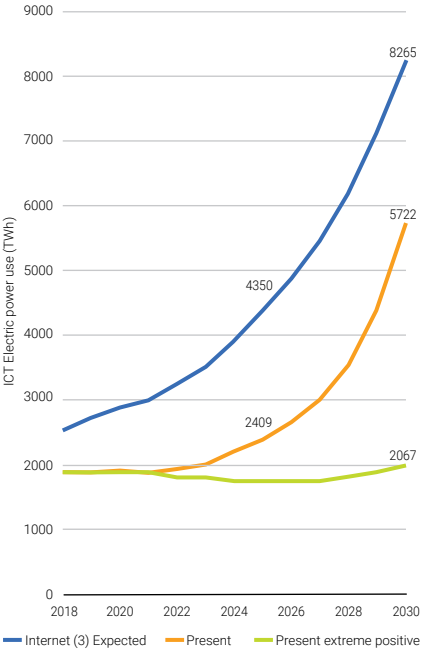
Recommendations

In order to avoid digitalisation becoming an environmental problem itself, different measures and incentives can be adopted by policy makers, companies, service providers and users:

- Accelerate the adoption as well as disclosure of renewable energy for ICT industries, including manufacturer and server farms.
- Encourage the improvement in governance of the ICT sector supply chain, especially regarding the extraction of rare earth in minerals and metals, the recycling of e-waste and the safe disposal of toxic materials.
- Extend the life span of servers and other devices using evolutive design and circular economy models to enable the upgrading and replaceability of key components.
- Reduce the air-conditioning needed for server farms and re-use the heat generated for other purposes.
- Encourage users and institutions to delete cloud content that is no longer used or to archive information to external drives that are switched off when in long term storage.
- Study the benefits versus negative impacts of this new technology, as well as alternatives, such as high-speed fibre cables.
- Encourage the large-scale adoption of environmentally responsible online behaviour.
- Encourage the assessment of the framework for the technologies of cryptocurrencies.
- Explore the potential of a digital 'product passport'.
- Adopt best practice in terms of Green ICT during procurement of ICT infrastructure by governments and international organizations.



ICT electric power use scenario 2018-2030
Source: Andrae, 2020

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/37439/FB027.pdf

People's livelihood and cities – building back greener

Photo credit: Shutterstock/Belen Desmaison

The livelihoods of urban residents are shaped by the complex relationship between environmental, social and economic issues affecting inhabitants of urban areas. There is a need for a global reset after the COVID-19 pandemic, which disrupted urban livelihoods, access to services and socioeconomic opportunities and widened inequalities. This requires all stakeholders to clearly see the relationship between environmental, social and economic justice and a forward-looking policy to 'building back better' — and greener. Such a strategy requires putting human rights and sustainability at the heart of urban decision-making across the world. It also needs to tackle other important global trends and challenges, such as answering demographic changes, clever use of data and technology, overcoming different forms of inequalities and the leading of a re-birth of high quality public services.

Sustainable Development Goals

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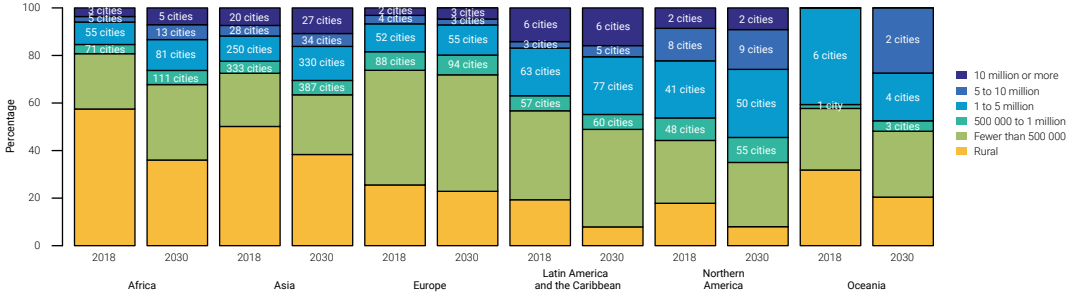
Recommendations

- Resource management for better urban living - The linear economy pattern that is built on a 'take-make-waste' approach (European Commission 2015) cannot be continued for three main reasons: shrinking availability of resources, amount of energy consumed during the production process, as well as environmental pollution due to dominant production and consumption patterns. A circular Economy approach needs to be taken.
- Coherent urban policy instead of spatial chaos - Cities need to grow their density and land use mix, while at the same time efficiently manage their development processes. Five key elements of sustainable neighbourhoods should be adhered to: appropriate densities; inclusive and adequate complete streets; land use mix; social mix; limiting big-scale specialisation through zoning. These principles need to be supported by three 'enabling components': an adequate local and national legal and policy framework, inclusive and participatory urban design and financial mechanisms and sufficient investments – all tailored to the local context

Photo credit: Shutterstock



Population distribution by size class of settlement* and region, 2018 and 2030

In 2030 urban population will constitute a majority of people inhabiting each of the permanently settled continents. Cities themselves will also grow in size.
Source: United Nations (2018)

* The population of cities with fewer than 500,000 inhabitants is estimated by taking the difference between the total urban population and the population in cities with 500,000 inhabitants or more. The number of cities with fewer than 500,000 inhabitants is not estimated.

For the full brief go to https://www.unep.org/resources/emerging-issues/peoples-livelihood-and-cities-building-back-greener

Working with plants, soils, and water to cool the climate and rehydrate Earth's landscapes

Photo credit: Shutterstock/PARALAXIS

Increased human land use has resulted in reduced vegetation cover, degraded soil and diminished water retention, which directly reduces evapotranspiration, increasing ground temperatures, in turn impacting on global temperature rise. Increasing vegetation on land will increase soil fertility and ground water recharge, increasing evapotranspiration, in turn leading to increased cloud cover and increased rainfall. There are interwoven relationships and fluxes of energy between plants, soils, and water on the ground, as well as in the oceans and with the atmosphere which are disrupted by the reduced vegetation cover. However there are positive feedback loops that can help mitigate climate change, while at the same time creating a resilient ecosystem.

Sustainable Development Goals

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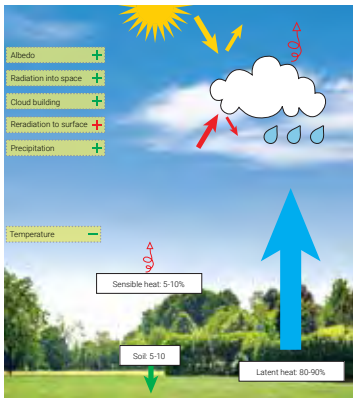
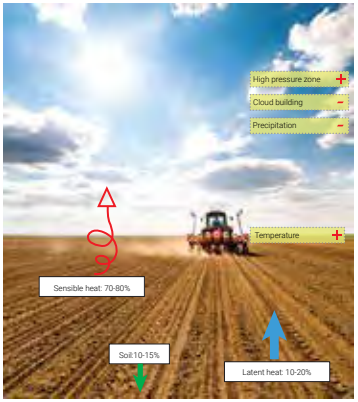
Recommendations

- Create awareness of positive feedback loops. Climate change, deforestation, drought, and forest fires form a triple-loop of reinforcing feedbacks.
- Promote the REDD+ mechanism as a model for recognizing and funding the international water and energy services provided by large forest ecosystems.
- Protect and manage important and sensitive forest regions.
- Stop deforestation and increase reforestation efforts around the world.
- Agricultural practices should focus on soil building, year-round soil cover with plants and the use of agroforestry methods.

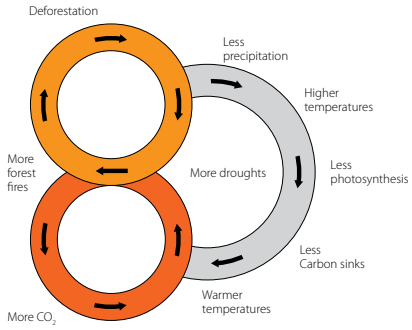




Evapotranspiration decreases ground temperature and increases cloud albedo, radiation into space during condensation process, cloud building and thus precipitation. Removing vegetation increases temperature at ground level, emit with increasing ground temperature exponentially increasing heat energy, creates high pressure zones which hinder the passing of low pressure (and thus moist) air masses, lessen cloud building potential and thus reduce precipitation

Graphic: Stefan Schwarzer, UN Environment/GRID-Geneva

Photo credit: Shutterstock/Richard Whitcombe



Due to the interrelated nature of forest fires, deforestation, drought and climate change, isolating one of the processes fails to describe the complexity of the interconnected whole

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/36619/FB025.pdf

Sargassum: Brown tide or golden jewel?

Drone photograph of a vast mat of sargassum near Silk Cayes, Belize (4 September 2018)
Photo credit: Tony Rath

Warming oceans due to climate change and other environmental conditions leads to massive quantities of sargassum being transported to coastlines in the Caribbean and West Africa. The seaweed itself is not harmful: floating sargassum at sea is beneficial as a unique habitat. It is the large floating mats clogging fishing gear and impeding navigation at sea, and the mass stranding on coastlines and ensuing decomposition that is highly detrimental to people, ecosystems, and economies. It reduces economic activities in climate sensitive sectors such as tourism, maritime transport and fisheries, and adversely affects ocean biodiversity and human well-being. Sargassum decomposition on shorelines also increases air and water pollution. Increasing pollution, decreasing biodiversity and declining economic activity causes human health directly or in-directly to decline. The decline in human health in turn reinforces a further decline in economic activity. These trends can be reversed through appropriate measures including monitoring and research into the causes of sargassum transportation and policies leading to the development of sargassum product and blue initiatives. These initiatives would result in sargassum being used on shorelines to increase economic activities and in turn improving biodiversity and reducing pollution. Policy interventions that result in reduced sargassum on shorelines can therefore improve overall human health through reinforcing beneficial feedback loops.

Sustainable Development Goals

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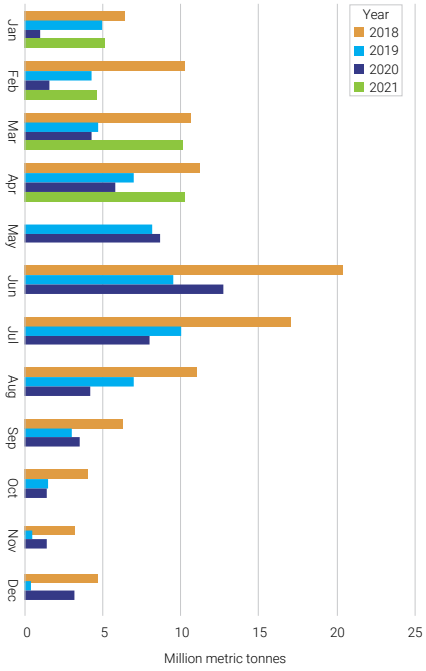
Recommendations

- Targeted policy interventions are needed to guide the adaptation of legal and regulatory frameworks to address the issues and facilitate knowledge sharing at the science-policy interface. Compiling spatially explicit information (mapping) on exposure, vulnerability, and available resources is recommended. This, along with clear policies and regulations, contributes to the enabling environment by reducing uncertainty for investors and facilitates efficient use of resources and effective management interventions.
- Sargassum-specific policies, protocols and standards are needed to prevent environmental damage and ensure the safety of products for consumptive or contact uses, thereby supporting sustainable sargassum-related businesses and protecting public and environmental health.
- Territories are advised to develop policies that encourage investment in sargassum exploitation, in such a way as to mitigate the negative effects while putting safeguards in place against risks, such as environmental impacts, conflicts around resource rights, or displacement of people, or small businesses.
- Policy actions that promote the engagement of women and youth in the sargassum management and innovation are important as is the development of gender responsive adaptive management strategies



Estimated total amount (million metric tonnes) of sargassum in the tropical Atlantic (2018 – 2021)
Source: USF Outlook Bulletin

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/36315/FB024.pdf

Nature-based solutions for urban challenges

Photo credit: Shutterstock/hkeita

Currently, already half of Earth's population lives in urban areas, and projections suggest that it is likely to increase by up to 68% or more by mid-century. Urban expansion has heavily drawn on natural resources, consumed vast spaces, and led to the degradation and destruction of valuable ecosystems, thereby depriving us of the wealth of benefits they provide. Nature-based solutions (NbS) aim to fully utilize and apply the potential of the natural systems for human uses and can be used to address certain social challenges in urban areas as they pertain to climate change and thus to improve the cities' resilience to climate change, improve the quality of life of the city's dwellers and increase biodiversity in the city through the creation of green spaces.

Sustainable Development Goals

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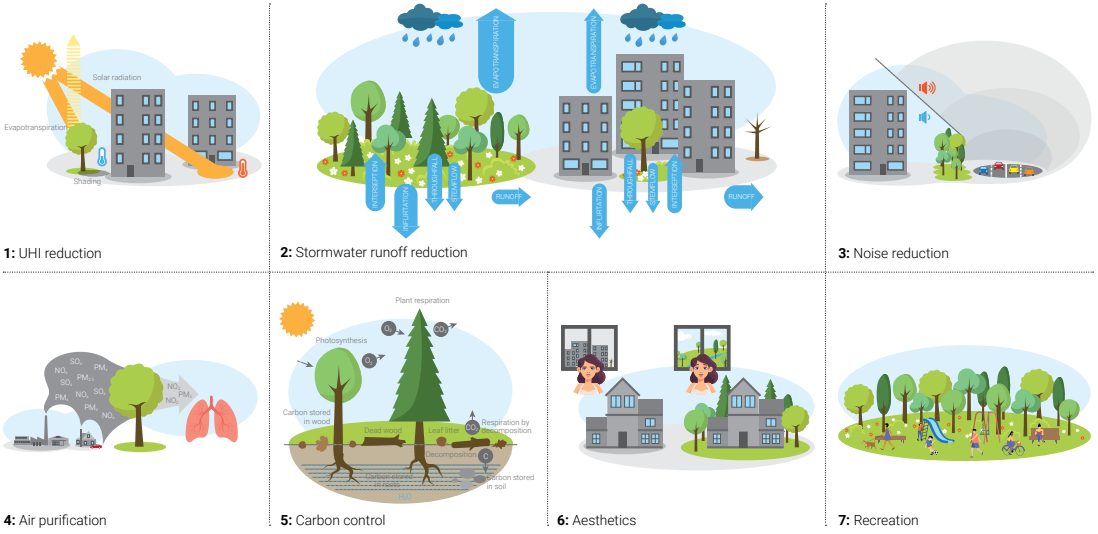
Global Environmental Monitoring

Recommendations

- Encourage collaborative planning because NbS are multifunctional and require cross-sectoral and cross-departmental planning procedures where different vested interests may be balanced.
- Engage the Private Sector in Public-Private Partnerships (PPPs) to create a favourable climate for NbS investments.
- Integrate NbS with environmentally sound fiscal reforms to help and enhance the implementation of NbS in urban areas.



1: UHI reduction
2: Stormwater runoff reduction
3: Noise reduction
4: Air purification
5: Carbon control
6: Aesthetics
7: Recreation

It should be noted that in addition to supporting adaptation to climate change, green infrastructure also provides many other ecosystem services of high importance in urban areas. They include: noise reduction (**2**), stormwater runoff reduction (**3**), air purification (**4**), carbon control (**5**), aesthetics (**6**) and recreation (**7**). All above mentioned ecosystem services improve the quality of life of city dwellers and, for this reason, when deciding to invest in NbS all of them should be acknowledged. The COVID-19 pandemic provided a new strong reason and argument for appreciating the value of the natural systems as important providers of numerous health and mental benefits, and generally positively affecting human well-being (UNEP 2021). This is true for both non-urban and urban environments.

Source: UNEP/GRID-Warsaw Centre

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/35864/FB023.pdf

Desert locusts' upsurges: A harbinger of emerging climate change-induced crises?

Photo credit: Shutterstock/Kuttelvaserova Stuchelova

The economic importance of locusts is evident from their impacts on livelihoods, food security and nutrition, economic development and on the environment. This foresight brief discusses some of these issues and highlights the role of climate change in locust infestations. Predicting and controlling locust outbreaks are some of the major challenges that countries face. Addressing these issues requires well-organised early warning systems that operate within an integrated pest management context and employ innovative strategies such as ecosystem-based approaches. However, these can only work if governments employ a joined-up approach to policy implementation at all levels, collaborating with development partners and addressing some of the underlying causes.

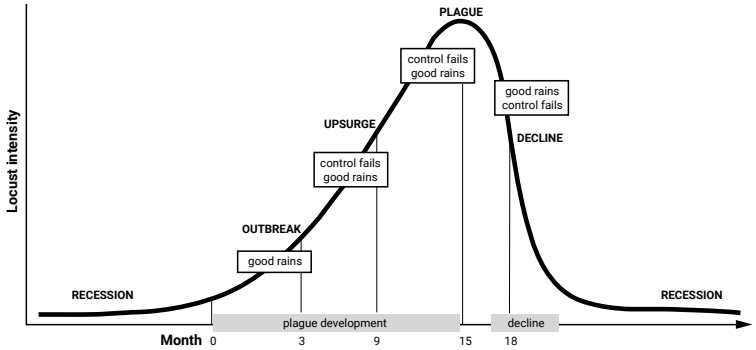
Sustainable Development Goals

UNEP Strategic Priorities

Global Environmental Monitoring

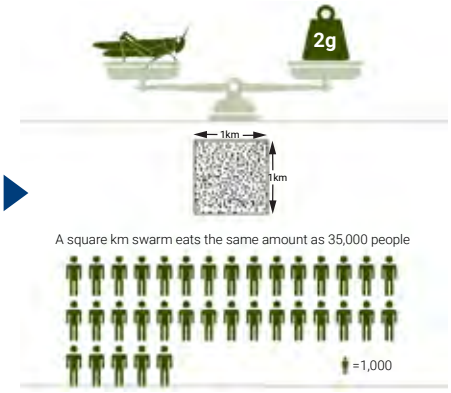
Recommendations

- Desert locusts are ravaging crops in the field before harvesting, wiping out livestock and wildlife feed, and with them savings, assets and livelihoods. Deployment of climate action solutions such as decentralizing solar dryers to agro-value chain actors can ensure that people living in poverty earn up to 30 times more by being able to preserve their harvest and sell during the offseason, or gives them the flexibility to compensate for unpredictable events such as these locust swarms.
- The United Nations' response to locust attack control should continue to be multi-agency in nature. While the immediate sector at risk is food security, climate can play an exacerbating role. The UN Environment Programme plays an important role in disseminating the latest science on emerging climate trends to inform cross-sectoral policies and ensure resilience is built in the relevant sectors. The World Meteorological Organization plays the crucial role of forecasting the more immediate weather changes that may exacerbate the locusts' attacks.
- There is an urgent need to build the resilience of economies facing a growing threat of such outbreaks while at the same time working on mitigating the underlying causes including climate change.



The evolution of desert locust plague
Source: Cressman 2016

Locusts consume equivalent of their own weight in a day and 1 sq. km of locusts can consume the same amount of food consumed by 35,000 people
Source: BBC 2020; FAO 2020c



For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/35058/FB022.pdf?sequence=3&isAllowed=y

The need to eliminate lead paint globally

Photo credit: Shutterstock/adike

Lead has wide-ranging effects on health, with concomitant personal, societal, and economic impacts, and thus, it was identified as one of the 10 chemicals of major public health concern globally. One of the main sources of lead poisoning is exposure to deteriorating lead paint in homes and schools, which affects primarily children, especially those living in poorer communities. Other important sources of lead exposure, including emissions from mining, smelting, combustion, incineration, manufacturing and recycling, contaminated food, and drinking water, also need to be addressed, but will require significant time and effort to control but eliminating the danger of lead-paint exposure is a globally achievable goal within a decade. Developed countries banned lead paint in the 1970s and 80s, but much of the rest of the world was left behind. More than sixty percent of all countries still allow lead paint. Nevertheless there is significant momentum in the effort to ban lead paint globally. Progress has accelerated, particularly in Africa, the continent with the fewest laws.

Sustainable Development Goals

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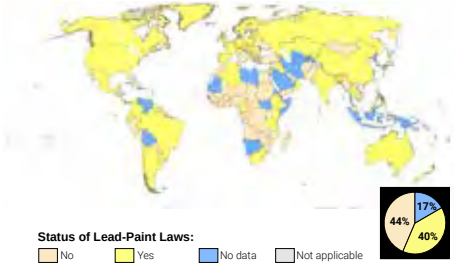
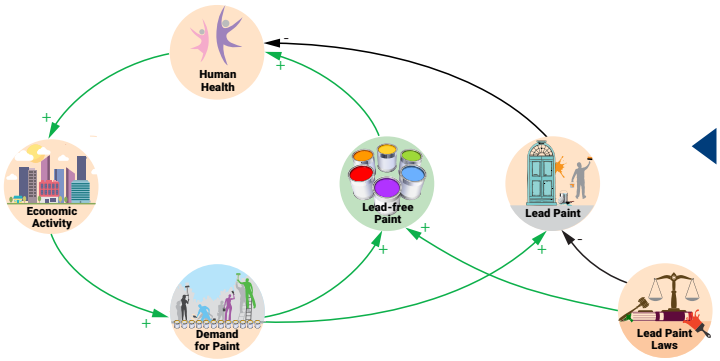
Recommendations

- Urge all countries to enact and enforce laws on lead paint which is the only effective way to eliminate this hazard through legally-binding requirements The legal limit on lead in paint should be low
- Raise awareness of tools and information resources to help countries address the challenges of developing lead-paint laws.
- Promote the use of sound scientific principles and data when establishing effective environmental and public health policies.



Map showing the status of lead-paint laws around the globe as of October 2020.
Data from (WHO, 2020b), with updates from the Global Alliance to Eliminate Lead Paint

A Systems Thinking Perspective



Economic activity drives the demand for paint. In many developing countries lead paint is still widely used, which adversely impacts human health and this in turn has a detrimental effect on economic activity. The introduction of lead paint laws changes this relationship by eliminating the use of lead paint, which reinforces the use of alternative lead-free paint resulting in a virtuous cycle of improved human health and economic activity.(+) Influence is in the same direction, (-) influence is in the opposite direction.

Photo credit: Shutterstock/Oleksiy Mark

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/34627/FB.pdf?sequence=1&isAllowed=y

Food loss and waste in the Sustainable Development Goals' nexus

Photo credit: Shutterstock/j.chizhe

Food loss and waste (FLW), occurring at different stages of food production, distribution, and consumption cycles, is now a truly global phenomenon. It results in humanity losing about one-third of the total food produced and a quarter of its caloric value. The effects of such a situation led to wasted social and economic opportunities, as well as environmental degradation due to rising pressure on ecosystems stemming from the need for agricultural land. The brief addresses the various reasons for food loss and waste across the world, offering both habit nudges and policy changes that may lead to better practices by farmers, retailers, or consumers. Given that agriculture already covers 37% of Earth's landmass (excluding Antarctica) our approach towards food production and consumption – including food loss and waste – is of utmost importance in terms of averting runaway climate change.

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Recommendations

- Education, along with the strategies of influencing consumer behaviour by, e.g., lowered pricing, may be useful in terms of promoting "ugly" foods – as cosmetic imperfections do not affect nutritional value. An important role in the sector of catering and restaurants may be played by nudging. Simple ideas, such as offering only plates instead of food trays would limit the possibility of" hoarding" food which then is left uneaten (and often wasted).
- Straightforward messaging encouraging customers to take only as much as they can eat can be helpful, as can offering a variety of portion sizes. Such experiments may also involve trials focused on tracking sources of food loss and waste in the establishment, giving customers information regarding the negative effects of FLW, as well as being open to feedback from them regarding hitting the sweet spot of high quality, attractive price, and the right amount of food on the plate.
- Carefully planned shopping, understanding the information displayed on products, cooking skills to manage surplus and use leftovers, and adequate storage are examples of everyday small steps that may result in limiting food waste.
- Social campaigns may play an important role, while – in the case of food spoilage – a separate collection of food waste may at least allow for extracting some value, e.g. through composting. Cooperation between the retail and food service sectors and food banks or NGOs allows for the giving away of unsold food products for the purpose of feeding those in need. Avoiding overproduction or ending the practice of partial crop gathering from the field means fewer emissions of GHG, such as methane. Viable storage facilities can raise household incomes and improve chances for broadening access to quality education, or for providing gender equality. Access to food unsold by the shops may help people living on low incomes to retain good health.
- Changing the food waste culture can happen on three fronts: a) legislative regulations, for example, requiring large retailers to sign food donation agreements with charitable organisations or food banks; b) public-private partnerships around SDG 12.3; and c) addressing consumer demand and nudging, for example by offering "ugly" fruits and vegetables and using innovative solutions, such as apps connecting consumers to shops and restaurants offering unsold products at discounted rates that might otherwise have been wasted.

Food recovery hierarchy
Source: US EPA

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/34443/FB020.pdf?sequence=1&isAllowed=y

Blockchain technology and environmental sustainability

Photo credit: Shutterstock/Iurii Motov

Ever since the surge of cryptocurrency prices in 2017, most people associate blockchain with cryptocurrencies. However, over the past few years, scholars have increasingly proposed blockchain as a potential solution for sustainable development, including the environmental dimension focused on sustainability. The brief builds upon environmental use cases to review the technology's key features, including record-keeping, transparency, value transferring, tokenized ecosystems and cost reduction. The Foresight brief also considers challenges when applying blockchain technology, among them scalability and energy consumption, and offers guidance for the progress of the technology's policies.

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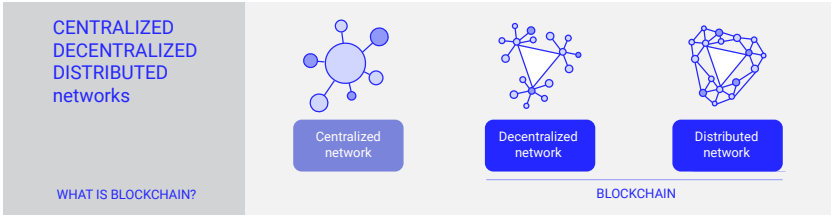
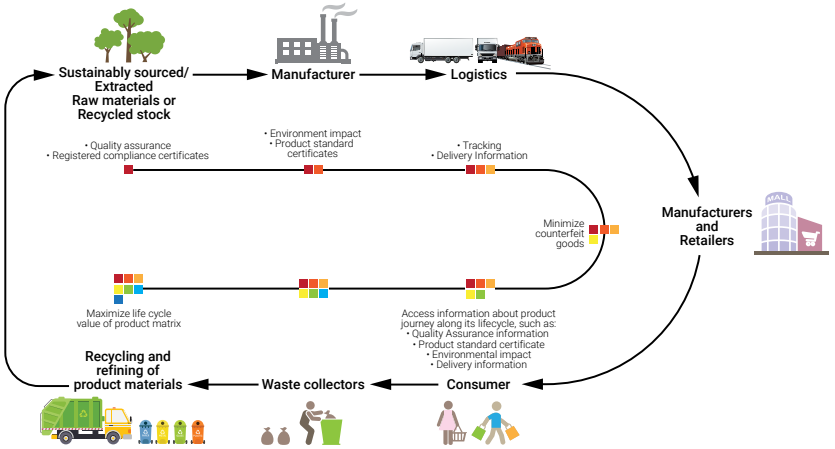
Recommendations

- Convene global-scale dialogues on blockchain technology that centre around the natural environment. Policymakers, scientists, and blockchain developers can together develop a united vision by integrating the advanced and practical understanding of blockchain merged with other emerging technologies.
- Establish consistent legal and regulatory frameworks. International organizations could draw together stakeholders to support the development of policy frameworks to facilitate the creation of enabling environments for innovation through blockchain.
- Encourage the live testing of innovative technologies in controlled environments. Such a pilot interface can be leveraged to explore whether the research outcomes could be applied to the real environment.
- Promote the establishment or improvement of national innovation centres, hubs, and accelerators. These innovation centres could help increase and improve the capacity of local practitioners to develop and operate local projects and integrate them into existing blockchain infrastructures whilst ensuring interoperability between them.





A generalized outline of what a supply chain supported by blockchain may look like
Source: by Authors

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/34226/FB019.pdf?sequence=1&isAllowed=y

Unveiling plastic pollution in oceans

Photo credit: Shutterstock/Parilov

Marine plastic litter pollution is a global concern that threatens seas and the ocean, biodiversity, human health and economic activities such as tourism, fisheries and marine navigation/transportation. Plastics represent approximately 80% of marine litter and result from both land and sea-based human activities. Combating marine litter requires knowledge of sources, pathways, links and impacts, which calls for worldwide harmonized monitoring and assessment programmes to guide measures and assess their effectiveness. This Brief was prepared based on the findings of the report entitled 'Guidelines for the monitoring and assessment of plastic litter and microplastics in the ocean' found at https://wesr.unep.org/media/docs/marine_plastics/une_science_dvision_gesamp_reports.pdf.

Sustainable Development Goals

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Global Environmental Monitoring

Recommendations

- An urgent call is needed for both local and global action to foster a comprehensive long-term monitoring and assessment programme. As the subject is complicated and costly, member-states and other relevant stakeholders should commit to reaching the best trade-off among simplicity of indicators, cost, and comprehensiveness to support decision-making at both local and global levels.
- To support more effective monitoring, interested stakeholders are encouraged to join the Global Partnership on Marine Litter (GPML), a multi-stakeholder partnership which provides a unique mechanism to bring together all actors working on marine litter to share knowledge and experience and to advance solutions to this pressing global issue. The GPML also facilitates capacity building providing access to training and collaboration among partners, including a Massive Open Online Course (https://www.unep.org/unepmap/news/news/massive-open-online-course-mooc-marine-litter).

Photo credit: Shutterstock/Inside Creative House

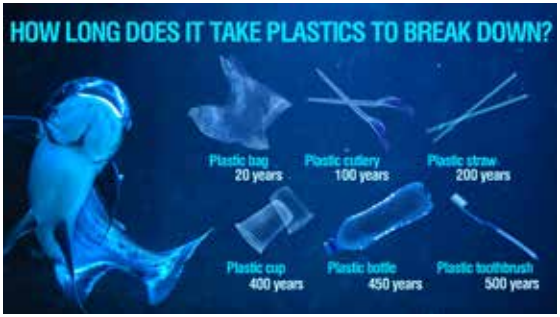

Photo credit: Shutterstock/Pavlovska Yevheniia

Photo credit: Shutterstock/lazyllama

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/33604/FB18.pdf?sequence=1&isAllowed=y

Challenges for the growth of the electric vehicle market

Photo credit: Shutterstock/Petair

Electric vehicles (EV) can play an important part in the decarbonisation of the traffic sector. This helps in climate mitigation and positively impacts the air quality of cities, due to reduced emissions such as CO_2, NO_x, SO_2 and fine particles. To become an eco-friendlier product, however, increased efforts must be made to lighten the environmental and social burdens of the mining of rare earth materials, needed especially for the batteries and engines, and its production process. It must be accompanied by a shift from electricity production to renewable energy sources, while pushing for clear guidelines on re-usage and recycling of the batteries. If the issues presented in this Foresight Brief can be addressed, they will largely improve EVs footprint.

Sustainable Development Goals

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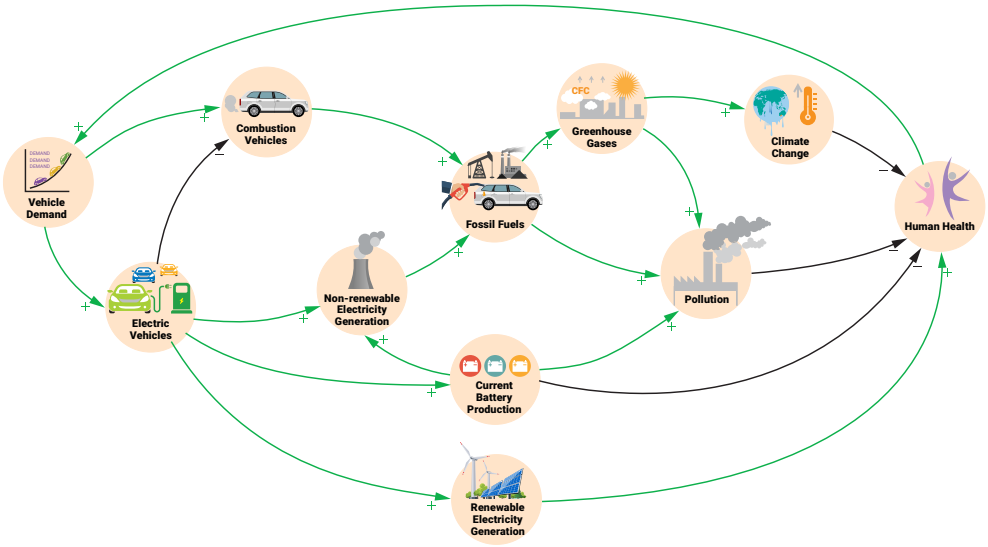
Recommendations

- Encourage the development of battery technologies that work with less or no cobalt and use less harmful substances.
- Organize and regulate the recycling process of batteries.
- Focus on reducing individual mobility by cars and implement incentives for individuals to instead use public transport and encourage soft mobility.
- Promote the rapid shift to renewable energies and material in the car production and use phase.
- Encourage due diligence process for companies during the production of all metals in the manufacturing phase.
- Promote the reuse of car batteries.
- Increase the capacity to recycle batteries.
- Promote research and development of alternative materials.
- Promote the taxing of heavier cars and creating incentives for smaller models in both electric and traditional vehicles.

A Systems Thinking Perspective



Dominant causal loops in individual vehicle demand and alternatives to consider. Vehicle demand drives production and supply of vehicles. Combustion vehicles use fossil fuels that are polluting and increase greenhouse gases that worsen climate change which in turn adversely impacts human health. Electric vehicles, if built and operated using renewable energy resources and with recyclable components such as batteries, will help improve human health. This approach in turn leads to a more sustainable reinforcement of vehicle demand. (+) Influence is reinforcing and in the Same direction, (-) influence is balancing and in the Opposite direction.

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/33111/FB17.pdf?sequence=7&isAllowed=y

Seagrasses, the forgotten ecosystems

Photo credit: Benjamin Jones, Project Seagrass

Seagrasses are marine flowering plants, or angiosperms, comprising more than 70 species that form extensive meadows, and highly productive and biologically rich habitats. They are among the most extensive coastal ecosystems with a global areal cover of potentially over 300,000 km^2 distributed in 159 countries on six continents. Seagrass meadows significantly support world fisheries production and global food security, providing valuable nursery habitat for over one-fifth of the world's largest fisheries, as well as shelter and food for thousands of species including threatened charismatic species such as turtles, dugongs, seahorses, and waterfowl. Recognizing the importance of seagrass ecosystems to biodiversity and human well-being can help in the conservation, better management, and restoration of seagrass meadows.

Sustainable Development Goals

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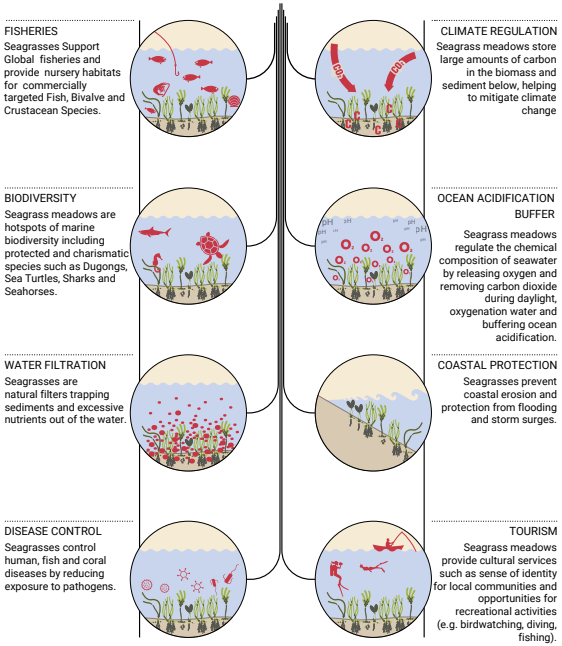
Recommendations

- International Policy: Support the development of a policy expert group for seagrass for recommendations to the international community; Integrate seagrass into the planning and implementation of the post-2020 global biodiversity framework; Include actions on seagrass ecosystems in plans for the United Nations Decade on Ecosystem Restoration and the United Nations Decade on Ocean Science for Sustainable Development; Recognize the value of seagrasses in Nationally Determined Contributions (NDCs) as a key component of climate change adaptation and mitigation; and Recognize the value of protecting seagrasses for the SDGs, the 2030 Agenda for Sustainable Development and the other international policy targets.
- Research: Develop a comprehensive global map of seagrass health and distribution; and Invest in understanding and quantifying the values of ecosystem goods and services that seagrass ecosystems provide.
- Communication: Raise awareness and communicate the economic and social importance of seagrasses, as well as the consequence of their loss.
- Conservation action: Develop national action plans for seagrass ecosystems; Engage stakeholders at all levels and stimulate partnerships to facilitate the integration of seagrass conservation into planning and implementation phases; and Designate more Marine Protected Areas or Locally Managed Marine Areas that include or focus on seagrass ecosystems.
- Financing: Increase national, bilateral, and multilateral funding for the comprehensive actions required to conserve and sustainably manage seagrass ecosystems; and Stimulate seagrass conservation and restoration by providing financial mechanisms and incentives.

Seagrass ecosystem services



Source: GRID Arendal (2019)

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/32643/FB16.pdf?sequence=1&isAllowed=y

Growing popularity of alternate food systems for environment and health

Photo credit: Shutterstock/S Andrii Spy_k

The question around food has moved beyond a focus on food security solely, to include the context of human wellbeing and the sustainability of our planet. A food system could be defined as the path that food travels - starting from conception in the field to the resulting nutritional outcomes for those consuming it. This includes the growing, harvesting, processing, packaging, transporting, marketing, consuming, and disposing of food. The inputs used and outputs obtained at each stage are also an integral part of any food system. Environmental and health advocates point to the challenges with certain foods and the current food system, that have caused a large environmental footprint on the planet. Several alternate social movements based on food have emerged in the recent past and continue to gain momentum as the need for substantive transformation of what we eat and how it is produced becomes increasingly pressing in order to achieve the goals set under Agenda 2030.

Sustainable Development Goals

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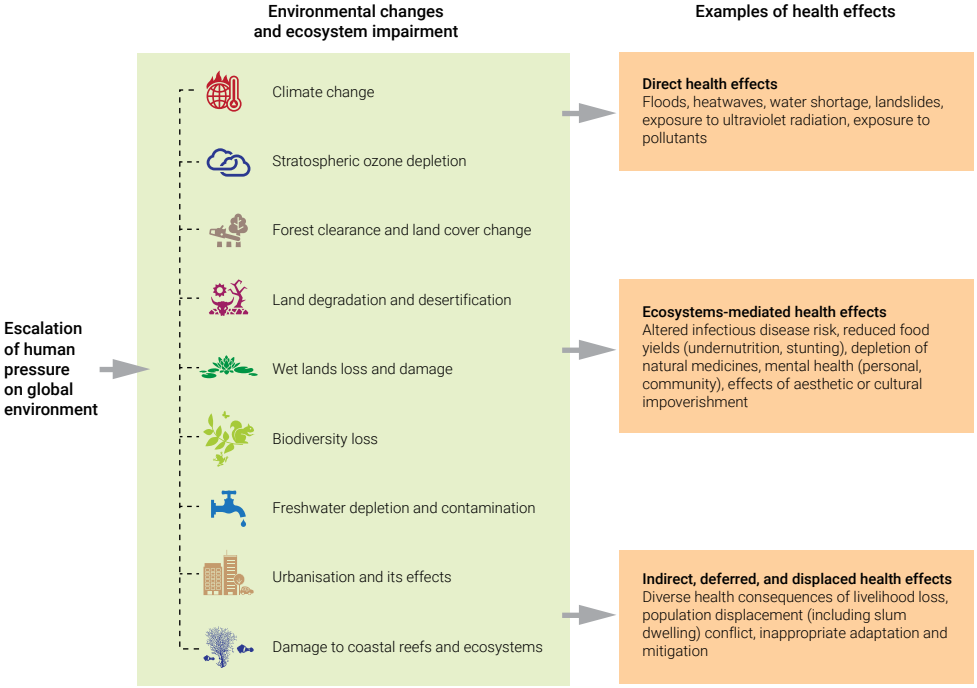
Recommendations

- Promote a sustainable intensification approach that consists of the three interlinked activities of ecological intensification, genetic intensification, and market intensification.
- Encourage the efficient use of water and fertilizer using appropriate strategies and methods.
- Promote measuring food loss and waste, and the research into the behaviours and drivers that give rise to food waste such as fungal contamination, aflatoxin control strategies, and natural non-toxic technology.
- Promote school-based food and nutrition education at the local level.
- Encourage children and their communities to develop capacities that support their health and wellbeing, making them empowered to become active agents of change in their local food systems.



Mechanism by which the harmful effects of ecosystem change can affect human health
Source: Adapted by UNEP from Whitmee et al. (2015)

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/32312/FRS15.pdf?sequence=1&isAllowed=y

Building a digital ecosystem for the planet

Photo credit: Shutterstock/Dmitry Kalinovsky

Emerging frontier technologies have dramatically boosted the ways in which we can monitor the health of our planet. If we can leverage this information effectively, we will be able to assess and predict risks, increase transparency and accountability in the management of natural resources, inform markets and consumer choice and guide the political action required to counter the environmental risks and crises; and ultimately stand a better chance of achieving the Sustainable Development Goals (SDGs). For this vision to become a reality, stakeholders must collaborate to build and deploy a global digital ecosystem combining data, infrastructure, analytics, and insights and be cognisant of the risks which include monopolies linked to global datasets; Quality and openness of data and algorithms; Protecting individual privacy, data security and intellectual property; Direct environmental impacts.

Sustainable Development Goals

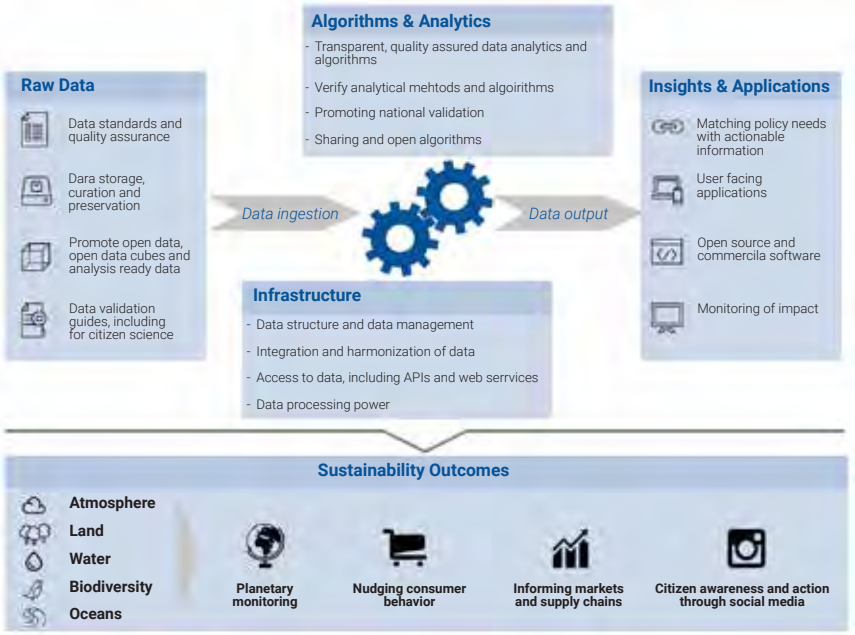
UNEP Strategic Priorities

Global Environmental Monitoring

Recommendations

- To move forward with a digital ecosystem for our planet, we need to develop the business case, new business models and public-private partnership frameworks.
- Encourage all UN member states, international institutions and relevant non-governmental organizations to clarify their own policy positions on how a digital ecosystem for the planet can be built, paid for, and governed in the future.
- Encourage funding bodies such as the Global Environment Facility, the Green Climate Fund, and existing and future investments to positively influence the shape of the emerging digital ecosystems for the planet.
- Encourage collaboration between experts in frontier technologies and domain experts from different environments fields. They must explore practical applications and use cases for solving different environmental and climate challenges.
- Align current efforts to the work of the UN High-Level Panel on Digital Cooperation and to the recent report of the panel on "The Age of Digital Interdependence".

A Digital Ecosystem for the Planet



A digital ecosystem integrates data, infrastructure, algorithms to generate insights that can be used to achieve different sustainability outcomes

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/30612/Foresight014.pdf?sequence=1&isAllowed=y

Putting carbon back where it belongs - the potential of carbon sequestration in the soil

In cold climate countries, soil erosion mostly takes place on the surface, but can generate erosion gullies as well (photo from Germany), as it does in more brittle environments, washing away large amounts of soil.
Photo credit: Stefan Schwarzer

In many regions, soil fertility has been decreasing for decades and large amounts of fertile soil has been (and continues to be) washed into rivers, lakes, and oceans - gone forever, and with it, much carbon, originating from the oxidation of soil organic matter (SOM, commonly known as "humus"), has been released into the atmosphere in the form of CO_2, all of these with severe economic implications. However, soils – and thus agriculture - can play a major role in mitigating climate change. Through multiple agricultural practices, we could help store vast amounts of atmospheric carbon in the soil, while at the same time regenerating soil fertility, plant health and whole ecosystems. This is a no regret option that offers multiple benefits and deserves high-level visibility.

Recommendations

- Address land degradation and support land regeneration restoration.
- Encourage agro-ecological practices that increase the quantity of soil organic matter and pay farmers for soil carbon storage.
- Mainstream agro-ecology and holistic food systems approaches into political, education and research agendas.
- Improve knowledge, communication, training, and networking of/for practitioners on improving soil organic matter levels, sustainable soil management and agroecological practices and approaches.
- Support agriculture and forestry as sectors potentially contributing to mitigation of climate change.
- Support campaigns and initiatives to preserve and build soils, such as SaveOurSoils campaign and "4 per 1000" initiative.
- Focus not only on total yields, but as well on other "ecosystems services" that farmers can contribute to (carbon sequestration, climate regulation, water storage and filtering, erosion control, biodiversity, nutritious-dense food and others).
- Work for the opening of carbon markets and/or stimuli to new sectors such as agriculture and agroforestry.
- Develop policies for the supply of agricultural products that encourage sustainable soil management through public procurement where appropriate.
- Enhance research for soil carbon sequestration practices to generate knowledge to support actions.

Sustainable Development Goals

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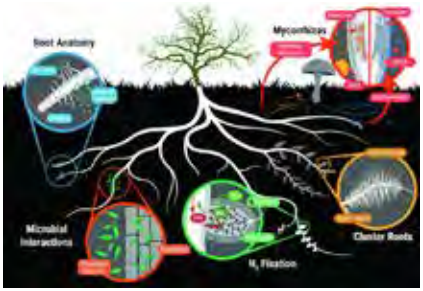
Global Environmental Monitoring



Many interactions take place in the "rhizosphere", the active zone where roots meet bacteria and fungi
Drawing: Scott Buckley, Source: PlantsInAction

The five principles of soil carbon storage and regenerative agriculture based on "how nature does it".

- Always protect the soil surface.
- Minimize soil disturbance.
- Use high diversity of plants and animals.
- Keep living plant-root networks.
- Integrate animals into the crop.

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/28453/Foresight013.pdf

Environment, climate change and security

Juba, South Sudan, February 2017. Women and children sitting on the ground. Yellow jerrycan with number of a displaced family. Camp for internally displaced persons (IDPs).
Adriana Mahdalova/Shutterstock.com

Climate change is happening, and it is a threat to human security. The potential future effects of global climate change include more frequent wildfires, longer periods of drought in some regions, and an increase in the number, duration and intensity of tropical storms. When climate change accelerates environmental degradation, the risk of conflict increases. Climate change alone is unlikely to be the primary cause of conflict, but it is an important threat multiplier. This reinforcing feedback loop is demonstrated in the case of South Sudan.

Sustainable Development Goals

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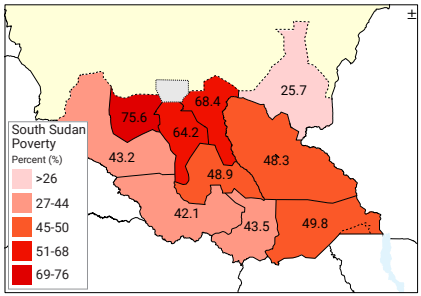
Global Environmental Monitoring

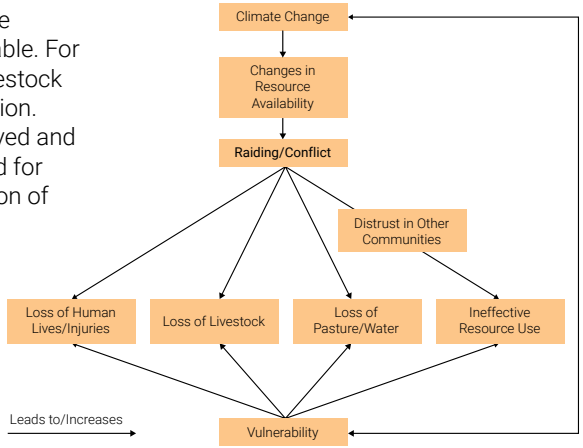
Recommendations

- The interconnections between environment, climate change and conflict are vast and complex. To improve implementation of a sustainable development policy, we need to continue to build an understanding of how climate change is a threat to human security. For those countries whose populations' livelihoods depend on an agro-pastoral economy (such as in the Sahel), we need to document more case studies of primary and secondary causality and bring this evidence to policy-making platforms. This evidence should include the current and potential cost of climate change to society at local, national and international levels.
- Document and publish case studies of how environmental solutions such as ecosystems-based adaptation and ecosystem-based disaster risk reduction can reduce the threat of climate change with a co-benefit of improving security.
- Channel environmental assessments into the peace-making process to provoke discussion of how national wealth is managed and shared at the negotiating table. For example, post-conflict planning in South Sudan should address land tenure, livestock management and biodiversity resources in the Sudd and related wildlife migration.
- There is a need for an investment platform to set up a foundation for an improved and growing role for environment and natural resources in South Sudan's future and for improving the role that environmental information will play in the implementation of national policy.



South Sudan poverty by State

Dead goats that drank from the contaminated mud pit at Gummry Oil Field, #17 on the 14th of January 2017. The mud pit was neither treated nor backfilled.
Source: Mr. Humoon, Ministry of Petroleum - HSE



Relationship between climate change and conflict
Source: Schilling et al 2012

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/27920/Foresight%20150419.pdf?sequence=1&isAllowed=y

We are losing the "little things that run the world"

Photo credit: Shutterstock/SunflowerMomma

Insects make up about half of all known living organisms. They play key roles in, pollination, nutrient cycling, food chains or birds and other insectivores, and are one of the pillars of our ecosystems. They enable the maintenance and dynamic equilibrium of ecosystems through the services they provide, such as pollination, herbivory and detritivory, nutrient cycling, pest control, and food source provision for birds, mammals and amphibians. However, the wide use of insecticides, intensification of agricultural activities, fragmentation of habitats and climate change are placing multiple threats on them, and their populations are under sharp decline.

Sustainable Development Goals

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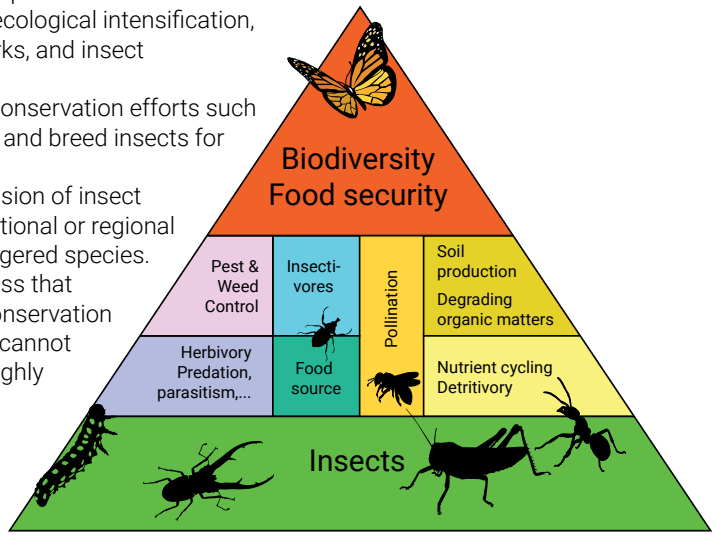
Recommendations

- Encourage farmers to plant flower strips and maintain as much as possible hedgerows with different flowering species.
- Encourage environmentally friendly alternatives to pesticides.
- Promote restoration of seminatural and natural areas to increase pollinator diversity.
- Promote the setup of insect conservatories, butterfly farms and exhibits.
- Introduce incentives for the implementation of environmental and agricultural policies that recognize the positive economic values of natural habitats, ecological intensification, ecological networks, and insect conservatories.
- Incentivize local conservation efforts such those that collect and breed insects for export.
- Promote the inclusion of insect species on the national or regional Red List of endangered species.
- Increase awareness that policies for the conservation of insect species cannot depend only on highly preserved natural ecosystems.



Insects play fundamental roles in the ecosystems, so maintaining insect populations is essential

What can be done by individuals!

- Retain unimproved grassland and prioritize native plants as much as possible;
- Maintain as much as possible hedgerows with different flowering species; Maintain flowers in the gardens;
- Maintain dead woods which constitute an important habitat for many insects' species (alternatively promote the use of insect hotels);
- Avoid the use of synthetic insecticides (there are a lot of other less armful alternatives to control pest insects e.g. botanical pesticides) but also avoid an intensive use of microbial insecticides that can reproduce and last forever, versus chemical pesticides that decay in the environment.

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/27255/Foresight_Brief_No_011.pdf?sequence=1&isAllowed=y

Alternatives for the use of glyphosate

Photo credit: Shutterstock/B Brown

Glyphosate is the most widely applied herbicide in agriculture and is often used in conjunction with crops that are genetically modified. Farmers' dependency on glyphosate has grown steeply in recent years as it is easy to apply and relatively inexpensive. However, glyphosate is also increasingly controversial, with accumulating evidence that it can lead to a wide range of health and environmental impacts. Two countries have already banned glyphosate and others are considering to do the same. This Foresight Brief shows that there are alternative methods which can help to avoid the use of glyphosate as well as other harmful chemicals to kill weeds. The alternative methods offer the benefits of restoring soil fertility and increasing biodiversity in the environment.

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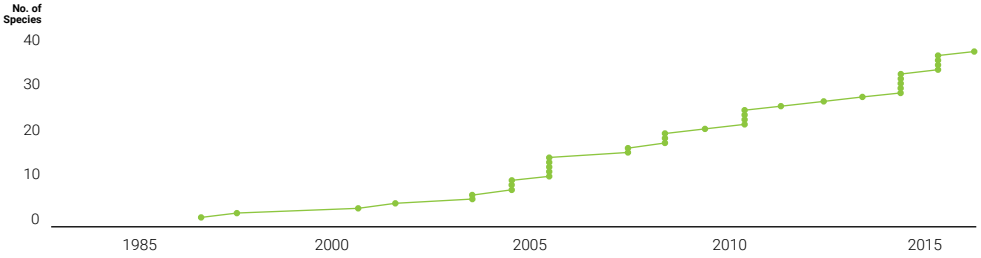
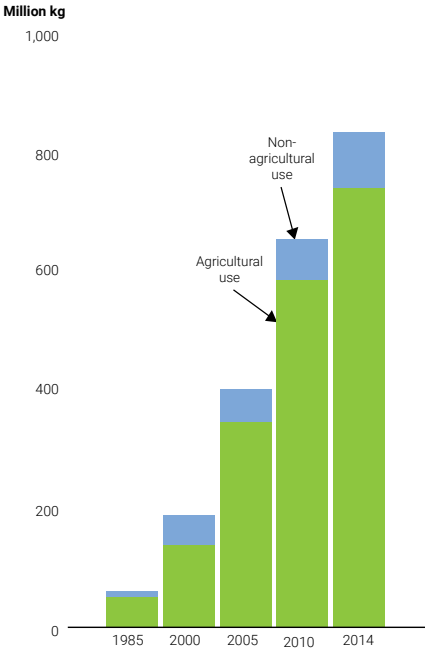
Recommendations

- Thinking through the transition leading to the end of glyphosate requires a timescale that considers the implementation of alternative techniques like Mechanical weed control; Thermal weed control; Crop-rotation, Inter-cropping instead of No-Till.
- Governments should secure more funds for whole systems approaches, organic farming and allocate investments to research on "alternative" agricultural methods. Education, training, advice and support to farmers are essential and should also be supported by governments.
- Agricultural schools (including universities) need a focused approach on (eco) system "agriculture" and its many beneficial relationships between plants and soil.
- As chemical alternatives to glyphosate are possibly of greater environmental and human health concern, the use of glyphosate for farmers in trouble with serious weed problems could be kept as a "last resort", through controlled sale and usage.
- Policies which support the above-mentioned practices could help bring more diversity on farms, in the fields and the crops, while building a healthier agricultural system.



Global use of glyphosate - steadily on the rise

Source: Heap, I. (2018). Overview of glyphosate-resistant weeds worldwide. In. Pest Management Science



Global use of glyphosate

Source: Benbrook, C. (2016): Trends in glyphosate herbicide use in the Used States and globally. In: Environmental Sciences Europe (28:3)

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/26729/foresight_brief_010.pdf

Revisiting ocean acidification, food security and our earth system

Photo credit: Shutterstock/Vlad61

Carbon dioxide is altering the chemistry of the surface oceans and causing them to become more acidic. This is a global issue, which is affecting all ocean regions. It is important as it may have severe impacts on marine organisms and ecosystems. Loss of biodiversity is a likely result, accompanied by a reduction of harvestable resources, including those associated with human food resources. Ocean acidification is compounded by other non-climate related impacts, including pollution, which add pressure to already strained marine ecosystems that provide food for human consumption. If CO_2 emissions continue at the same rate, ocean acidification will have a considerable influence on marine-based diets for billions of people worldwide.

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Recommendations

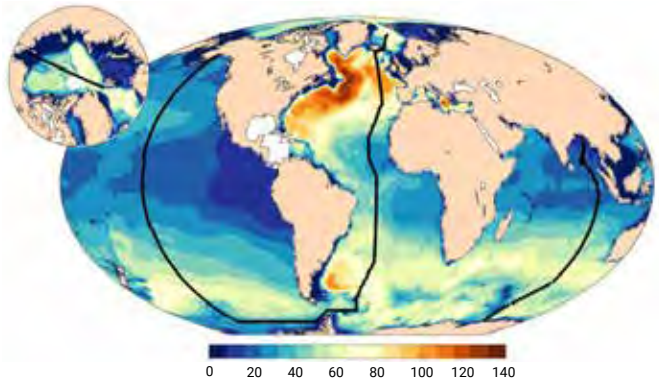
The only way to stop ocean acidification is to curb emissions of CO_2. However, there are additional levers for mitigating acidification in the coastal ocean:

- Promote the potential for local and national scale pollution control measures.
- Encourage public awareness activities on ocean acidification and its environmental impact on marine ecosystems and fisheries.
- Encourage international cooperation and collaboration with international frameworks of data sharing, such as the Global Ocean Acidification Observation Network (GOA-ON) and its sub-networks.
- Promote and support capacity development activities and scientific research in monitoring of marine ecosystems.

The chemical reaction that gives the ocean its large CO_2 uptake capacity also introduces the problem of ocean acidification:

$$CO_2 + CO_3^{2-} + H_2O \rightarrow 2HCO_3^-$$

(Carbon dioxide + carbonate ion + water → 2 bicarbonate ions)



Distribution of anthropogenic CO_2 in the ocean. The colours indicate the amount of carbon (measured in mol C m^{-2}); brown colours represent high values. The black lines mark a path through the oceans.

Unhealthy Antarctic pteropod showing effects of ocean acidification including ragged, dissolving shell ridges on upper surface, a cloudy shell in lower right quadrant , and severe abrasions and weak spots

Photo credit: Courtesy of NOAA

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/25797/Foresight_Brief_009_July.pdf?sequence=1&isAllowed=y

Faith for Earth

Photo credit: Shutterstock/wavelbreakmedia

For many religions, nature is sacred, has intrinsic value, and therefore demands reverent care (Taylor 2010). Utilizing the agility of these beliefs in addressing climate change, energy conservation, sustainable use of biodiversity, and reforestation, among others, in collaboration with key scientific, economic, public policy, and education partners is crucial for sustainable development (UNEP 2016; Hitzhusen and Tucker 2013). UN Environment has been engaging with faith-based organizations for many years, recognizing the prominent role that they can play in the implementation of the 2030 agenda.

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Recommendations

- The language spoken by scientists must be translated into a language understood by faith followers and with simple policy statements for local and regional authorities. It is important to include youth in faith dialogues and to build on their use of technologies, creativity, drive and entrepreneurship. Mobilizing youth will provide better prospects for improved living standards as well as promote peace and tolerance, and a transformational change connecting people back with nature.
- Utilize faith-based value systems to improve environmental citizenship by tapping into a common set of beliefs among faith groups that drives their actions and underpins their values.
- Strengthen partnerships with Faith-Based Organizations' leadership for policy impact. A global compact for action by religious leaders on collaborative work on care for creation would inspire and empower policymakers to address serious environmental issues common to all religions.
- Greening Faith-Based Organizations' Investments, Operations and Assets: Faith-based investing involves the idea of using ethics to guide monetary decisions and could pioneer modern forms of responsible investment. One focus is divesting away from environmentally unsustainable investments, decarbonizing assets and making investments more climate-friendly, promoting investments in large-scale renewable energy, sustainable transport, and sustainable city projects.

The influence of Faith-Based Organisations

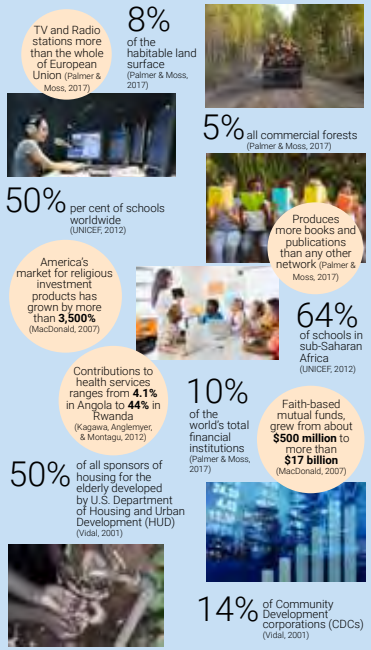

Photo credits (top to bottom): Shutterstock/Konjushenko Vladimir; Shutterstock/zhu difeng; Shutterstock/wavebreakmedia; Shutterstock/wavebreakmedia; Shutterstock/Number1411; Shutterstock/Riccardo Mayer

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/25452/Foresight_008_201805.pdf?sequence=1&isAllowed=y

Smoke-haze: A transboundary air pollution issue in Southeast Asia

Thick smoke from peat fires outside Palangka Raya, Central Kalimantan.
Source: (16 October 2015) https://www.flickr.com/photos/cifor/35054025464/

Air pollution results from the emission of harmful substances into the air. Human-driven activities and, to some extent, natural sources contribute to air pollution. Transboundary smoke haze pollution affects about half of the countries in Southeast Asia. The haze is made up of smoke consisting of small airborne particles containing many harmful compounds and over 60 per cent are derived from fires started in peatlands. There are economic, health, environmental, and social impacts from the haze. The longer the issue goes unaddressed, the greater the public and environmental health impacts and economic costs become. Furthermore, it risks straining relations between the countries within the ASEAN region. The affected countries include Indonesia, Malaysia, Singapore, and Brunei, and to a lesser extent Thailand, Vietnam, and the Philippines.

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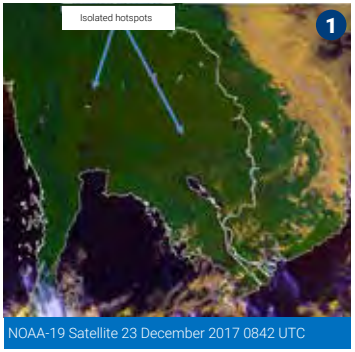
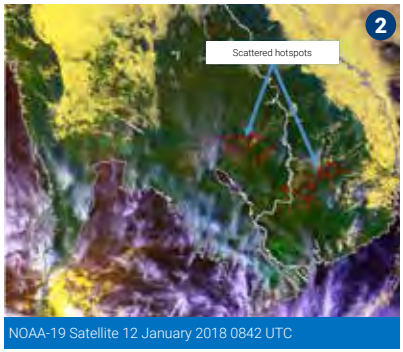
Recommendations

- Promote the implementation, collaboration, and enforcement of existing international and sub-regional cooperative frameworks for transboundary environmental pollution.
- Create a global compact on pollution to strengthen political leadership and partnerships.
- Promote the use of data from the ASEAN Specialised Meteorological Centre (ASMC) to feed policy and implementation processes.
- Encourage studies on the effects of haze on biodiversity and ecosystems to support science-based policy implementation at national and regional level.
- Strengthen public awareness and education that informs and mobilizes the citizenry to action to reduce their own pollution.
- Encourage cooperation with global initiatives such as the Climate and Clean Air Coalition and the BreatheLife Campaign to encourage action at local government level.





1. NOAA-19 satellite image shows dry weather conditions over Myanmar
Source: http://asmc.asean.org/wp-content/uploads/2018/01/figure8.jpg

2. NOAA-19 satellite image shows dry condition and scattered hotspots detected over Sub-Mekong region
Source: http://asmc.asean.org/wp-content/uploads/2018/02/figure6.jpg

Examples of sub-regional air pollution initiatives in Asia and the Pacific

- Acid Deposition Monitoring Network in East Asia (EANET)
- The Malé Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia
- The Framework Convention on Protection of the Environment for Sustainable Development in Central Asia
- Secretariat of the Pacific Regional Environment Programme (SPREP)
- Asia Pacific Clean Air Partnership (APCAP) Joint Forum (formerly called Joint Forum on Atmospheric Environment in Asia and the Pacific)

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/25370/foresight_brief_007.pdf?sequence=1&isAllowed=y

Hacking economics for people and planet

Photo credit: Shutterstock/Nattapol_Sritongcom

As global environmentalism and environmental policymaking have moved into the 21st century, it has not significantly addressed a critical blind spot: the fundamental economic system that lies at the root of our ecological and social challenges. Conventional economics takes a growth-first approach and this growth-first drive prevents sound environmental and social policies from being successful in their aims by dismissing environmental degradation and social injustice as mere 'externalities'. An alternative approach is that taken by the Kingdom of Bhutan which applies a post-growth, social and ecological well-being based model that aims at increasing Gross National Happiness (GNH) instead of GDP. The GNH model consists of 4 unconventional economic pillars 1) sustainable and equitable socioeconomic development, 2) environmental conservation, 3) preservation and promotion of culture, and 4) good governance

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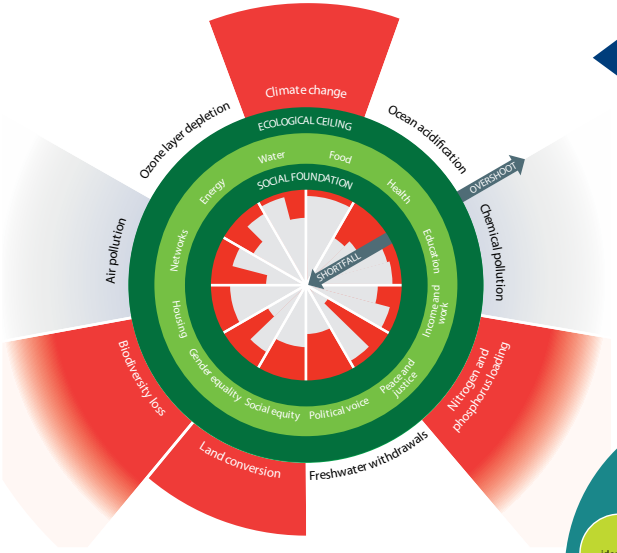
Recommendations

- Global environmental policymaking alone cannot keep up with the conventional economy's ability to outpace ecological limits and conservation attempts. Environmental policymaking is constrained by a hindsight approach (i.e., reactive to things that have happened) while powerful economic policy is constantly looking to, and borrowing from, the future to maximize value-poor financial goals. This growth-first approach encourages disruption of perverse efficiencies while environmental policies try to find a balance and equilibrium. This duality, with the planet on the losing end, is not conducive to a goal of real sustainability.
- Be vigilant about not over-relying on approaches that attempt to 'economize Nature'. Terms such as "ecosystem services" and "natural capital", if not carefully contextualized as part of a transitional step, risk further strengthening the mindset that Nature is simply a cornucopia of resources that exist to be exploited by humanity.



Merging 'doughnut economics' with planetary boundaries; can we reach the target of a "safe and just space" for humanity?

Dark green circles show the social foundation and ecological ceiling, encompassing a safe and just space for humanity. Red wedges show shortfalls in the social foundation or overshoot of the ecological ceiling.
Source: (Raworth, 2017)

The Fundamental Human Needs framework according to Chilean economist Manfred Max Neef
Source: Graphic from sublimemagazine.com

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/23021/Foresight_%20Brief_%20006_201802.pdf?sequence=1&isAllowed=y

Emerging sponge cities

Floods in cities across China in 2016 caused as much as US$45 billion worth of damage.
Source: http://www.climatesignals.org/sites/default/files/styles/article_image/public/events/CHINA-FLOOD_0.jpg?itok=FMjhQ4cY

Cities are the drivers of social and economic growth of countries around the world. They are responsible for 75 per cent of global economic activity, 66 per cent of the world's overall energy consumption and 70 per cent of all greenhouse gas emissions. 'Sponge cities' is an innovative strategy that is employed in urban areas to tackle urban flooding by creating green spaces. When vegetation is replaced with concrete, the ground loses its permeability. But trees and other vegetation can be used as sponges, drawing enormous quantities of water into the earth, preventing erosion, limiting floods, and recharging groundwater supplies for times of drought. The brief provides examples of where this strategy has been implemented and highlights a few challenges which may inhibit wide-scale implementation and success of the sponge city initiative.

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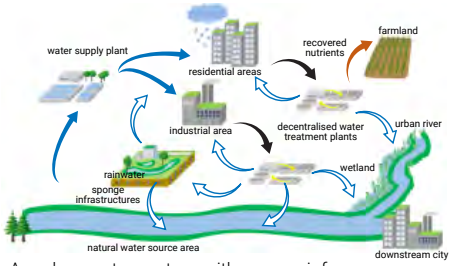
Recommendations

- Promote adoption of ecosystem-based adaptation projects that create green spaces to tackle flooding in urban areas.
- Encourage sharing of experiences among cities around the world, from Berlin to Wuhan, that are now pursuing this innovative strategy.
- Integrate land use, topographic and geologic conditions in the planning of an urban master plan to suit the actual situation of cities.
- Participatory planning and coordinated governance.
- Facilitate technology to allow participatory assessment, interactive design, and communication, leading to coordinated planning and administration.
- Mobilize and significantly increase financial resources to facilitate the construction of sponge cities.



An urban water system with sponge infrastructures, decentralized sewerage systems and ecological rivers

Model of a sponge city in China, Yangming Archipelago, Changde. Blue, gray, brown and yellow arrows represent water flow, wastewater flow, resource and energy, respectively
(Ren et al., 2017)

Photo credit: Shutterstock.com/Alexandre Rotenberg

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/22710/Foresight_Brief_005_2018.pdf?sequence=1&isAllowed=y

Lake Urmia: Signs of recovery

Photo credit: Shutterstock/fabzad

Lake Urmia, located in a mountainous region between the provinces of East and West Azerbaijan in northwestern Iran is one of the country's most important ecosystems, supporting agriculture and industry as well as the energy, food, water and housing needs of the people that live around the lake and within the wider catchment basin. Over time the lake has been in decline due to increased agricultural water use, new dams and irrigation projects and declining precipitation levels. Recent indications are that the lake is recovering. A number of activities including better water management throughout the basin, release of water from dams and desilting of feeder rivers have resulted in the slow but sure restoration.

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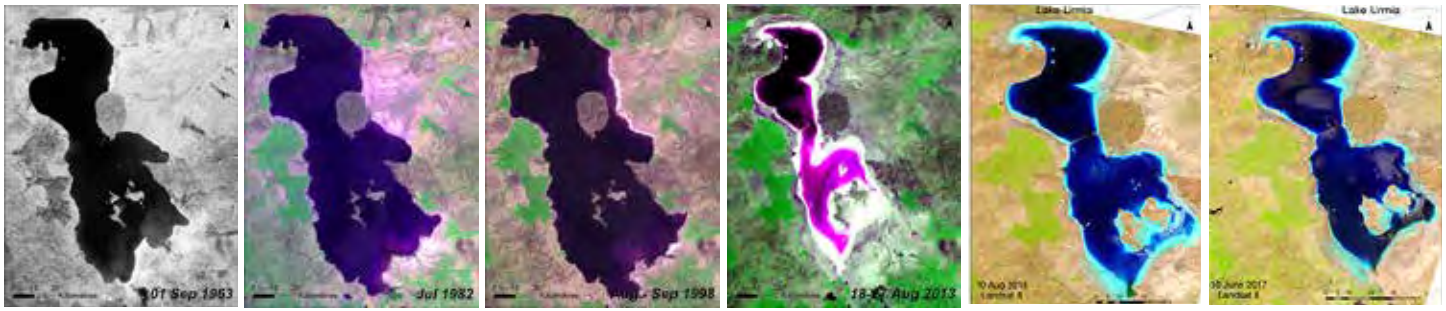
Recommendations

- Build consensus amongst stakeholders by encouraging the involvement of all stakeholders to develop and implement an agreed governance model.
- Employ an Integrated Water Resources Management approach by fully implementing the 2010 Integrated Management Plan and the 2012 Drought Risk Management Plan for Lake Urmia Basin.
- Address Water governance issues – to encourage water conservation, the government should consider economic instruments, legislation and water storage solutions.

Thousands of Flamingos delay migration from Lake Urmia



1963 1982 1998 2013 2016 2017

Changes in the surface area of Lake Urmia (1963-2017)
Source: UNEP

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/22312/Foresight_%20Brief_%20004_2017.pdf?sequence=1&isAllowed=y

The changing Aral Sea

Photo credit: UNEP/Flickr.com

The Aral Sea is an inland lake in the Central Asia region. The lake is changing primarily due to the glacial melt waters, the implementation of major irrigation projects, and hydropower production. This has resulted in reduced mean surface area, lowered sea level and volume, increased net evaporation, and increased windstorms composed of dust and salt. The Aral Sea supports agriculture, industry, energy provision and the general wellbeing of the people in this region making intervention critical. There have been some interventions that prove that it is possible to address some of the environmental degradation problems and improve the water management situation within the region.

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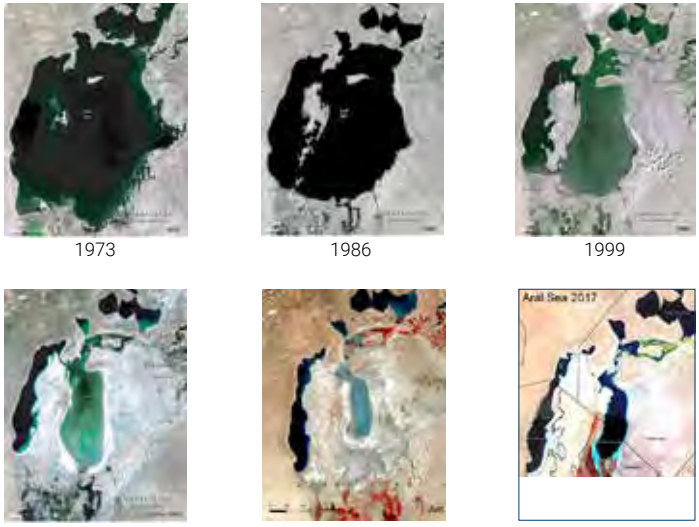
Recommendations

- Encourage transboundary co-operation between upstream and downstream countries.
- Increase awareness of the benefits of environmental restoration.
- Improve the efficiency of irrigation technologies that stabilize the level of the Aral Sea.
- Improve policy framework for water resources.



Satellite images illustrating the progressive shrinking of the large Aral Sea, but small Aral Sea expanding

Source: UNEP

The 13km Kok-Aral Dam in Kazakhstan as seen on Google Earth in 2017. The World Bank and the Government of Kazakhstan funded the Syr Darya Control and Northern Aral Sea that raised and stabilized the level of the Small Aral Sea leading to a partial restoration and to greatly improved ecological conditions and replenishment of surrounding lakes

Source: http://www.eorc.jaxa.jp/en/earthview/2007/img/tp071226_03e.jpg

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/22314/Foresight_%20Brief_%20003_2017.pdf?sequence=1&isAllowed=y

Marine plastics litter and microplastics

Photo credit: Shutterstock/Henner Damke

The global production of plastics has increased from 1.5 million tons in the 1950s to about 300 million tons currently, at an average increase rate of 4 per cent per annum and is expected to continue growing. About 50 per cent of the plastics produced are for single use, and the literature estimates that 8 million tons (2.5 per cent) of the plastic produced are leaked into the oceans annually (Plastics Europe 2016). This impacts on marine species as well as human and ecological health. There are also socio-economic impacts including losses in earnings due to beach cleaning, damage to beach use and the related impacts on tourism earnings.

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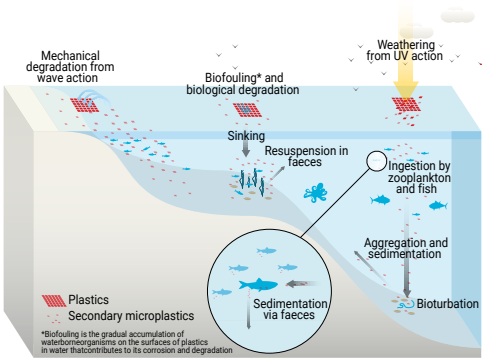
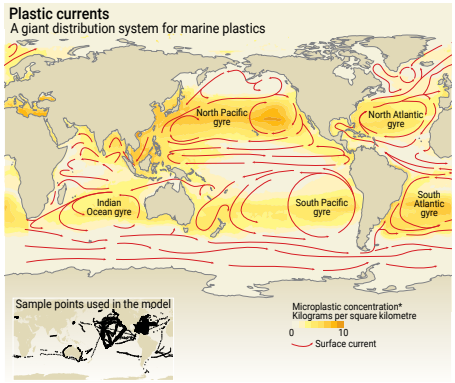
Recommendations

- Strengthen the implementation and enforcement of existing international and regional frameworks to help identify areas of strength and synergy enabling leveraging of comparative advantage.
- Improve the data available to feed policy and implementation processes. Harmonize and standardize data collection, sharing, and use of data.
- Strengthen public awareness and education – to increase awareness and promote positive behaviour at personal, community and industry levels.
- Develop a global marine pollution policy – a policy that will specify clear targets to help reduce marine plastic litter and a methodology to monitor progress.
- Reduce leakage of plastic waste to the environment.



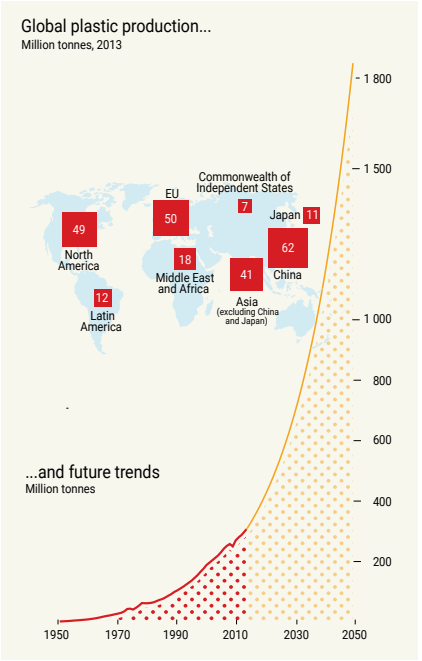
Natural processes affecting the distribution and fate of plastics

Source: UNEP and GRID-Arendal 2016



Plastic currents and the location of the five mid-ocean convergence hotspots

Source: UNEP and GRID-Arendal 2016



Global plastic production

Source: Ryan in UNEP 2015 and GRID-Arendal 2016

For the full brief go to https://wedocs.unep.org/bitstream/handle/20.500.11822/22313/Foresight_%20Brief_%20002_2017.pdf?sequence=1&isAllowed=y

Saving Lake Faguibine

Photo credit: IFAD/Amadou Keita

The 1st edition of UNEP's Foresight Brief considered the decline of and efforts to restore the Faguibine system, a lake ecosystem in the Sahel of West Africa. The decline of the Faguibine is an important issue because of its impact on livelihoods, food security and the resulting collapse of the natural ecosystem. Climate change data shows that water levels are declining due to increased droughts and a decline in precipitation. In addition, reservoirs and dams for water storage and electricity generation are having an adverse effect on water levels. Projects to restore the ecosystem have been initiated by the government, the UN, and other donors.

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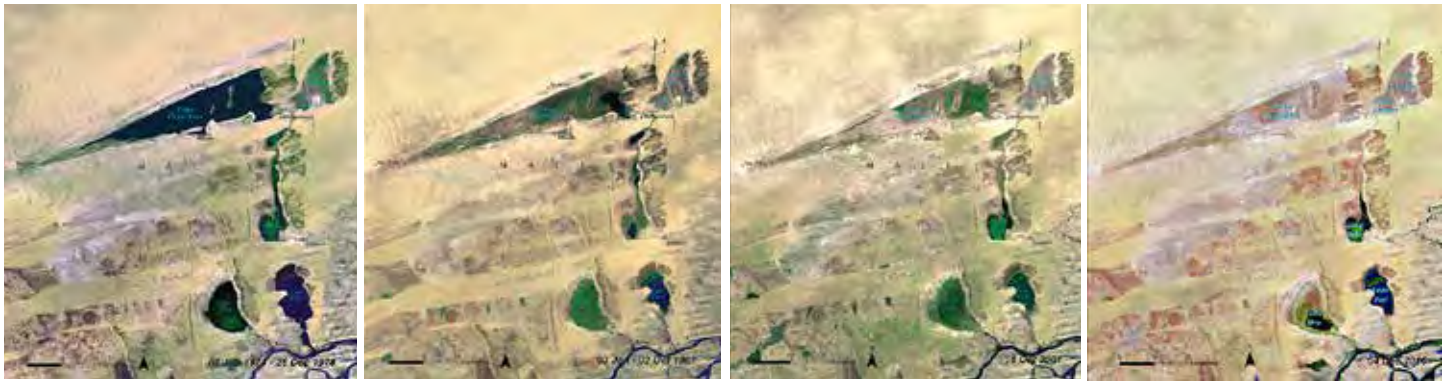
Recommendations

- Adopt an integrated or a Niger Basin wide, approach that considers the local development, good governance, ecosystem restoration and conservation.
- Involve key partners who have experience in working with governments in complex areas requiring an integrated approach.
- Address land tenure and land rights.
- Consider new roles and services provided by the forest ecosystem.
- Consider interactions between the different stakeholders when planning processes to reduce competition.



1994 -1978 | 1987 | 2001 | 2016

The dark colour are wetland areas. A significant difference in extent of water is evident in the lake between 1990 and 2010. After rehabilitation efforts initiated in 2009, there seems to be no recovery as can be seen in the 2016 image.

For the full brief go to https://wedocs.unep.org/xmlui/bitstream/handle/20.500.11822/22323/Foresight_%20Brief_%20001_2017.pdf?sequence=1&isAllowed=y

Conclusion

Photo credit: Shutterstock/Valentin Valkov

The world has become more complex, unstable and uncertain than ever before. This trend is likely to increase in the forthcoming decades, which will likely be an era of significant geopolitical transition. Strengthening Foresight capacity is critical for nations, organizations and individuals. It should be a priority for supporting decision making and action for better lives for People, Places and Planet.

The environmental challenges of our time, such as the triple planetary crisis of climate change, biodiversity loss and pollution is intertwined within an interconnected system. This nexus includes in a systemic way, the socio-economic dimensions of development, the peace and security and humanitarian pillars, as well as the international rule of law and human rights. This is the overall nexus of the United Nations: the aspiration of a "One United Nations".

This unique collection of environmental foresight analyses provides insights into the future. By adopting a system´s thinking perspective, it underscores the importance of gaining a better understanding of the underlying structures behind emerging issues and hotspots of environmental change. The systems thinking perspective is also an efficient and effective mechanism to "act and deliver as one", and is more impactful.

Our capability to use data, information and knowledge, to access and share information worldwide, has been multiplied several times in the last decade. This is the result of advances in processing power, storage capacity, big data, internet technology, geospatial capacity, artificial intelligence and other human computer interface technology changes. By taking advantage of advanced data analytics and building scenarios, one is better prepared today for supporting decision making and environmental action.

The next frontier is using "data intelligence", embedding and enabling true systems thinking and foresight capabilities to provide, simulate and test possible, alternative and desired scenarios. Equipping humanity with a foresight ability to be better prepared is critical, to be able to respond more effectively and to recover building back better for our Common Future.

This booklet is good evidence that by pursuing in a systematic way a dynamic, permanent foresight function, analysing a wide range of topics and multiple hotspots, supporting global environmental monitoring, contributing to strategic foresight and priority setting, and adopting a nexus approach, one is and will be in a better position to grasp alternative possible pathways and Futures.

Strengthening our foresight ability to build the future constitutes an outstanding enabler to equip Humanity for accelerating Agenda 2030 and achieving the Sustainable Development Goals. It is a core enabler for the Summit of the Future - for Humanity´s Future.

This is a time of change and is a change of our times.

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Key for Sustainable Development Goals, UNEP Priority Areas and Global Environmental Monitoring

Sustainable Development Goals (SDGs)


SDG 1: No Poverty


SDG 2: Zero Hunger


SDG 3: Good Health and Well-being


SDG 4: Quality Education


SDG 5: Gender Equality


SDG 6: Clean Water and Sanitation


SDG 7: Affordable and Clean Energy


SDG 8: Decent Work and Economic Growth


SDG 9: Industry, Innovation and Infrastructure


SDG 10: Reduced Inequalities


SDG 11: Sustainable Cities and Communities


SDG 12: Responsible Consumption and Production


SDG 13: Climate Action


SDG 14: Life below Water


SDG 15: Life on Land


SDG 16: Peace, Justice and Strong Institutions


SDG 17: Partnerships for the Goals

UNEP Strategic Priority or Action Areas (2017-2022)


Climate Change (MTS 2022-2025)


Nature and Biodiversity Loss (MTS 2022-2025)


Pollution and Waste (MTS 2022-2025)


Oceans


Finance


Faith


Security

Global Environmental Monitoring


Air


Biota


Water


Land


Oceans

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