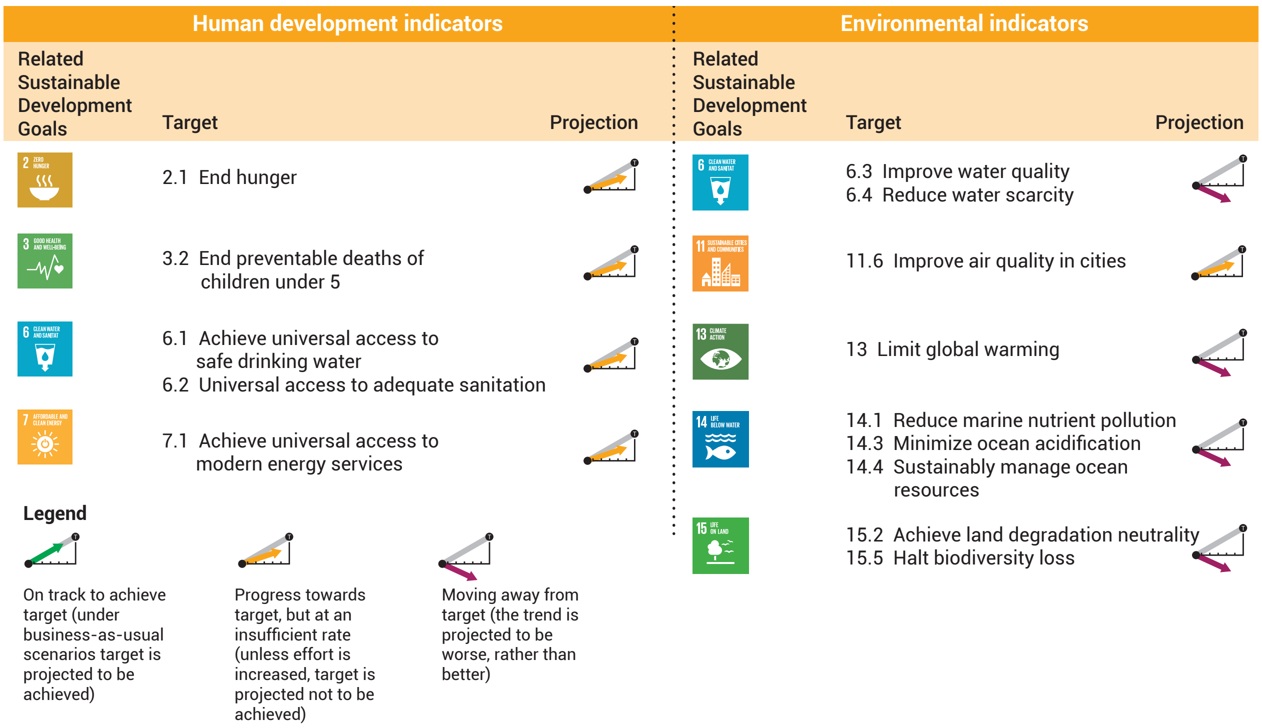
5 A Healthy Planet and Healthy People are Synergetic: Achieving Transformative Change

5.1 Future developments without further policy interventions

Based on an assessment of the scenario literature, it can be concluded that a continuation of current trends will not lead to fulfilment of selected environmental targets of the SDGs (*established but incomplete*). While business-as-usual scenarios project some improvement for indicators related to human development, indicators related to the natural resource base are projected to move further in the opposite direction **(Figure 5.1)**. Ongoing population growth and economic development imply that global demand for food, water and energy will strongly increase towards 2050. At the same time, clear improvements are projected in reducing hunger, increasing access to safe drinking water and adequate sanitation, and increasing access to modern energy services, although not fast enough to meet the corresponding SDG targets by 2030. Furthermore, although resource efficiency in production and consumption (in agricultural yields, nutrient use efficiency, water use efficiency and energy efficiency) is projected to improve, mostly in line with historical trends, climate change, biodiversity loss, water scarcity, land degradation, nutrient pollution and ocean acidification are projected to continue at a rapid rate so that the corresponding SDG targets will not be met. {21.4}

Figure 5.1: Projected global trends in target achievement for selected Sustainable Development Goals and internationally agreed environmental goals



Note: Many Sustainable Development Goal targets and internationally agreed environmental goals are broader in scope than shown in the above figure, which only assesses selected targets or elements of targets. The icons shown indicate the related Sustainable Development Goal. Trends are based on an assessment of business-as-usual projections in the scenario literature. For several target elements, trends are confirmed by multiple studies {SDG targets 2.1, 3.2, 7.1, 6.4, 11.6, 14.3 and 15.5, and SDG 13}, while for others, only limited scenario literature was available. (SDG targets 6.1, 6.2, 6.3, 14.1, 14.4 and 15.2) {Table 21.2}

Source: United Nations Environment Programme [UNEP] (2019a, p. 19).

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Table 5.1: Historic and business-as-usual trends in resource use efficiency in production and consumption

Selected target for GEO-6	Indicator	Historic development	Trend in business-as-usual scenarios
Increase agricultural productivity (Section 21.3.2)	Yield improvement over time (cereals)	1.9 per cent/yr (1970-2010)	0.4-0.9 per cent/yr (2010-2050)
Increase nutrient-use efficiency (Section 21.3.2)	Total N inputs to the crop N yields	0.42 in 2010	0.55 in 2050
Increase water-use efficiency (Section 21.3.4)	Change in water-use efficiency over time	0.2-1 per cent/yr (1970-2010)	0.3-1 per cent/yr (2010-2050)
Increase the share of renewable energy (Section 21.3.3)	Renewable energy share in total final energy consumption	15 per cent in 2010	20-30 per cent in 2050
Increase energy efficiency (Section 21.3.3)	Reduction in energy intensity over time (measured in terms of primary energy and GDP)	1-2 per cent/yr (1970-2010)	1-2.5 per cent/yr (2010-2050)

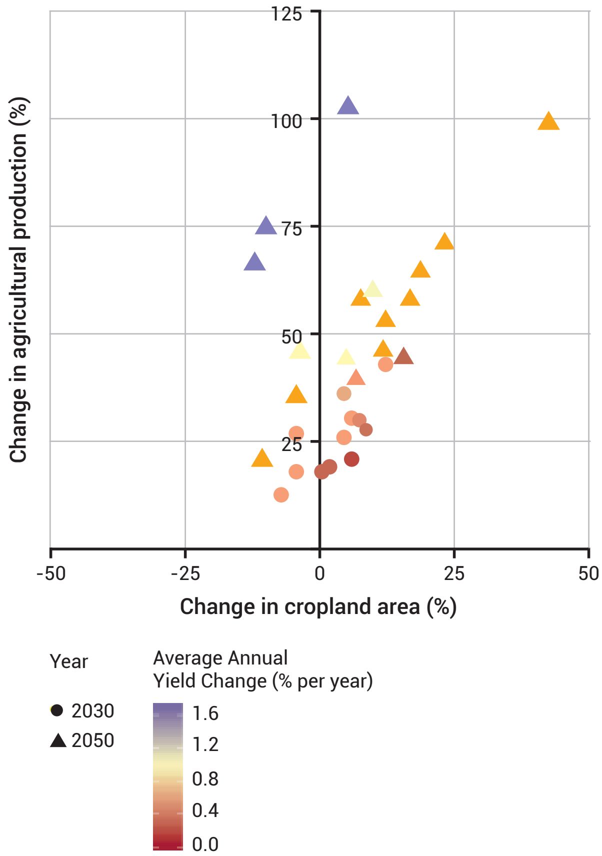
Source: UNEP (2019b, p. 505).

Under current trends, environmental problems related to global food production will further increase and energy systems will continue to be largely responsible for climate change and air pollution *(well established)*. Global demand for food and primary energy sources is projected to increase by more than 50 per cent between 2015 and 2050. The number of undernourished people is projected to decline and access to modern and clean energy sources is projected to increase, but far from enough to eradicate hunger or to achieve universal access by 2030. Over the last decades, around four-fifths of the increase in food demand has been met by agricultural intensification and one-fifth by an increase in agricultural area. This trend is projected to more or less continue **(Figure 5.2)**. {21.4}

Fossil fuels are projected to remain prominent in the world energy system. Overall, global food production will continue to contribute to environmental problems, including increased GHG emissions, land conversion, water demand, nutrient run-off, biodiversity loss and land degradation. Furthermore, energy use is projected to continue to be the most important cause of GHG emissions and air pollutants. {21.3.2; 21.3.3}

Without the adoption and implementation of new climate policies, the Paris Agreement goal of limiting global average temperature to well below 2°C will not be achieved *(well established)*. Current and planned climate policies, as formulated by different countries under the Paris Agreement, are projected to lead, at best, to a stabilization of emissions. This is considerably less than what is needed to achieve the Paris Agreement objectives. Achieving these objectives would require an almost complete decarbonization of the energy system by 2050. {21.3.3}

Figure 5.2: Percentage change in non-energy crop production vs. the percentage change in non-energy cropland area from 2010 to 2030 and 2050



Each marker is a model-scenario-year combination. Colour indicates the annual percentage change in yield over the same time period. Yellow is close to historical trends (about 1 per cent per year between 1960 and today from Alexandratos and Bruinsma 2012); blue indicates yield growth faster than historical trends; red indicates yield growth slower than historical trends. For the SSPs, yield is the global average yield for cereal crops. For the Bajželj *et al.* (2014) scenarios, yield is the global average yield for wheat and data are referenced with respect to 2009.

Sources: SSPs (Popp *et al.* 2017) and Bajželj *et al.* (2014).

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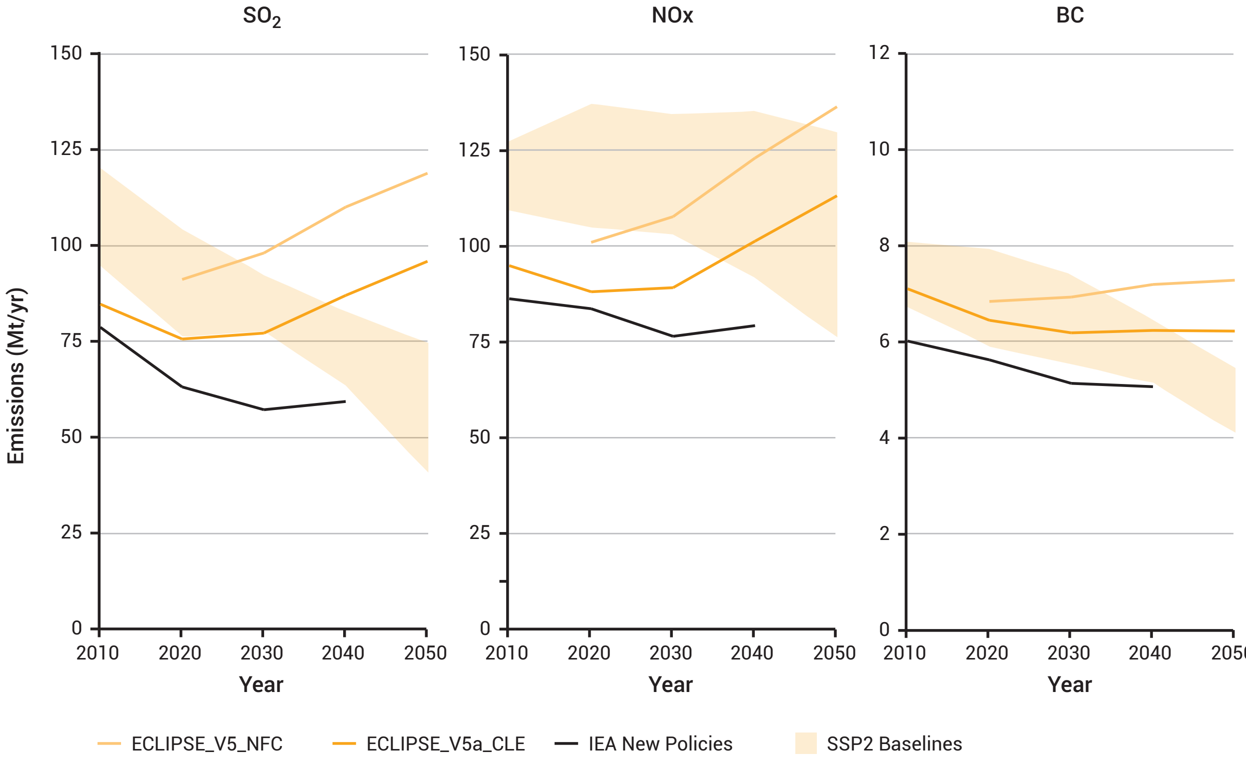
Figure 5.3: Future projections of emissions for air pollutants SO_2, NO_x and BC



Source: ECLIPSE_V5_NFC and ECLIPSE_V5a_CLE represent ECLIPSE's "no further control" and "current legislation" scenarios (Stohl *et al.* 2015; Klimont *et al.* 2017). IEA New Policies represent IEA's new policy scenario that includes nationally determined contributions (NDCs) of the Paris Agreement (International Energy Agency [IEA] 2016). For the SSP2 scenario, the shading represents the range for all models (Rao *et al.* 2017).

Ambient air pollution is projected to continue contributing to millions of premature deaths in the coming decades (Figure 5.4). *(established but incomplete)*. Without stringent policies to control air pollution, ambient $PM_{2.5}$ concentrations are projected to increase. Most trend scenarios assume that more stringent air pollution policies will be applied in developing countries as their incomes increase, bringing about a slow decrease in emissions of $PM_{2.5}$ and its precursors. However, this trend would not be sufficient to reduce $PM_{2.5}$ concentrations below the least stringent WHO air quality target in large parts of Asia, the Middle East and Africa, thus projecting 4.5 to 7 million premature deaths globally by mid-century. {21.3.3}

Biodiversity will continue to decline under business-as-usual scenarios *(well established)*. Loss of natural habitat has been, and still is, the single most important factor in biodiversity loss. However, trends in water scarcity, climate change, pollution and disturbance are driving a further decline in biodiversity. Scenario studies show that many of these factors are likely to worsen in the future. As a result, model projections show changes in different dimensions of biodiversity. {21.3.2}

Oceans are expected to continue to be polluted and overexploited *(established but incomplete)*. Increased fertilizer use in agricultural production and developments in wastewater treatment that are lagging behind improvements in access to sanitation are projected to increase nutrient (nitrogen and phosphorus) flows from land run-off and freshwater transport into oceans, exceeding sustainable levels. As a result, dead zones and algal blooms in coastal areas will increase. Furthermore, because of increasing CO_2 concentrations, oceans are projected to further acidify, negatively affecting marine organisms' ability to create shells and skeletons or even resulting in shell dissolution. Acidification is expected to increase most rapidly in the polar regions. Finally, if current strategies for improving fishing performance fail to be effective or more widely deployed, the projected increase in demand for fish is expected to reduce the proportion of fish stocks that remain at biologically sustainable levels. {21.3.5}

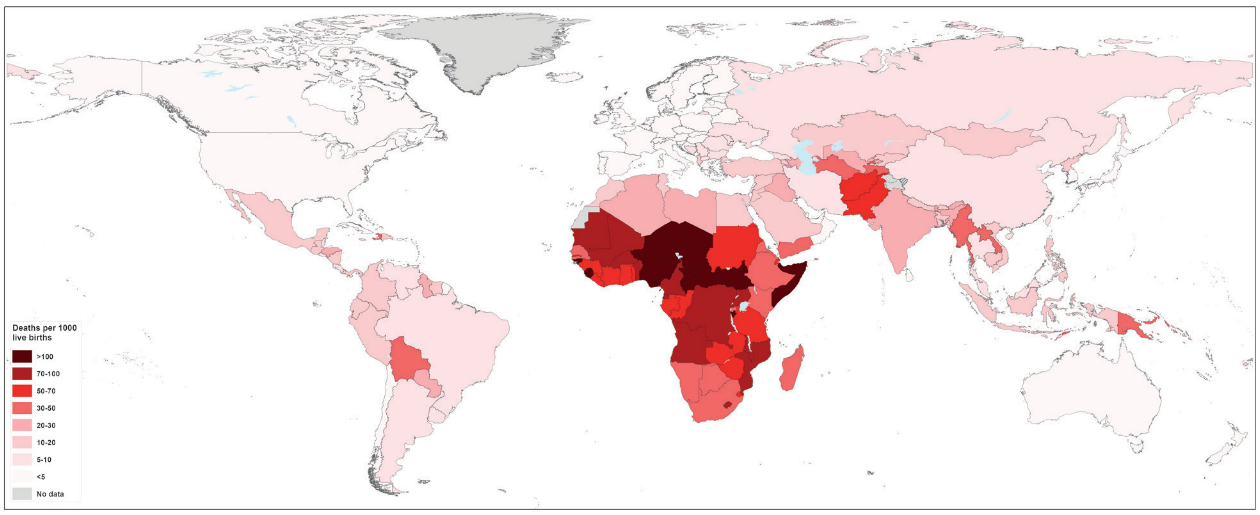
Further land degradation is expected to occur, based on trends in land use, climate change and increasing pressure on land and water resources. *(well established)* As a consequence of continuing land conversion and unsustainable land management, an additional 27 Gt of soil organic carbon is projected to be lost between 2010 and 2050, affecting agricultural yields through reduced water-holding capacity and loss of nutrients. Furthermore, losses of soil organic carbon will have wider effects on biodiversity, hydrology and carbon emissions. {21.3.2}

Despite technological development and improved seeds, machinery and fertilizers, based on current trends we are unlikely to meet future demands for food, energy, timber and other provisioning ecosystem services, or the SDG targets for terrestrial and marine biodiversity *(well established)*. International trade is increasingly important to meet global food demand. However, as seen during the 2008 food price crisis, it is not a "silver bullet solution" to sudden shocks or crises, which is what will be needed as climate change exacerbates environmental problems in vulnerable agricultural systems. {8.5.1}

Both global water scarcity and the population affected by it are expected to increase *(established but incomplete)*. Human water demand is projected to increase by around 25 to 40 per cent by the end of this century. This increase will primarily be driven by rapid population growth and increased industrial activity (with, for example, higher electricity and energy use) in developing countries. Expansion of irrigated area and higher irrigation intensity are also projected, although their effect could be compensated by improvements in irrigation efficiency in regions where there is strong economic development. Changing rainfall patterns will exert additional pressure on regional water availability. By 2050 the Asian population living in areas exposed to severe water stress is projected to increase by around 50 per cent compared with 2010 levels, putting severe pressure on non-renewable groundwater reserves. {21.3.4}

Preventable environmental health risks are projected to remain prominent in 2030, with related negative impacts particularly on child mortality *(established, but incomplete)*. Nearly one-quarter of all deaths globally in 2012 can be attributed to environmental factors, with a greater portion – differentiated by gender, age and class – occurring in vulnerable populations and in developing countries. Preventable environmental risk factors (e.g. exposure to ambient air pollution or not having access to clean water, adequate sanitation and modern energy services), together with global hunger, are projected to improve towards 2030 although not fast enough to achieve the corresponding targets in all countries. Related global child mortality is projected to decline, but not enough to achieve the SDG targets in many developing countries **(Figure 5.4)**. Especially in sub-Saharan Africa, child mortality rates remain high, with a continued (although smaller) share related to preventable environmental risk factors. {21.3.6}

Figure 5.4: Projected under-five mortality rate in 2030



Source: Moyer and Hedden (2020).

5.2 Pathways to Sustainable Development

Based on an assessment of the scenario literature, it can be concluded that different pathways exist to achieve selected environment-related SDG targets, but that these pathways require transformative change *(established but incomplete)*. The rates of change in the pathways imply more than incremental environmental policies: significant improvements in resource efficiency with respect to land, water and energy are required. This would include large productivity gains in agriculture; significant improvements in nutrient-use and water-use efficiency; almost a doubling of the energy efficiency improvement rate; and more rapid introduction of "carbon-free" energy options. Achieving full access to food, water and energy resources will also require systemic change. {22.3; 22.4.1}

Achieving the targets of the environment-related SDGs will require a broad portfolio of measures based on technological improvements, lifestyle changes and localized solutions *(established but incomplete)*. The pathways emphasize a number of key transitions associated with achieving sustainable consumption and production patterns for energy, food and water, in order to provide universal access to these resources, while preventing climate change, air pollution, land degradation, loss of biodiversity, water scarcity, over-exploitation and pollution of the oceans. These transitions include, on one hand, changes in consumer behaviour and, on the other, cleaner production processes, resource efficiency and decoupling, and corporate responsibility. {22.3}

Concurrently eliminating hunger and preventing biodiversity loss is possible through combining measures related to consumption, production and access to food, including food from the sea, with nature conservation policies *(well established)*. Scenarios for achieving the targets are typically characterized by a 50 per cent faster improvement in agricultural yields than business-as-usual scenarios, but they depend heavily on changes on the consumption side and improvements in food distribution. Halting biodiversity loss would also require measures related to landscape management and protected areas. Reducing land degradation is linked to developments in land use, but scenario studies are lacking in the literature. {22.3.1}

Resource efficiency contributes to economic resilience (*well established*) by increasing the supply security of primary materials and closing resource loops through remanufacturing and recycling, thereby reducing the pressures of resource exploitation, climate change, accumulation of toxic substances in ecosystems, and biodiversity loss. {17.6.2}

Increasing resource efficiency to the required extent will not happen spontaneously through the market but requires well-designed policies (*established but incomplete*) that facilitate a change to sustainable systems of production and consumption and sustainable and resilient infrastructure. {17.6.4}

The strong links between biodiversity loss and land use mean that more coordinated international action is needed *(established but incomplete)*. The scenario literature clearly shows that meeting targets to halt biodiversity loss would not be feasible if land use followed business-as-usual trajectories into the future. Moreover, other policies outside the realm of traditional nature conservation policies, such as those related to infrastructure development and climate change, are urgently needed in order to conserve biodiversity. Ensuring more coordinated policy action is therefore important at all levels – within national governments, but also internationally – particularly between land-use planning and biodiversity protection. {22.3.1}

Measures to achieve targets related to climate change, air pollution and access to energy can be combined in different ways but need to be implemented rapidly and at an unprecedented scale *(well established)*. This involves investment in energy access, doubling of energy efficiency improvement, lifestyle changes (e.g. a shift to low-meat diets and a move to more public modes of transport), more rapid introduction of low- and zero-carbon technologies (including hydropower, solar and wind, and carbon capture and storage), air pollution control, reduction of non-CO_2 GHG emissions, and use of land-based mitigation options (e.g. forestation measures and the use of bioenergy). Emission reduction measures need to be implemented rapidly, as the carbon budgets for achieving the Paris Agreement are very tight. {22.3.2}

Pathways consistent with meeting the objectives of the Paris Agreement are characterized by a combination of energy intensity reduction and an increase in the share of low-GHG emission technologies that is significantly larger than historical values. *(well established)* The energy efficiency increase would need to be at least 2-3.5 per cent per year, while the level of low- and zero-carbon technologies would need to increase from around 15 per cent today to at least 40-60 per cent by 2050

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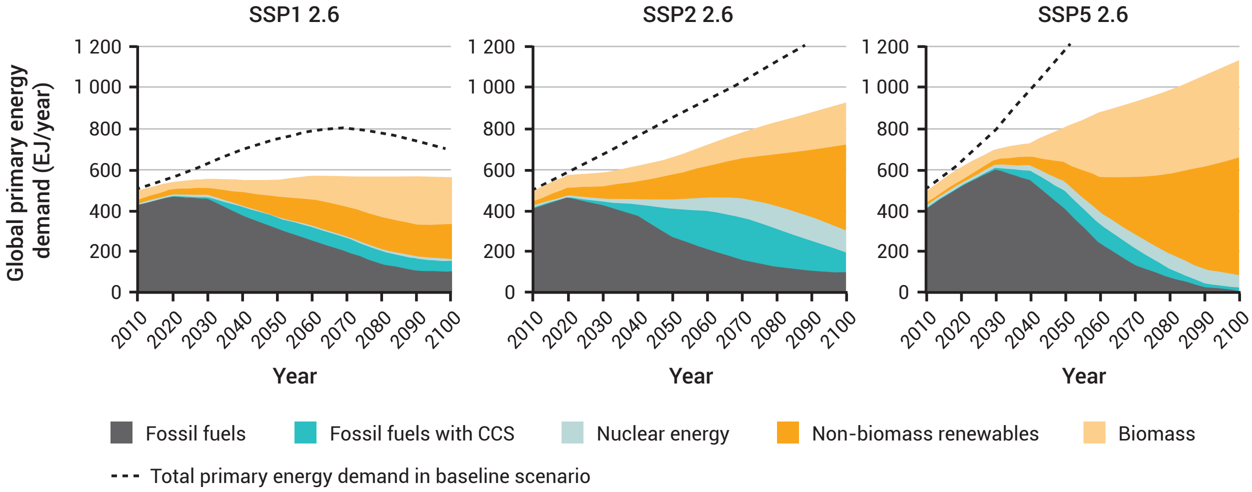
Figure 5.5: Different pathways leading to a global mean temperature increase well below 2°C



Source: Bauer *et al*. (2017); Riahi *et al*. (2017).

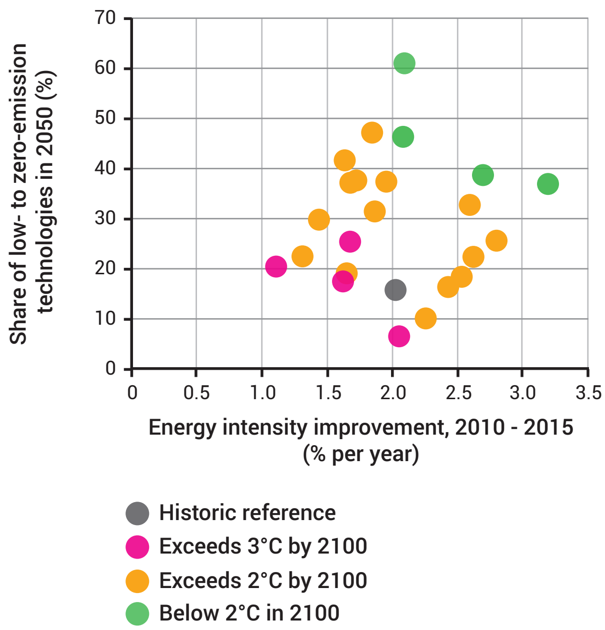
(Figure 5.5). The low-range value of 40 per cent is only sufficient if combined with a rapid decline in energy demand. All in all, the reduction in the carbon intensity of the global economy (rate of change of the ratio of CO_2 over GDP) needs to increase from around 1-2 per cent per year historically to around 4-6 per cent per year towards 2050. {23.3.2}

There are numerous policy mechanisms available to address these challenges. These include carbon pricing (cap and trade systems, carbon taxes, and other economic instruments such as fuel taxes and different subsidies to renewable energy), regulatory approaches (energy efficiency standards, command-and-control, mandatory decommissioning of old plants), information programmes (targeting behaviour, lifestyles and culture), and addressing administrative or political barriers (including through international cooperation) (*established but incomplete*). {24.3}

Decarbonizing supply and improving demand efficiency are two key policy elements that have been applied successfully (*well established*). Nevertheless, they need to be scaled up rapidly, together with phasing in new policies, reducing energy intensity, and increasing the share of low- or zero-carbon technologies. While demand-side measures mostly reduce energy intensity, supply-side measures would increase the share of low-carbon options (**Figure 5.6**). {17.5.4; 22.3.2} Major areas of policy intervention in energy systems related to the SDGs (especially SDG 7) are decarbonization measures that aim to substitute fossil fuels with clean(er) or renewable alternatives and implementation of efficiency measures that can provide the same service while using fewer resources. {17.5.2} Rapid advances are occurring in the market development of cleaner and energy-efficient technologies, including renewables (e.g. solar, wind, advanced biomass), storage (e.g. batteries, pumped hydro), energy efficiency (e.g. demand-side management and dematerialization) and decarbonized transport options (e.g. electric vehicles). In the case of renewable energy, for example, diffusion and scale-up are becoming both feasible and affordable worldwide. {2.6.2}

The economics of transition to low-carbon energy

Figure 5.6: 2010-2050 energy intensity reduction rate and the 2050 share of low GHG technologies in the total energy mix of the scenarios included in the SSP database



Source: Riahi *et al*. (2017); Rogelj *et al*. (2018).

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sources have been greatly assisted by a dramatic reduction in the cost of renewables *(established but incomplete)*, especially wind and solar photovoltaic systems. Solar power experienced a price decline of 23 per cent for each cumulative doubling of production during the last 35 years. In many cases these costs are now lower than those of conventional fossil fuel electricity generation technologies. By 2040, it is estimated that renewables will constitute two-thirds of the global investment in power generation while solar energy will become the largest source of global low-carbon capacity. {2.6.2, 4.4.2}

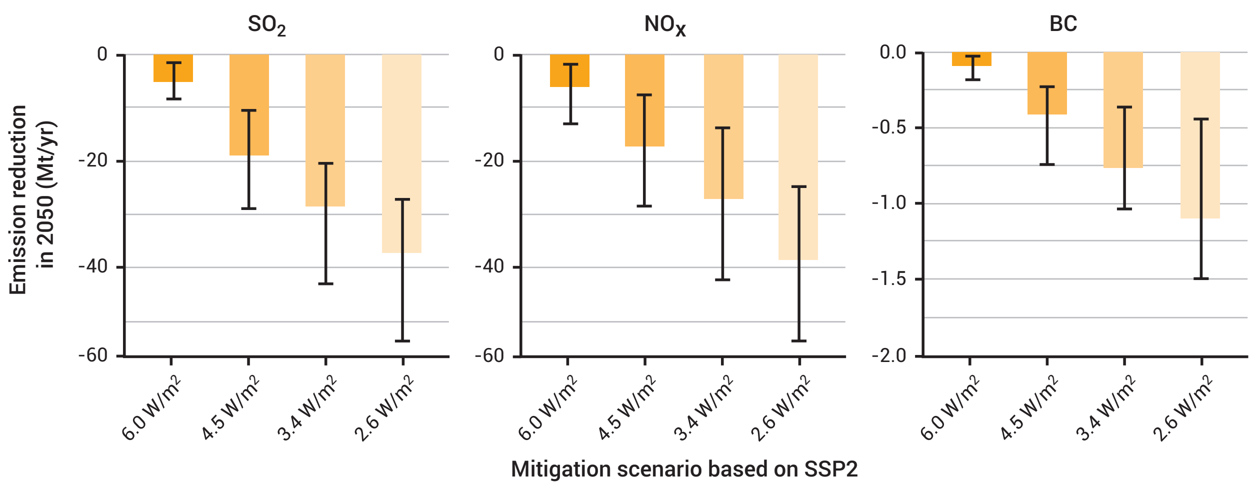
Air pollution emissions can be reduced significantly, but pathways towards meeting the most stringent air quality guidelines are currently not available *(established but incomplete)*. Introducing air pollution policies alone is often not enough to achieve stringent air quality standards. However, climate change mitigation (e.g. through phasing out fossil fuels) also significantly reduces air pollutant emissions **(Figure 5.7)**. As a result, scenarios that combine climate policies with stringent air pollution policies show strong reductions in emissions of particulate matter with diameter less than 2.5 micrometres (µm) (or $PM_{2.5}$), leading to a significant improvement in air quality in all regions. Under the best-case scenarios, less than 5 per cent of the population is projected to be exposed to $PM_{2.5}$ levels above the WHO's most lenient interim target of 35 µg/m^3, although more than half the population is still projected to be exposed to levels above the guideline of 10 µg/ m^3. {22.3.2}

Achieving environmental targets related to oceans requires consistent policies in other sectors *(well established)*. Preventing ocean acidification is highly dependent on climate change mitigation (i.e. reduced CO_2 emissions). Reducing marine nutrient pollution, and related hypoxia and algal blooms, will require a significant reduction in nutrient run-off, primarily from fertilizer use and untreated wastewater. {22.3.4}

Reducing global water stress, including groundwater depletion, will require more efficient and circular water use, as well as increasing water storage above and below ground and investing in wastewater treatment, recycling and reuse *(established but incomplete)*. To reduce the total global population suffering from water scarcity by 2050 and beyond, water-use efficiency needs to improve by more than 20-50 per cent globally. This includes increasing agricultural water productivity, improving irrigation efficiency, and making water use more efficient in both domestic and industrial sectors. Rainwater harvesting and aquifer storage and recharge require modest investments which are urgently needed. Wastewater treatment and reuse need a large amount of economic investment and modernization of existing infrastructure, which might not be feasible for some developing countries. Desalination technologies are highly capital- and energy-intensive. However, nature-based solutions can increase and/or regulate water supply by mitigating water pollution while complementing economic investments. {22.3.3}

Land-based climate change mitigation and agricultural intensification are key measures for achieving climate and biodiversity targets, respectively, but they could have significant detrimental effects on other targets if not managed carefully *(well established)*. While nearly all scenarios consistent with achieving the Paris Agreement rely on land-based mitigation measures (i.e.

Figure 5.7: Differences in the air pollution emissions between various climate mitigation scenarios, and the SSP2 baseline



Source: Rao *et al*. (2017).

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bioenergy crop production and afforestation projects), their use increases demand for land, with related biodiversity impacts, and potentially leading to higher food prices. Increasing agricultural yields can improve overall food availability and reduce pressure on land, but could also (through greater water, pesticide and fertilizer use and mechanization) lead to land degradation, water scarcity, hypoxia and algal blooms, biodiversity loss and increased GHG emissions. {22.4.2}

Changes in diet are considered an effective measure to reduce the land-use impacts of agriculture. *(established but incomplete)* Diet changes resulting in lower consumption of meat, particularly beef, would reduce crop use as animal feed, in turn reducing demand for land since direct human consumption of crops requires less land, as well as reducing greenhouse gas emissions (most notably methane). Vegan and vegetarian diets are widely understood to demand less land, water and energy, and produce less methane emissions, than meat-based ones, although regionally appropriate livestock rearing on pasture and well managed fisheries can be sustainable. {22.3}

Reducing food waste would help meet future demand for food. *(established but incomplete)* If food wastage were a country, it would be the third largest GHG emitting country in the world. In the global South, losses are mainly due to the absence of food-chain infrastructure and lack of knowledge about (or investment in) storage techniques. In the global North pre-retail losses are lower, but those arising from retail, food service and households are higher. {8.5.1}

Reducing global hunger and staying within the limits of available land and water Meeting requirements for food will require transformative practices in agriculture and fisheries and across the entire food system. *(established but incomplete)* Better agricultural and fishing practices also play a role in maintaining a sustainable balance between reducing global hunger and staying within the limits of available land, and water and fish stocks. Some agricultural technologies and practices (e.g. crop protection, drip irrigation, improved drought and heat tolerance, integrated soil fertility management, no-till farming, nutrient use efficiency, organic agriculture, precision agriculture, sprinkler irrigation, water harvesting, and land conservation measures) might be scaled up to achieve the dual goal of improving food security while reducing environmental pressure. International Food Policy Research Institute has identified 11 agricultural innovations which, in aggregate, might help to improve global crop yields by up to 67 per cent by 2050 while reducing food prices by nearly half. {2.6.3} Agricultural productivity could also be increased (and hunger and poverty reduced) by closing the gender gap in regard to access to information and technology, as well as access to and control over production inputs and land. {5.4}

Meeting demand for resources while reducing waste generation will require more efficient resource use and a shift to the circular economy, combined with changes in production, distribution, and consumption habits. The circular economy entails a systems approach to industrial processes and economic activity that makes it possible for resources to maintain their highest value as long as possible (*well established*). Key conditions for implementing the circular economy are reducing and rethinking resource use, and the pursuit of longevity, renewability, reusability, reparability, replaceability and upgradability for resources and products. It also involves end-products (wastes) being reduced, reused, recycled for as long as possible. This also requires the redesign of products, e.g. through green (or sustainable) chemistry and developing obsolescence prevention pathways in product and urban system designs through sustainable materials management (UNEP 2019c, pp. 515-543). {8.5.2, 17.6.3}

Creating and expanding markets for products for circular and sharing economies requires innovation. It may also require market-supporting policies that make niche innovations more affordable for consumers (e.g. in reusing waste). Support for learning and experimentation, research and development, deployment and demonstration, and policies that stimulate entrepreneurship, incubators, low-interest loans, venture capital and supportive regulatory conditions are interventions that can create an enabling environment for sustainable innovations to be developed. Cross-sector and cross-disciplinary collaboration that empowers consumers as citizens is also key. {17.6.4, 23.12}

Understanding interlinkages between measures and targets is crucial for synergistic implementation and policy coherence *(well established)*. Where measures generally aim at achieving specific targets, or clusters of targets, they can also affect other targets. Integrated approaches are needed to grasp synergies and address potential trade-offs to achieve the environmental targets simultaneously. {22.3, 22.4.2}

Ending the preventable deaths of children under five requires continued efforts to reduce environmental risk factors, but also an increased emphasis on poverty eradication, the education of women and girls, and child and maternal health care *(established but incomplete)*. Ending hunger and achieving universal

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and equitable access to safe drinking water, adequate sanitation and modern energy services would improve health significantly, especially for young children. Nevertheless, even if all the environment-related SDG targets were achieved by 2030, the under-five mortality target would not be met. A healthy planet alone is not enough to ensure that there are healthy people. Working solely on environmental problems will not solve the human rights or quality of life problems that are implicated in inequitable social systems. For example, achieving the SDG target for child mortality also requires addressing non-environmental risk factors including poverty alleviation, better education of women and girls, and improvements in child and maternal health care. Environmental problems and social problems are inextricably linked and must be addressed both separately and synergistically. {22.3.5}

Overall, the literature reveals that there are more synergies than trade-offs within and among the SDGs and their targets *(established but incomplete)*. Synergies exist between specific measures and a broad range of sustainability targets, including measures related to education, reducing agricultural demand and reducing air pollution. Improved education, especially for women and girls, has particularly strong synergies with health outcomes, economic growth, reduced poverty and better environmental management. Reducing agricultural demand through changing dietary patterns towards less meat consumption (and less food loss and waste) reduces pressures on land and water, creating synergies with reducing biodiversity loss and mitigating climate change. Phasing out the use of fossil fuels and moving to low- and zero-carbon technologies will contribute to achieving both climate and air pollution targets, the latter having synergies with improving human health, increasing agricultural production and reducing biodiversity loss. {22.4.2}

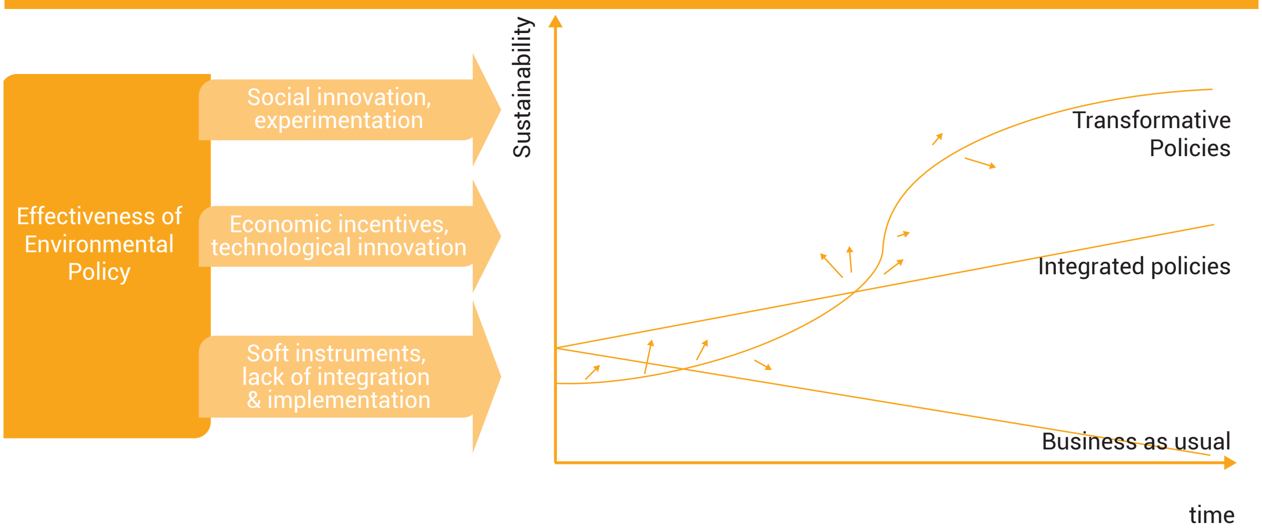
5.3 Transformative Change

Business-as-usual and the implementation of existing policies will be inadequate to address key environmental challenges. *(established but incomplete)* Integrated approaches may help resolve some of these challenges, but they will not be sufficient to put the global community on the path to sustainability. Instead, transformative approaches are necessary **(Figure 5.8)**. {24.1}

Following transformative pathways to sustainable development requires (i) vision, to guide systemic innovation towards sustainability; (ii) social and policy innovation; (iii) phasing out of unsustainable practices; (iv) policy experimentation; and (v) engaging with and enabling actors and stakeholders *(established but incomplete)*. Innovative solutions could link policies to the SDGs, promote viable business models, finance support for and management of investment risks, support international cooperation, and address the concerns of citizens and stakeholders and ensure their active participation. {24.3}

Transformative change cannot occur without adaptive policies, the creation of an enabling environment for niche innovations, and the removal of barriers to change. The physical, social, economic and health impacts of climate change, especially on the most vulnerable communities, call for urgent adaptation approaches that are systemic, multidimensional and transformative *(established but incomplete)*. Adapting to

Figure 5.8: Different policy approaches



Source: UNEP (2019b, p. 583).

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climate change, biodiversity loss and land degradation is a complex process that requires clear environmental governance and needs to occur in all regions and sectors and at numerous temporal and geographical scales. The initiatives taken to adapt to climate change should consider the complex and interacting elements and feedback mechanisms of the human-environment system. Political, institutional and behavioural changes can help make possible transformative change. Local-scale policy experiments can provide space for policy tailoring and innovation that are closely monitored. They can also allow inclusion of indigenous and local knowledge systems for improved environmental management. Redress for environmental degradation through legal procedures is another important mechanism that can help ensure a cleaner, healthier environment for all. {17.3.1}

There are many existing projects and initiatives promoting change that could collectively help to achieve the SDGs, MEAs and other relevant internationally agreed goals (*well established*). Social, policy and technological innovations are needed. At the local scale, numerous transformative projects and innovative solutions could be scaled appropriately. Reviewing bottom-up initiatives reveals ideas, actions, and programmes that seek to achieve the SDGs and involve a wide range of different public and private stakeholders. Among them are (i) nature-based solutions, including those that draw on indigenous knowledge such as that pertaining to ecological infrastructure and ecological restoration; (ii) monitoring and reporting innovations, including earth observation systems for better information on environmental conditions, citizen science initiatives that involve people in environmental monitoring, and natural capital accounting that integrates economic, social and environmental components; (iii) circular and sharing economy innovations based on increased efficiency of resource use, for example through new business models that better engage with the waste products of other production processes and innovations related to the peer-to-peer sharing of goods and services; (iv) innovations and policies that help reduce plastics, toxic substances and solid waste; (v) building of awareness and skills through sustainability and environmental education to improve public awareness and build relevant skills; (vi) an emphasis on gender equity and equality, women's empowerment, and solutions that promote the fair treatment of all from local to global; (vii) decentralization of technologies to educate and engage citizens (e.g. web applications that allow citizens to monitor water quality and report problems to relevant government agencies); and (viii) smart, sustainable cities that, for example, use modern digital technologies to engage and connect citizens in addressing key urban sustainability challenges such as transportation, consumption patterns, energy, nutrition, water and waste management. {23.11; 24.3; SPM 4.3}

Sustainability transformations are often broken down into multiple phases*(established but incomplete)*, with a preparation phase in which innovations begin to develop, a navigation/acceleration phase in which innovations grow and become part of the new system, and an institutionalization phase in which a more desirable system is made sustainable in the long term. For transformations to occur successfully, each phase requires governance conditions that are strongly enabling, both supporting appropriate innovations and weakening existing, problematic structures. {23.12}

A transformative approach to adapting to climate and other environmental change needs to address uncertainties and complexities arising from climate change impacts, as well as the drivers of risks and the underlying factors of vulnerability *(established but incomplete)*. It should also reduce inequality, promote gender empowerment, and build resilience and adaptive capacity. {17.3.3}

Incorporating principles of distributive justice can help construct a development agenda based on principles of equity and equality. *(established but incomplete)* Normative principles designed to guide the allocation of the benefits and burdens of economic activity based on fair distribution can help account for the disparate developmental conditions of the global South and global North. This process can provide more equitable options for where and how to implement solutions with the most transformative potential to achieve sustainable development, for example in reforming consumption and production patterns or in instituting market mechanisms such as caps in emission-trading schemes, carbon taxes and offsetting schemes. Addressing these global inequities is a means of achieving the global goal of equity. {23.14}

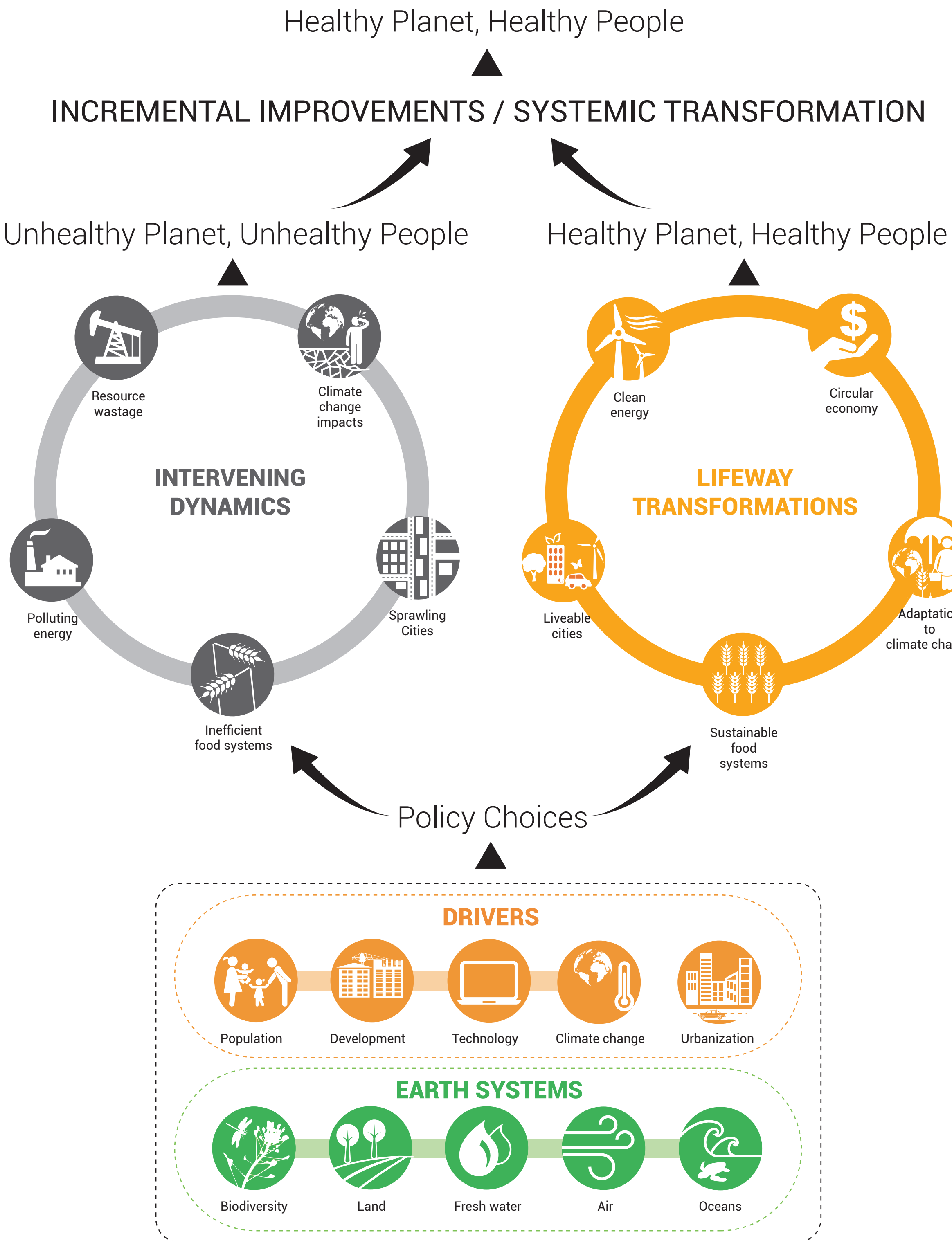
5.4 A Healthy Planet and Healthy People are Synergetic

GEO-6 underlines the importance of maintaining the integrity of ecosystems and recognizes their interlinkages with socioeconomic systems. It emphasizes that a healthy planet is a necessary foundation for human physical, psychological, social, economic and emotional health and well-being and is therefore critical for achieving all the SDGs. {1.1} **Figure 5.9** illustrates how policy choices may contribute to transformations that lead to a healthy planet for healthy people. {1.1}

Education promotes a healthier environment, and

https://doi.org/10.1017/9781108627450.007 Published online by Cambridge University Press

Figure 5.9: Choices to be made to achieve a healthy planet for healthy people



Source: UNEP (2019b, p. 6).

https://doi.org/10.1017/9781108627450.007 Published online by Cambridge University Press

vice versa *(established but incomplete)*. Environmental pollution, biodiversity loss and climate change are important causes of health problems and environmental diseases, which in turn may negatively affect education and learning, especially among children; they can also restrict employment among adults. {1.3.2}

Although some degree of environmental ill-health may be seen as having been inevitable during the economic growth process, the Earth is reaching tipping points beyond which human health and well-being will be irreversibly threatened. A healthy planet requires protection and sustainable management of natural capital (nature's contributions to people) and human capital. {1.1} Throughout GEO-6, evidence is presented showing how nature's contributions fundamentally underpin human health and well-being. Cleaning up the environment, avoiding pollution, and protecting and restoring habitats are major opportunities to improve health which, in turn, help people lead fuller and more productive lives. {1.3.2} The social environment has a strong influence on health and well-being, as clearly shown in socioeconomic studies where social disadvantage is associated with poor health and well-being across a wide range of diseases and behaviours that pose health risks. {3.6.2} Rigorous incorporation and integration of human health considerations in health-determining sectoral plans (e.g. for agriculture, water, disaster management, urban design, climate mitigation and adaptation) can support responses that address human health impacts with a focus on prevention activities. {4.2.1} The health sector must rapidly strengthen the way it articulates messages on human health and emphasize that most environmental pressures ultimately have human health impacts. {4.2.1}

Furthermore, healthy lifestyles can have beneficial impacts on the environment. *(established but incomplete)* Activities like walking and bicycling have many benefits for health and well-being. However, these benefits vary with, for example, the climate and pollution levels. Reducing red meat intake per capita where there is high consumption (especially of processed meats) will improve human health. The benefits to human health and well-being of access to safe and biodiverse natural environments, both green and blue spaces, are being recognized. {4.2.1}

Enhancing synergies between the health of the planet and people's health may require more fundamental changes. *(established but incomplete)* Solutions to the degradation of natural systems, including management of environmental pollution at its sources, should take account of the complex interactions between the planet and human health, consider "environment-health" as a complex system, seeking co-benefits and, where practicable, avoid trade-offs, win-lose situations and unintended adverse consequences. Rigorous incorporation and integration of human health considerations within health-determining sectoral plans (e.g. agriculture, water, disaster management, urban design) can support responses that address human health impacts, with a focus on prevention activities. {4.2.1}

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