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ENVIRONMENTAL PROBLEMS AND PROTECTION UNDER CURRENT SITUATIONS OF 2020

Hosam E.A.F. Bayoumi Hamuda*, Krisztina Demény

Óbuda University, Rejtő Sándor Faculty of Light Industry and Environmental Engineering, Institute of Environmental Engineering and Natural Sciences, Budapest, Hungary

**Corresponding author*

***Abstract**: What is the current situation of the global environment? Major current environmental issues may include climate change, pollution, and environmental degradation, loss of biodiversity and resource depletion. The World Health Organization has declared coronavirus disease 2019 (COVID-19) is the first pandemic caused by coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). SARS-CoV-2 is the most pressing global health issue due to the ongoing pandemic. The conservation movement lobbies for protection of endangered species and protection of any ecologically valuable natural areas, genetically modified foods and global warming. More than 200 natural disasters were occurred across world in 1st half of 2020. The great fallacy of the environmental debate over the past 30 years has been the hope that an ecological turnaround can essentially be implemented with some technological innovation programme within the existing economic order. The planet Earth will not continue to offer its harvest, except with faithful stewardship. We cannot say we love the land and then take steps to destroy it for use by future generations. Environmental issues are defined as problems with the planet s systems (air, water, soil, etc.) that have developed as a result of human interference or mistreatment of the planet. Our planet is poised on the brink of a severe environmental crisis. The hard fact is that environmental pressures have increased, and some urgently need to be brought under control. Current environmental problems make us vulnerable to disasters and tragedies, now and in the future. Key environmental policies for a more environmentally friendly future are thus needed. Again, easy regulatory solutions for this simply do not exist. It is quite simply a fact that the current ways of life and economic activity have a comprehensive and deep impact on various ecosystems. Future generations and other living organisms face drastic and irreversible disadvantages. It is extremely likely that human activities, especially emissions of greenhouse gases, are the dominant cause of the observed warming since the mid-20th century.*

***Keywords**: Life and economic activity, current environmental issues, Current environmental problems, key environmental policies, environmental and human health and quality*

LNTRODUCTION

Environmental Problems

The global environment is constantly changing. There is no denying that fact. With a massive influx of natural disasters, warming and cooling periods, different types of weather patterns and much more, people need to be aware of what types of environmental problems our planet is facing. Global warming has become an undisputed fact about our current livelihoods; our planet is warming up and we are definitely part of the problem. However, this isn't the only environmental problem that we should be concerned about. All across the world, people are facing a wealth of new and challenging environmental problems every day. Some of them are small and only affect a few ecosystems, but others are drastically changing the landscape of what we already know. We'll take a look at some of them — from water shortages and loss of biodiversity to waste management — and discuss the challenges we have ahead of us. This global plan of action adopted in 2015 puts forward specific measures to achieve a world that is fairer, more prosperous and more respectful of the environment within ten years. The impact that human activities have on the environment around us is undeniable and more studies are being conducted each year to show the extent of the issue. Climate change and the many factors that contribute to emissions could lead to catastrophic issues in the future. More needs to be done to remedy the major environmental issues that affect us today. If this doesn't happen, the possibility exists that great swathes of the planet will become uninhabitable in the future. The good news is that many of these issues can be controlled. By making adjustments, humanity can have a direct and positive impact on the environment.

Environmental Policy

To date, environmental and sustainability policy has far from succeeded in achieving a sufficiently strong reduction in ecological burdens. Since public and common goods such as clean air, biodiversity, cohesion, or justice have no price, they can be destroyed for free and the resulting costs are charged to the general public.

Developing the right policies demands some knowledge of the kinds of pressures globe is facing, what is driving these pressures, and how they are likely to evolve. Building a sound view of how the environment look in 2020 is therefore a crucial exercise. It means analyzing recent trends, taking stock of the present state of the environment, and making projections for developments in the most environmentally sensitive issues, as well as for the underlying social and economic forces that drive them.

Take the case of chemicals. Yet manufactured chemicals are still widespread in the environment, and are difficult to tackle because of releases through diffuse uses, like driving cars and farming. Groundwater pollution harbours a similar problem, for unlike the more manageable surface water and point source problems (such as rivers and industrial factories), its causes are also diffuse, primarily from agricultural run-off. Likewise, while some air pollution emissions have been reduced (Pb, SO_2, and CO_2), others, such as volatile organic compounds and NO_x emissions which contribute to photochemical smog, are on the increase. Again, easy regulatory solutions for this simply do not exist. The destruction of tropical forests, encroaching deserts, dry wastelands, millions of more species lost, weather patterns playing havoc, cities choking, watercourses trickling, and vast dead oceans heaving with oil and other undigestable left behind by the human race. This is an exaggerated and harrowing view of the future and, thankfully, no such scenario for the world's environment is in prospect, at least not between now and 2025. But is a spoiled planet Earth really as improbable as all that?

Global use of materials is accelerating. It has more than tripled since 1970. Moreover, the global economy is only 9% circula. Just 9% of the 92.8 billion tonnes of material that enter the economy are re-used annually.

Greenhouse gas (GHG) emissions tell a similar story. While the output of GHG emissions relative to GDP has fallen for the Organisation for Economic Co-operation and Development (OECD) countries in recent years, total absolute emissions have risen. Under current policies, OECD countries could increase GHG emissions by a further 30% to 2010, far from the overall Kyoto Protocol target of a 5% reduction from 1990 levels to 2008-2012. This is true of transportation, where motor vehicle kilometres travelled in the OECD are expected to increase by at least 65% between 1990 and 2020 and passenger air kilometres are expected almost to quadruple. Similarly, levels of OECD municipal waste generation in 2020 are expected to continue following Gross Domestic Product (GDP) growth, approximately doubling from the 1980 levels.

The OECD Environmental Outlook to 2030 is based on projections of economic and environmental trends to 2030. The key environmental challenges for the future are presented according to a "traffic light" system (Table 1). The Outlook also presents simulations of policy actions to address the key challenges, including their potential environmental, economic and social impacts. [41]

Separating growth and the environment

In general, environmental degradation has kept pace with economic growth. But the use of energy and other resources, like raw agricultural materials, water and metals, now appears to be on the decline in relation to GDP [12] in many OECD countries. This fall in intensity points to a potential decoupling between the respective directions the economy and the environment are taking, with an easing in the rhythm of environmental degradation in relation to economic growth. In some cases, these reductions in resource intensity have been large enough to lead to absolute, rather than just relative, environmental improvements, by offsetting the overall effects of total economic and population growth. However, despite such eco-efficiency improvements, overall environmental degradation has persisted in most cases.

Table (1) The OECD Environmental Outlook to 2030 [41]

	[Green Light]	[Yellow Light]	[Red Light]
Climate change		• Declining GHG emissions per unit of GDP	• Global GHG emissions • Increasing evidence of an already changing climate
Biodiversity & renewable natural resources	• Forested area in OECD countries	• Forest management • • Protected areas	• Ecosystem quality • Species loss • Invasive alien species • Tropical forests • Illegal logging • Ecosystem fragmentation
Water	• Point-source water pollution in OECD countries (industry, municipalities)	• Surface water quality and wastewater treatment	• Water scarcity • Groundwater quality • Agricultural water use & pollution
Air quality	• OECD country SO2 & NOx emissions	• PM & ground-level ozone • Road transport emissions	• Urban air quality
Waste & hazardous chemicals	• Waste management in OECD countries • OECD country emissions of CFCs	• Municipal waste generation • Developing country emissions of CFCs	• Hazardous waste management and transportation • Waste management in developing countries • Chemicals in the environment and in products

Source: KEY:
Green light = environmental issues which are being well managed, or for which there have been significant improvements in management in recent years but for which countries should remain vigilant.
Yellow light = environmental issues which remain a challenge but for which management is improving, or for which current state is uncertain, or which have been well managed in the past but are less so now.
Red light = environmental issues which are not well managed, are in a bad or worsening state, and which require urgent attention. All trends are global, unless otherwise specified.

The Environmental Problems of 2020

Overpopulation

The population of the planet is reaching unsustainable levels as it faces a shortage of resources like water, fuel and food. Population explosion in less developed and developing countries is straining the already scarce resources. Intensive agriculture practiced to produce food damages the environment through the use of chemical fertilizer, pesticides and insecticides. Overpopulation is also one of the crucial current environmental problems**.** Overpopulation may seem to impact the environment by straining resources, but this is complicated by consumption patterns, government policy, availability of technologies, and regions where the population rise occurs. However, in 2019, the UN revised its world population report of previous projections of 11.2 billion people by 2100. The new data shows a downward turn in birth rates with populations actually shrinking. Many of the issues listed here result from the massive population growth that Earth has experienced in the last century. The planet's population grows by 1.13%/year, which works out to 80 million people. This results in a number of issues, such as a lack of fresh water, habitat loss for wild animals, overuse of natural resources and even species extinction. The latter is particularly damaging, as the planet is now losing 30,000 species per year.

Gender inequality

Although gender inequality is not a direct environmental problem, solving problems like inadequate access to birth control, health services, and education has a positive impact on the economy and environment. Education lays a foundation for vibrant lives for girls and women, their families, and their communities. It is one of the most powerful levers available for avoiding emissions by curbing population growth. Women with more years of education have fewer and healthier children, and actively manage their reproductive health. Gender inequality is indirectly linked to environmental problems.

Poverty line

Poverty is indirectly linked to environmental problems. When you solve issues related to poverty you also solve environmental problems such as deforestation, population growth, gender inequality, and climate change. The world has been making steady progress toward ending extreme poverty for years according to the UN. The COVID-19 crisis has reversed some of the progress. But before the virus, life was better for many people around the world than ever before in history. Now, we need to deal with the crisis and get back to making progress.

Public Health

As infectious diseases and viruses, including the coronavirus, continue to increase in frequency, scientists have predicted that fighting high-impact epidemics will become commonplace. Cross-species transmission, or spillover, is the most significant cause of disease emergence in humans, and other species. This mostly occurs when animals are intensively farmed in close proximity with other animals or even with trees and agricultural produce. The current environmental problems pose a lot of risk to the health of humans and animals. Dirty water is the biggest health risk in the world and poses a threat to the quality of life and public health. Runoff to rivers carries with it toxins, chemicals and disease-carrying organisms. Pollutants cause respiratory diseases like Asthma and cardiac-vascular problems. High temperatures encourage the spread of infectious diseases like Dengue. The World Health Organization (WHO) defines health inequities as "avoidable inequalities in health between groups of people within countries and between countries"[1] The Corona virus disease 2019 (COVID-19) pandemic has played an important role in uncovering and amplifying numerous health inequalities that already existed within societies and between different population groups. COVID-19 was declared a pandemic by the WHO on March 11, 2020 (Table 2).

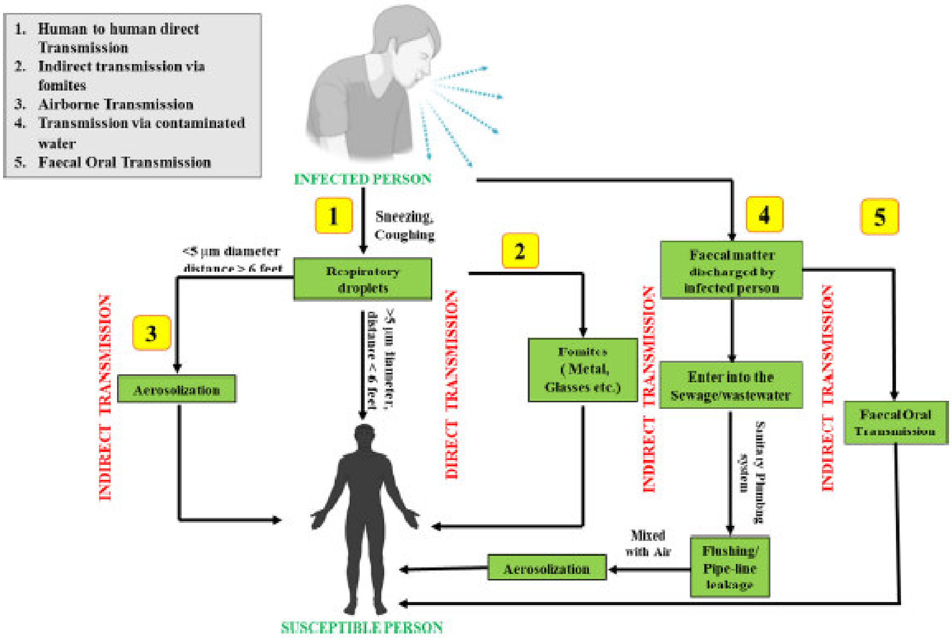
Table (2) The related events of novel coronavirus annocuned by WHO.

Time	Event
2020.01.12	2019 novel coronavirus (2019-nCoV)
2020.02.11	Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)
2020.02.12	Coronavirus disease 2019 (COVID-19)
2020.03.11	A pandemic

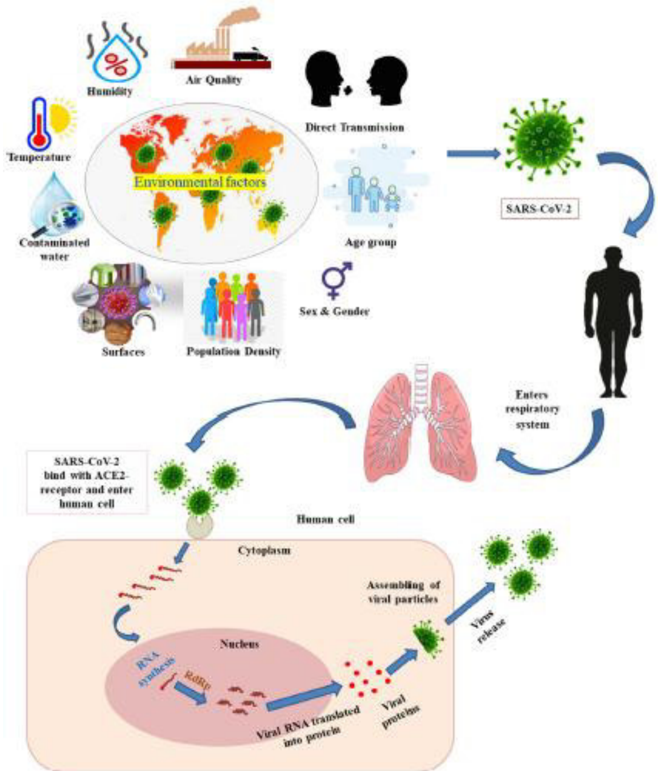
This has led to disastrous and unjust consequences in mortality rates amongst black and minority ethnic groups, vulnerable groups of society such as refugees, asylum seekers and individuals from socioeconomically deprived backgrounds.[2],[3] Inequalities in health during COVID-19 are exacerbated by interweaving risk factors and comorbidities which unfavorably magnify the disease burden and therefore this has been described as a co-occurring, synergistic pandemic for the more underprivileged communities.[3] The emergence and rapid global spread of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pose an unprecedented medical and socioeconomic crisis, in which at the end of 2019, a new severe respiratory infection caused by a novel pneumonia (COVID-19), caused by a novel coronavirus (SARS-CoV-2) and resulted in a high mortality rate in Wuhan City, Hubei Province, China.

Today, entire neighborhoods are caring for each other. COVID-19 is pandemic disease. Coronaviruses are enveloped, non-segmented, positive-sense, and single stranded RNA viruses that cause mild or severe diseases in some birds and mammals, including humans. Their genome size is about 30 kilobases which consist of non-structural open reading frames near the 5′-end and at least four structural proteins near the 3′-end, including membrane, envelope, spike, and nucleocapsid proteins. The coronavirus name derives from their solar corona appearance, which is formed due to the club-shaped spikes that project from the surface of the virus. Seven coronaviruses have been discovered in humans that can cause mild to lethal respiratory tract infections. HCoV-229E, HCoVOC43, HCoV-NL63, and HCoV-HKU1 are the low-risk members of this family and the reason for some common colds. Besides, SARS-CoV, MERS-CoV, and newly identified SARS-CoV-2, which is also known as 2019-nCoV, are the more dangerous viruses. Due to the rapid spread of this novel coronavirus and its related disease, COVID-19, a reliable, simple, fast, and low-cost detection method is necessary for patient diagnosis and tracking worldwide [4],[5],[6]. The increasing COVID-19 widespread has created the necessity to assess the diagnostic accuracy of newly introduced (RT-PCR based) assays for SARS-CoV-2 RNA detection in respiratory tract samples. The laboratory detection techniques include RT-PCR, RT-LAMP, electrochemical and optical biosensors for RNA detection, and whole virus or viral proteins detection assays. Looking deeper at that response can shed light on commonalities between the

AIDS/HIV and COVID-19 crises, but it points to a much deeper tradition of the capacity of humans to care for one another, independent of the state (especially when its response has been negligent). Healthcare professions are at high risk of occupational exposure to the new pandemic human coronavirus due to the directional airflow and strong environmental hygiene procedures. However, we detected viral RNA on the surface of some objects. The risk of infection was eliminated by the use of disposable footwear covers and the application of more effective environmental and personal hygiene measures. In addition, monitoring the environmental contamination of wards and disinfecting contaminated surfaces and places should be regularly performed to prevent the infection of environment including the humans. The major pathway of COVID-19 transmission and infection, which includes various ways (see the diagram betow).



Different transmission pathways COVID-19 in the environment



Influence of Environmental factors on THE infection OF COVID-19

Direct transmission refers to the transfer of viruses from an infected person to another person without any intermediate object, whereas indirect transmission is the transfer through contact with a contaminated intermediate object. Another major pathway/mode is airborne transmission, which encompasses droplet spray transmission and aerosol transmission. In droplet spray transmission, the virus is transferred via air droplets produced at the time of breathing/sneezing/coughing/talking, followed by its deposition on the mucous membrane. The present concern regarding the transmission of SARS-CoV-2 is not limited to direct contact with infected people or indirect contact with infected surfaces, but recent studies suggested transmission via droplets spray and aerosols. Major environmental factors regarding the influence of varied abiotic and biotic factors on COVID-19 transmission, persistence, and infectivity and discuss the existing knowledge gaps. Abiotic factors include: climatic, air quality, water and wastewater, solid surfaces and frozen food and cold chain transportation. Biotic factors such as age factor, sex and gender, blood type, population density and behavioural variables.

Climate Change

Climate change is yet another environmental problem that has surfaced in the last couple of decades. It occurs due to the rise in global warming, which happens due to the increase in temperature of the atmosphere by burning fossil fuels and the release of harmful gases by industries. Climate change has various harmful effects but not limited to the melting of polar ice, change in seasons, occurrence of new diseases, frequent occurrence of floods and change in overall weather scenario. Climate change is one of the most threatening consequences of the pursuit of everlasting economic growth. Despite all the promises made in Paris in 2015, the 5 largest producers even emit 28% more fossil fuels. An average increase in global warming of 5 degrees worldwide, as predicted by the end of the century, means massive changes. 5 degrees in the other direction *as a comparison, it* was the last ice age. About 2/3 of Switzerland were covered by ice at that time. That's the measure of change when we talk about 5 degrees. Climate change happens when GHGs are released and trapped in the atmosphere, causing the GH effect. The GH effect creates a layer around the earth's atmosphere that traps heat from the sun, making our atmosphere warmer, similar to a greenhouse. The following GHGs contribute to climate change.

- **Carbon dioxide (CO_2):** CO_2 enters the atmosphere when fossil fuels like coal, oil, and natural gas are burned. CO_2 is also released when trees and other plants are burned or cut down and through manufacturing cement. CO_2 made up 81% of man-made greenhouse gas emissions from the United States (US) in 2018 according to the Environmental Protection Agency (EPA).
- **Methane (CH_4):** CH_4 is released from fossil fuels (natural gas), agriculture (cow farts and manure), and landfills. CH_4 made up 10% of GHGs in the US in 2018.
- **Nitrous oxide (N_2O):** N_2O is emitted from agriculture, fossil fuels, industry, and waste-water treatment. N_2O made up 7% of GHG emissions in 2018.
- **Fluorinated gases:** Fluorinated gases are hydrofluorocarbons (used in refrigerators and air conditioners), perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride. They are man-made gases commonly used in refrigerants used for cooling air conditioners and refrigerators. These gases have a high Global Warming Potential and makeup 3% of GHGs emitted in the US according to the USEPA.

The global GHG emissions trend has increased since the beginning of the 21st century in comparison to the 3 previous decades, mainly due to the increase in CO_2 emissions from China and the other emerging economies. As a result, the atmospheric concentrations of GHGs substantially increased enhancing the natural GH effect, which may negatively affect the life on the Earth. These issues are internationally addressed in the framework of UNs Framework Convention on Climate Change (UNFCCC); countries are developing national emissions inventories and propose/implement actions to mitigate GHG emissions. CO_2 emissions, which are the main responsible for global warming are still increasing at world level despite climate change mitigation agreements. EDGAR [7] provides an independent estimate of GHGs for each world country, based on a robust and consistent methodology stemming from the latest Intergovernmental Panel on Climate Change (IPCC) guidelines and most recent activity data. Following the latest update released in September 2020, (Figure 1) emission data are now available for fossil CO_2 for each country for the time period 1970-2019. Climate change is a major factor in disease emergence. The survival, reproduction, abundance and distribution of pathogens, vectors and hosts can be influenced by climatic parameters affected by climate change, the United Nation Environment Program (UNEP) and the International Livestock Research Institute (ILRI) report released on July 6, 2020. Climate change can particularly affect diseases transmitted by insects, ticks and other arthropod vectors, according to the report preventing the Next Pandemic: Zoonotic disease and how to break the chain of transmission. Warmer temperatures can increase the vector population size and distribution, along with the season duration when infectious vector species are present in the environment. It was mentioned that climate change can increase or decrease the incidence of the insect-transmitted Chagas disease, sand-fly transmitted leishmaniasis and other vector-borne and zoonotic diseases, generally with greater illness occurring at higher degrees of warming.

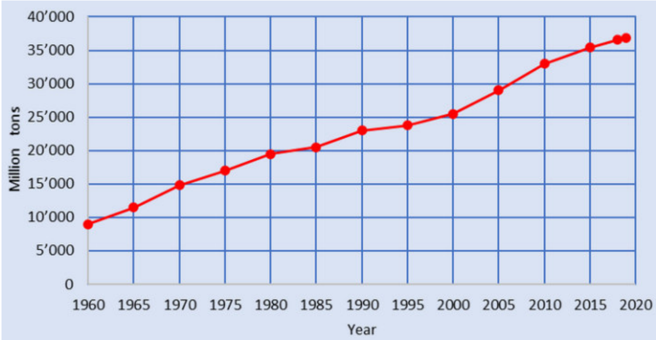


Figure (1) Worldwide CO_2 emissions 1960-2019

The climate crisis is accelerating at an unprecedented rate, and world is not ready for it. While the crisis has many factors that play a role in its exacerbation, there are some that warrant more attention than others. Here are some of the biggest environmental problems of lifetime of world population. The populations of rich countries and, more generally, the rich worldwide, bear an overwhelming responsibility for any future climate change. The goal of halving global emissions by 2030 represents the absolute minimum worldwide must achieve if the worldwide populations are to have at least a 50% chance of safeguarding humanity from the worst impacts. United Nations (UNs) is not fit to deal with the climate crisis: it was assembled to prevent another world war and is not fit for purpose. Anyway, members of the UNs are not mandated to comply with any suggestions or recommendations made by the organisation. For example, the Paris Agreement, an agreement within the UNFCCC, mentioned that countries need to reduce GHG emissions significantly so that global temperature rise is below 2 degrees Celsius by 2100, and ideally less than 1.5 degrees. Further, the issue of equity remains a contentious issue whereby developing countries are allowed to emit more in order to develop to the point where they can develop technologies to emit less, and it allows some countries, such as China, to exploit this. China is the single largest emitter of C. This is, largely due to goods produced in China but consumed elsewhere in the world. It was found that the attribute of the emissions to where the consumption takes place, North Americans consume 22.5 tons of CO_2/year/person, Western Europeans 13.1, Chinese 6, and South Asia just 2.2 [8]. Overall, 10% of the world's population (the highest polluters) contribute roughly 50% of CO_2 emissions, while the 50% who pollute the least contribute just over 10% (Figure 2). However, developed nations typically have high CO_2 emissions/capita, while some developing countries lead in the growth rate of CO_2 emissions. These uneven contributions to the climate crisis are at the core of the challenges the world community faces in finding effective and equitable solutions to global warming [9].

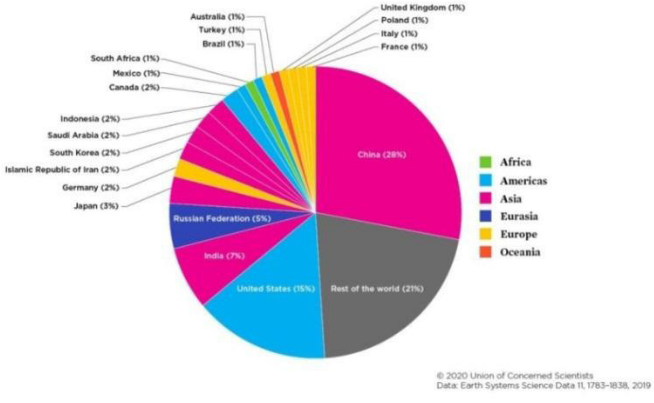


Figure (2) Worldwide CO_2 emissions

Global Warming

Scientists agree that global warming is caused mainly by human activity. Specifically, the evidence shows that certain heat-trapping gases, such as CO_2, are warming the world [10],[11],[14]. As scientific models and methods grow more sophisticated, and the confidence in human-caused climate change grows higher. Climate changes like global warming are the result of human practices like the emission of GHGs. Global warming leads to rising temperatures of the oceans and the earth' surface causing natural disasters that include flooding, melting of polar ice caps, rise in sea levels and also unnatural patterns of precipitation such as flash floods, hurricanes, wildfires, drought, excessive snow or desertification. At time of publication, CO_2 parts per million (PPM) is at 410 and the global temperature rise is 0.89°C. Increased GHGs emissions have caused temperatures to rise, which are causing catastrophic events all over the world just this year has seen Australia experience one of the most devastating bushfire seasons ever recorded, locusts swarming across parts of Africa, the Middle East and Asia, decimating crops, scientists warning that the planet has crossed a series of tipping points that could have catastrophic consequences, microplastic being found in Antarctic ice for the first time, a heatwave in Antarctica that saw temperatures rise above 20 degrees for the first time, warnings of advancing permafrost melt in Arctic regions, the Greenland ice sheet melting at an unprecedented rate, news of the accelerating sixth mass extinction, increasing deforestation in the Amazon rainforest, warnings of air pollution exacerbating the spread of COVID-19, China experiencing its worst floods in decades, methane levels rising to their highest on record, Canada's last intact ice shelf collapsing, a national park in the US recording the highest temperature ever recorded on Earth, 13% of deaths in the EU being linked to various forms of pollution, a report saying that population sizes of wildlife have experienced an average decline of 68% since 1970 and record-breaking wildfires in California that have blocked out the sun– and these are just a fraction of the events. The climate crisis is causing tropical storms and other weather events such as hurricanes, heat waves and flooding to be more intense and frequent than seen before. However, a study has found that even if all GHG emissions were halted in 2020, global warming would only be halted by around 2033. It is absolutely imperative that we reduce GHG emissions; thankfully, this year is set to see the highest uptake of renewable energy projects around the world (Figure 3) [15].

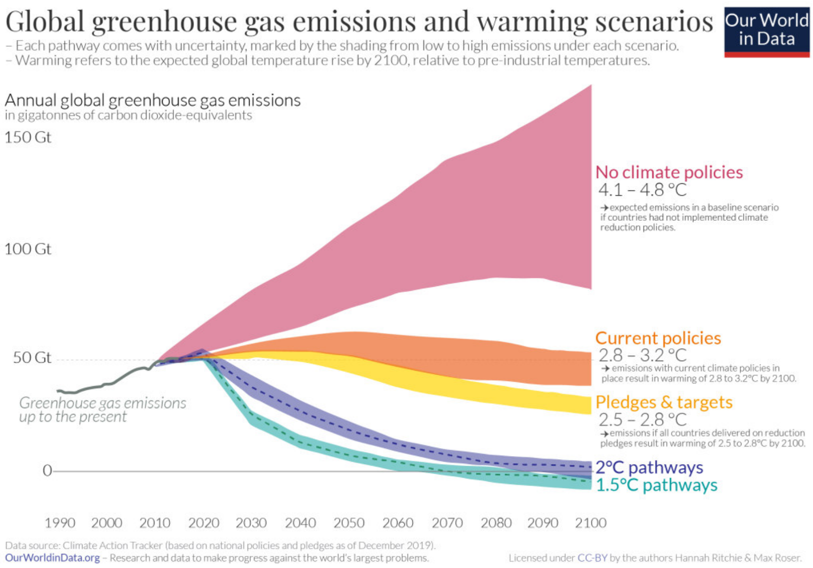


Figure (3) Global Greenhouse gas emissions and warming

Acid Rain

Acid rain occurs due to the presence of certain pollutants in the atmosphere. Acid rain can be caused due to combustion of fossil fuels or erupting volcanoes or rotting vegetation which releases SO_2 and N_2O into the atmosphere. Acid rain is a known environmental problem that can have a serious effect on human health, wildlife and aquatic species. Acid rain comes as a result of air pollution, mostly through chemicals released into the environment when fuel is burned. Its effects are most clearly seen in aquatic ecosystems, where increasing acidity in the water can lead to animal deaths. It also causes various issues for trees. Though it doesn't kill trees directly, acid rain does weaken them by damaging leaves, poisoning the trees and limiting their available nutrients [16].

Ozone Layer Depletion

The record-breaking 2020 Antarctic ozone hole finally closed at the end of December after an exceptional season due to naturally occurring meteorological conditions and the continued presence of ozone depleting substances in the atmosphere [17]. The ozone layer is an invisible layer of protection around the planet that protects us from the sun’s harmful rays. The depletion of the crucial ozone layer of the atmosphere is attributed to pollution caused by chlorine and bromide found in chloro-fluoro carbons (CFCs). Once these toxic gases reach the upper atmosphere, they create a hole in the ozone layer, the biggest of which is above the Antarctic. CFCs are banned in many industries and consumer products. The ozone layer is valuable because it prevents harmful UV radiation from reaching the earth. This is one of the most important current environmental problems. The 2020 Antarctic ozone hole grew rapidly from mid-August and peaked at around 24.8 million square kilometres on 20 September 2020, spreading over most of the Antarctic continent.

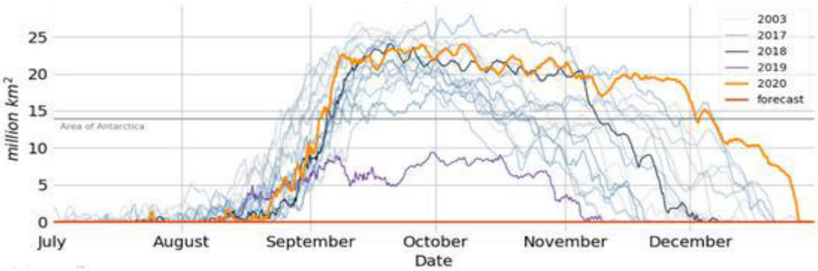


Figure (4) 2020 Southern hemisphere ozone hole areas

Ozone depletion is caused by the release of chemicals, primarily chlorine and bromide, into the atmosphere. A single atom of either has the potential to destroy thousands of ozone molecules before leaving the stratosphere. Ozone depletion results in more UVB radiation reaching the Earth’s surface. UVB has been linked to skin cancer and eye disease, plus it affects plant life and has been linked to a reduction of plankton in marine environments. “The last two ozone hole seasons demonstrate the year-to-year variability of the ozone hole and improve our understanding of the factors responsible for its formation, extent and severity,” said Oksana Tarasova, head of WMO Atmospheric Environment Research Division, which oversees WMO Global Atmosphere Watch network of monitoring stations. “We need continued international action to enforce the Montreal Protocol on ozone depleting chemicals. [17]

Melting Ice Caps

The issue of the melting of polar ice caps is a contentious one. Although NASA studies have shown that the amount of ice in Antarctica is increasing, however, this increase is only one-third of what is being lost in the Arctic. There is enough evidence that shows sea levels are rising, and the melting of Arctic ice caps is a major contributor. Over time, the melting of polar ice caps could lead to extensive flooding, contamination of drinking water and major changes in ecosystems. The climate crisis is warming the Arctic more than twice as fast as anywhere else on the planet. Seas are now raising an average of 3.2 mm/year globally, and are predicted to climb to a total of 0.2 to 2 m by 2100. In the Arctic, the Greenland Ice Sheet poses the greatest risk for sea levels because melting land ice is the main cause of rising sea levels.



Representing arguably the biggest of the environmental problems, this is made all the more concerning considering that last year’s summer triggered the loss of 60 billion tons of ice from Greenland, enough to

raise global sea levels by 2.2 mm in just two months. According to satellite data, the Greenland ice sheet lost a record amount of ice in 2019: an average of a million tons/minute throughout the year, one of the biggest environmental problems that have cascading effects. If the entire Greenland ice sheet melts, sea level would rise by six metres. Meanwhile, the Antarctic continent contributes about 1 mm/year to sea level rise, which is a third of the annual global increase. Additionally, the last fully intact ice shelf in Canada in the Arctic recently collapsed, having lost about 80 km^2, or 40%, of its area over a two-day period in late July, according to the Canadian Ice Service. This indicator tracks the extent, age, and melt season of sea ice in the Arctic Ocean (Figure 5).
The sea level rise will have a devastating impact on those living in coastal regions: according to research and advocacy group Climate Central, sea level rise this century could flood coastal areas that are now home to 340 million to 480 million people. Climate Change Indicators:

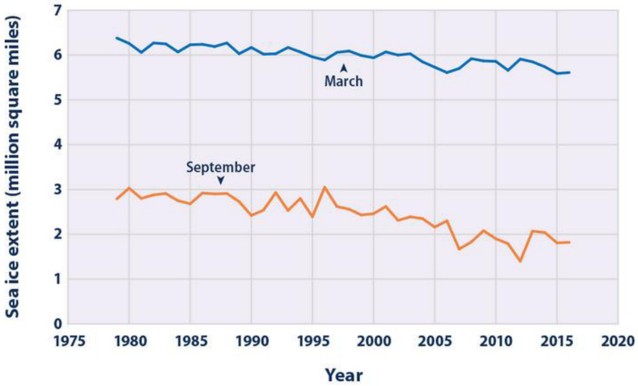


Figure (5) March and September Monthly Average Arctic Sea Ice Extent (18)

Ocean acidification

It is a direct impact of excessive production of CO_2. 25% of total atmospheric CO_2 is produced by humans. The ocean acidity has increased by the last 250 years, but by 2100, it may shoot up by 150%. The main impact is on shellfish and plankton in the same way as human osteoporosis. Ocean acidification is one of the main problems associated with climate change. It doesn't get as much attention as other environmental problems, but it can have a major impact on ocean ecosystems. The ocean absorbs about 30% of the CO_2. As levels of atmospheric CO_2 increase from human activity such as burning fossil fuels (e.g., car emissions) and changing land use (e.g., deforestation), the amount of CO_2 absorbed by the ocean also increases. When CO_2 is absorbed by seawater, a series of chemical reactions occur resulting in the increased concentration of H^+ ions. This process has far reaching implications for the ocean and the creatures that live there (Figure 6).

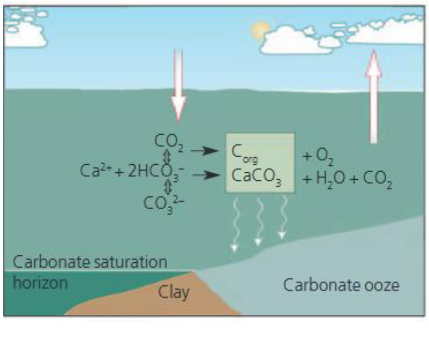


Figure (6) Diagram of the carbonate buffer and biologicalpump in the surface oceans [19]

After absorption of CO_2 intothe oceans it is converted by the carbonate buffer. Calcification in the oceans also releases CO_2, some ofwhich is returned to the atmosphere. The biological pump converts CO_2 from the atmosphere into organic carbon and $CaCO_3$ and transfers it to the deep ocean waters and sediments. The vertical scale is compressed: the process depicted by the equations and the 'box' occur within the surface oceans. This is far above the carbonate saturation horizon, which for the calcite form, occurs at depths in therange of about 1.5 to 5 km and for the aragonite form, atdepths in the range of about 0.5 to 2.5km.
Ocean acidification is the term used to describe the continued lowering of the pH levels of the Earth's oceans

as a result of CO_2 emissions. It is estimated that ocean acidity will increase by 150% by 2100 if efforts aren't made to halt it. This increase in acidification can have dire effect on calcifying species, such as shellfish. This causes issues throughout the food chain and may lead to reductions in aquatic life that would otherwise not be affected by acidification.

Agriculture

One of the great challenges facing humanity is the increase in food production to meet the ever-growing human population. Studies have shown that the global food system is responsible for up to 1/3 of all human-caused GHG emissions, of which 30% comes from livestock and fisheries. Crop production releases GHGs such as NO through the use of fertilisers. 60% of the world's agricultural area is dedicated to cattle ranching, although it only makes up 24% of global meat consumption. Agriculture not only covers a vast amount of land, but it also consumes a vast amount of freshwater, another one of the biggest environmental problems on this list. While arable lands and grazing pastures cover 1/3 of Earth's land surfaces, they consume 3-quarters of the world's limited freshwater resources. Scientists and environmentalists have continuously warned that world population need to rethink for the current food system; switching to a more plant-based diet would dramatically reduce the C footprint of the conventional agriculture industry.

Deforestation

Logging and clear-cutting destroy wildlife habitats and are among the leading causes of species extinction. Moreover this also contributes to global warming as trees trap GHG emissions, and in their absence these emissions increase, according to National Geographic. Worldwide forests are natural sinks of CO_2 and produce fresh O_2, as well as helps in regulating temperature and rainfall. At present, forests cover 30% of the land, but every year tree cover is lost, amounting to the country of Panama due to the growing population [13] demand for more food, shelter and cloth. Deforestation simply means clearing of green cover and make that land available for residential, industrial or commercial purposes.Deforestation is linked to many environmental problems and the biggest problem is agriculture. Agri-businesses should meet their commitments to deforestation-free commodity chains and companies that have not made zero deforestation commitments should do so. Commodity investors should adopt business models that are environmentally and socially responsible. These actions will, in many cases, require a revision of current policies and financial incentives. The demands of an increasing population have resulted in increasing levels of deforestation. Current estimates state that the planet is losing 80,000 acres of tropical forests per day. This results in loss of habitat for many species, placing many at risk and leading to large-scale extinction. Furthermore, deforestation is estimated to produce 15% of the world's greenhouse gas emissions.

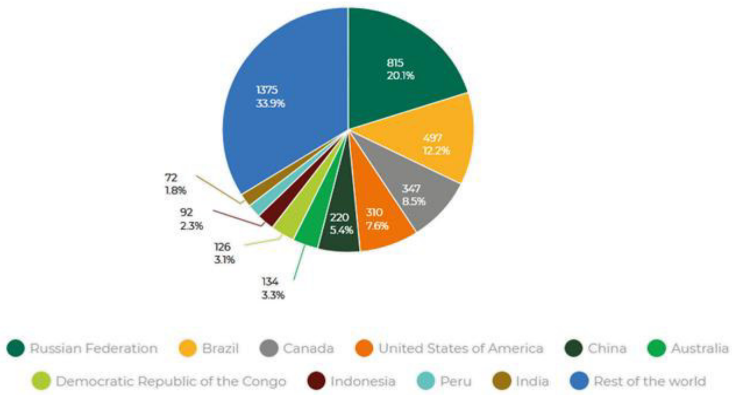


Figure (7) Global distribution of forests showing the ten countries with the largest forest area, 2020 (million hectares and % of world's forest) [20]

Every minute, forests the size of 20 football fields are cut down. By the year 2030, the planet Earth might have only 10% of its forests; if deforestation isn't stopped, they could all be gone in less than 100 years. Agriculture is the leading cause of deforestation, another one of the biggest environmental problems appearing on this list. Land is cleared to raise livestock or to plant other crops that are sold, such as sugar cane and palm oil. Besides for carbon sequestration, forests help to prevent soil erosion, because the tree roots bind the soil and prevent it from washing away, which also prevents landslides. The three countries experiencing the highest levels of deforestation are Brazil, the Democratic Republic of Congo and Indonesia.

Loss of Tropical Rainforests

Nearly 40% of Americans are worried about distant problems like loss of tropical forests. Rain forests cover only 2% of land but support 50% of its species according to Mongabay. Yet among tropical forests the area of rainforests cleared is the maximum, and most of it is export driven. Every year an area of rainforest the size of New Jersey is cut down and destroyed" notes Mongabay. In 2019, summer fires that ravaged the Brazilian Amazon and set the world ablaze with outcries [21].

Food and Water Insecurity

Improvements in health over the past century have been underpinned by positive advances in the management of vital resources such as water and food. Water supply and quality, and food security and safety are intertwined. Freshwater resources and especially high quality freshwater resources are becoming increasingly scarce, driven by factors including population growth, urbanisation and probably global climate change. The availability of freshwater resources adequate in both quantity and quality is vital to food security and production. Water, like food, is a vehicle for the transmission of many agents of disease and continues to cause significant outbreaks of disease in developed and developing countries world-wide.

Water can also contaminate food. Helminths, protozoa and viruses also may be spread from contaminated water to food. Contaminated irrigation water has been associated with hepatitis A. People can be exposed to infectious agents or toxic chemicals through:

– the ingestion of contaminated water incorporated into foods;

– the ingestion of foods irrigated with or harvested from contaminated water; and

– the ingestion of foods that have come into contact with contaminated water during processing.

There are many competing demands for fresh water and their number is increasing. They include food production and processing; domestic supplies; industry; tourism and leisure; energy production; navigation; and the need to maintain ecosystem integrity. Different uses may be polluting and/or make quantity/quality demands on resources.

Rising temperatures and unsustainable farming practices has resulted in the increasing threat of water and food insecurity. Globally, more than 68 billion tonnes of top-soil is eroded every year at a rate 100 times faster than it can naturally be replenished. Laden with biocides and fertiliser, the soil ends up in waterways where it contaminates drinking water and protected areas downstream. Furthermore, exposed and lifeless soil is more vulnerable to wind and water erosion due to lack of root and mycelium systems that hold it together. A key contributor to soil erosion is over-tilling: although it increases productivity in the short-term by mixing in surface nutrients (e.g. fertiliser), tilling is physically destructive to the soil’s structure and in the long-term leads to soil compaction, loss of fertility and surface crust formation that worsens topsoil erosion.

With the global population expected to reach 9 billion people by mid-century, the Food and Agriculture Organization of the United Nations (FAO) projects that global food demand may increase by 70% by 2050. Around the world, more than 820 million people do not get enough to eat. In terms of water security, only 3% of the world’s water is fresh water, and two-thirds of that is tucked away in frozen glaciers or otherwise unavailable for our use. As a result, some 1.1 billion people worldwide lack access to water, and a total of 2.7 billion find water scarce for at least one month of the year. By 2025, 2/3 of the world’s population may face water shortages. While these are some of the biggest environmental problems plaguing our planet, there are many more that have not been mentioned, including overfishing, urban sprawl, toxic superfund sites and land use changes. While there are many facets that need to be considered in formulating a response to the crisis, they must be coordinated, practical and far-reaching enough to make enough of a difference. [22]

The COVID-19 pandemic is a global health crisis that is already having devastating impacts on the world economy – both directly and through necessary measures to contain the spread of the disease. These impacts are also being felt by the food and agriculture sector. While the supply of food has held up well to date, in many countries, the measures put in place to contain the spread of the virus are starting to disrupt the supply of agro-food products to markets and consumers, both within and across borders. The sector is also experiencing a substantial shift in the composition and – for some commodities – the level of demand.

How damaging these impacts turn out to be for food security, nutrition and the livelihoods of farmers, fishers and others working along the food supply chain will depend in large part on policy responses over the short, medium and long term. In the short term, governments must manage multiple demands – responding to the health crisis, managing the consequences of the shock to the economy, and ensuring the smooth functioning of the food system. While the pandemic poses some serious challenges for the food system in the short term, it is also an opportunity to accelerate transformations in the food and agriculture sector to build its resilience in the face of a range of challenges, including climate change.

Biodiversity Loss

Biodiversity encompasses every living organism on the Earth. The various concerns for pollution, endangered species and the increase in species extinction and different types of pollution, make biodiversity the number one environmental concerns. Based on the increased rate of species extinction, some scientists have stated the earth is in the throes of the 6th extension, the 5th having been when the dinosaurs disappeared. A survey conducted by National Geographic Society and Ipsos of 12,000 people around the world revealed the majority believe half of the Earth should be dedicated to the protection of the land and sea. Human activity is leading to the extinction of species and habitats and loss of biodiversity. Ecosystems, which took millions of years to perfect, are in danger when any species population is decimating. Balance of natural processes like pollination is crucial to the survival of the ecosystem, and human activity threatens the same. Another example is the destruction of coral reefs in the various oceans, which support the rich marine life. The large and rapidly progressing decline in global biodiversity, e.g. in agriculture is a serious risk to the food security of future humans. Land use change linked to massive expansion of globalized, highly commercialized industrial agriculture is the main overarching driver of declining agrobiodiversity. Globally, the FAO estimates that 75% of crop diversity was lost in the 20th century. Historically about 7,000 plant species were cultivated for food; today only about 80 plant species make major contributions to food supplies at the global level. In fact, half of all plant-based calories come from only 3 species: rice, maize, and wheat. And 93% of global meat supplies come from just 4 animal species: pigs, poultry, cattle, and buffalo. Looking ahead, restoring agrobiodiversity (the richness of what we cultivate, breed, consume, and conserve in the wild) is crucial to ensure resilient food systems against the backdrop of climate change. The past 50 years have seen a rapid growth of human consumption, population, global trade and urbanisation, resulting in humanity using more of the Earth's resources than it can replenish naturally. A recent World Wildlife Fund (WWF) report found that the population sizes of mammals, fish, birds, reptiles and amphibians have experienced a decline of an average of 68% between 1970 and 2016. The biodiversity loss is due to land-use change, particularly the conversion of habitats, like forests, grasslands and mangroves, into agricultural systems. Animals such as pangolins, sharks and seahorses are significantly affected by the illegal wildlife trade, and pangolins are critically endangered because of it. More broadly, a recent analysis has found that the 6th mass extinction of wildlife on Earth is accelerating. More than 500 species of land animals are on the brink of extinction and are likely to be lost within 20 years; the same number was lost over the whole of the last century. The scientists say that without the human destruction of nature, this rate of loss would have taken thousands of years. [23]

Pollution

Pollution is among the many environmental challenges the world is facing today. It is a major concern in much of the developing countries as the impact of pollution is more severe with levels that often cause poor health, deaths, and disabilities for many people, which consequently leads to higher mortality rates. However, in many developing countries, the environmental cost of pollution is unavoidable as the industrial sector is a crucial sector that generates the primary engine of economic growth and development. There are 7 key types of pollution: air, water, soil, noise, radioactive, light and thermal and these are primary causes that affect our environment in many ways. All these types of pollution are interlinked and influence each other. Pollution of air, water and soil requires millions of years to recoup. Industry and motor vehicle exhaust are the number one pollutants. Heavy metals, nitrates and plastic are toxins responsible for pollution. While water pollution is caused by oil spill, acid rain, urban runoff, air pollution is caused by various gases and toxins released by industries and factories and combustion of fossil fuels; soil pollution is majorly caused by industrial waste that deprives soil from essential nutrients. Light pollution and noise pollution can affect the quality of residential life, human health and behavior. More than 100 million human beings are affected by noise pollution as well as the effect light pollution has on plants and animals by upsetting their natural biological clocks, affecting migratory birds, insects and even aquatic life.

Air Pollution

Air pollution is an important issue within the topic of sustainable development because air pollution

seriously threatens economic development, ecological civilization, and human well-being.
Air pollution coming from a variety of sources has a range of chemical compositions and toxicity that can harm human health when exposed to it. Various pollutants were used in the literature, along with particulate matter (PM), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), and carbon dioxide (CO_2), among others, to evaluate environmental pollution.
Socioeconomic development and the increase in human activities are the causes of air pollution, which have led to an increasingly tense relationship between humans and nature. Air pollution occurs in the natural world. It is caused by the artificial input of some harmful substances into the environment, and this deterioration makes the natural world unable to purify itself and thus harms the environment. This kind of harm affects the survival and reproduction of organisms and the productivity and life of humans.
Theoretically, a sizeable number of epidemiological studies have established a positive association between air pollutant exposure and mortality incidence rate. According to a 2019 WHO report 9 out of 10 people are breathing air that has high levels of pollutants. WHO reports 4.2 million people die annually from outdoor air pollution. For those living in urban areas, 80% are in regions where air pollution levels exceed the WHO limits. The State of Global Air reports air pollution is number 5 worldwide for the leading mortality risk factor. The largest worldwide risk factor is fine particle air pollution. Phys.org reported a 2019 study conducted by the International Council on Clean Transportation (ICCT) found diesel vehicles cause 47% of exhaust emissions death. Exhaust emissions deaths from diesel emissions in Italy, Germany, France, and India were 66%. Research from the World Health Organization (WHO) shows that an estimated 4.2 to 7 million people die from air pollution worldwide every year and that nine out of 10 people breathe air that contains high levels of pollutants. In Africa, 258 000 people died as a result of outdoor air pollution in 2017, up from 164 000 in 1990, according to United Nations Children's Fund (UNICEF).



This comes mostly from industrial sources and motor vehicles, as well as emissions from burning biomass and poor air quality due to dust storms. In Europe, a recent report from the EU’s environment agency showed that air pollution contributed to 400 000 annual deaths in the EU in 2012 (the last year for which data was available). In the wake of the COVID-19 pandemic, attention has been put on the role that air pollution has in transporting the virus molecules. Preliminary studies have identified a positive correlation between COVID-19-related mortalities and air pollution and there is also a plausible association of airborne particles assisting the viral spread. This could have contributed to the high death toll in China, where air quality is notoriously poor, although more definitive studies must be conducted before such a conclusion can be drawn. [24]

Biological Pollutants
The EPA says that "biological contaminants are, or are produced by, living things." These include bacteria, viruses, molds, mildew, dander, dust, mites, and pollen, as indoor pollutants. They are found in places where there is food and moisture available. They can cause allergic reactions or infectious diseases, to which children and elderly people are more susceptible. [25] Microbial contamination and damaging effects due to environmental factors (temperature, humidity) of old books is an extremely important issue in the heritage preserving field, being a great threat to this unique cultural and literary treasure.

Traffic Cause for Concern
WHO mentined that:
- Approximately 1.35 million people die each year as a result of road traffic crashes.
- The2030 Agenda for Sustainable Development has set an ambitious target of halving the global number of deaths and injuries from road traffic crashes by 2020.

- Road traffic crashes cost most countries 3% of their gross domestic product.
- More than half of all road traffic deaths are among vulnerable road users: pedestrians, cyclists, and motorcyclists.
- 93% of the world's fatalities on the roads occur in low- and middle-income countries, even though these countries have approximately 60% of the world's vehicles.
- Road traffic injuries are the leading cause of death for children and young adults aged 5-29 years.

Traffic is a major cause of concern. Throughout the world the numbers of cars are increasing, as are harmful emissions. New generation cars, however, such as hybrid and electric cars are an environmentally friendly option. These cars offer good performance along with limited harmful emissions meaning that they are kind to the environment. [26]

Water Pollution

Water is the driving force of all life. Between the start of April and the end of August the Environment Agency (The Guardian) attended just 292 water pollution incidents, down from 1,726 during the same period in 2019, according to data obtained by the Guardian using freedom of information legislation. While the number of water pollution incidents attended by the Environment Agency declined by 83%, the number of reports of pollution incidents remained high. The agency was given 9,144 reports of pollution incidents during the time period. This is just 3% less than the 9,424 it received during the same period in 2019. [27]
Many water sources like streams, rivers and oceans are getting polluted. Related issues include acid rain, nutrient pollution, ocean dumping, urban runoff, oil spills, ocean acidification, and wastewater. Rivers in Asia, Africa and South American are polluted. [28] Globally, "certain food-borne disease outbreaks" are linked to water pollution (Figure 8). Clean drinking water is becoming a rare commodity. Water is becoming an economic and political issue as the human population fights for this resource. One of the options suggested is using the process of desalinization. Industrial development is filling our rivers, seas and oceans with toxic pollutants, which are a major threat to human health. Fresh water is crucial to life on Earth, yet more sources are being polluted through human activities each year. On a global scale, 2 million tons of sewage, agricultural and industrial waste enters the world's water every day.

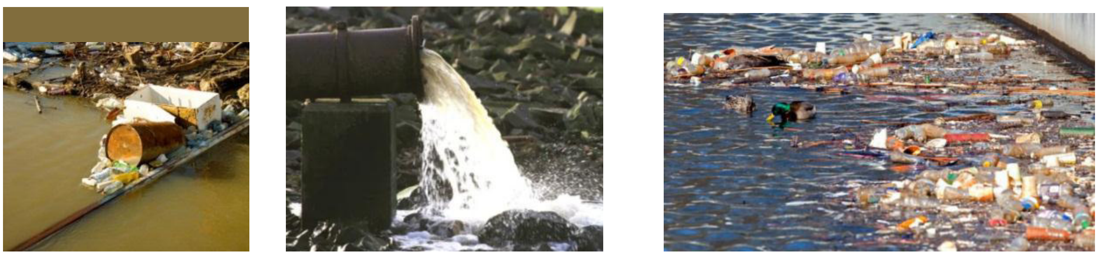


Figure (8) Water quality testing on coastal waters and lakes

Water pollution can have harmful effects outside of contamination of the water we drink. It also disrupts marine life, sometimes altering reproductive cycles and increasing mortality rates. Contamination of fresh water used for household needs, including pollution of rivers, lakes and reservoirs, ranks top on the list of environmental concerns for 61% of global population. The EPA has set standards to ensure quality of drinking water to protect public health by limiting levels of various contaminants like microorganisms, disinfectants and their byproducts, inorganic compounds, organic compounds and radionuclides.

Plastic Pollution

Plastic pollution is a major environmental problem. The global campaign to gain control of plastic waste is one of the fastest-growing environmental causes ever mounted. Yet it hasn't been enough to make a dent in the growing tonnage of discarded plastic that ends up in the seas. [29] Plastic comes from fossil fuels, which we need to phase out, so using less plastic is important. But ultimately solving the problem of plastic pollution may come down to improving waste management technology and creating a more circular economy for plastics. In 1950, the world produced more than 2 million tons of plastic per year. By 2015, this annual production swelled to 419 million tons. Eight million metric tons of plastic waste enter the oceans every year. This equates to one garbage truck's worth of plastic being dumped into our oceans every minute. The total weight is the equivalent of 90 aircraft carriers.

On top of that, models project that by 2050; there will be more plastic by weight than fish in the oceans. [30] [31] A report by science journal, Nature, determined that currently, roughly 11 million tons of plastic make its way into the oceans every year, harming wildlife habitats and the animals that live in them. The research found that if no action is taken, this will grow to 29 million metric tons/year by 2040. If worldwide include microplastics into this, the cumulative amount of plastic in the ocean could reach 600 million tons by 2040.

National Geographic found that 91% of all plastic that has ever been made is not recycled, representing not only one of the biggest environmental problems of our lifetime, but another massive market failure. Considering that plastic takes 400 years to decompose, it will be many generations until it ceases to exist.

Chemical Toxins

Toxic chemicals are used in industry, agriculture, laboratories, hospitals, waste management systems and even residential homes, and include chlorofluorocarbons, heavy metals, pesticides, herbicides, toxic waste, PCB, DDT, bioaccumulation, endocrine disruptors, asbestos. These can also arise from poorly implemented hazardous waste management. These can be solid, liquid or gaseous and can pollute air, water and soil. When they enter the food-chain, they pose a health risk especially for children and elderly people according to National Geographic.

Aquatic ecosystems are affected by man-made pressures, often causing combined impacts. The analysis of the impacts of chemical pollution is however commonly separate from that of other pressures and their impacts. This evolved from differences in the data available for applied ecology vis-à-vis applied ecotoxicology, which are field gradients and laboratory toxicity tests, respectively. With this study, we demonstrate that the current approach of chemical impact assessment, consisting of comparing measured concentrations to protective environmental quality standards for individual chemicals, is not optimal. [33]

Human activities are a driving force influencing the environment and human health. A variety of pressures may affect surface water quality and quantity, with impacts on aquatic life, ecosystem services and human health. Chemical pollution is an increasingly important pressure. In response, various regulations have been defined to prevent, assess and manage water quality. There is an increasing awareness that all pressures and impacts need to be considered at the systems-level. For example, chemical safety needs to look at the whole 'chemical economy', the multiple pressures on aquatic systems are assessed and managed starting from river basins and hydrological connections as the organizing principle, and pressure impacts on biodiversity are evaluated in the context of large-scale land use patterns.

The aquatic ecosystem can be contaminated by the transfer of metals from both natural and anthropogenic sources. Over long periods, these metals accumulate and are absorbed, increasing the concentration and toxicity in the food chain, and presenting a serious health hazard. Heavy metals are natural constituents in marine environments; they are freely soluble materials and may thus be taken up by all aquatic animals, especially by edible finfish and shellfish. The dissolved form of metals in water and sediment and decomposed foods can be transferred to bottom-dwelling aquatic animals. Trace metal pollution contained in marine source food is gradually becoming a global crisis, as seawater is exposed to the continuous discharge of pollutants in bays and coastal areas. Therefore, an increasing human health risk associated with the ingestion of marine source foods polluted by toxic heavy metals has been identified over the past few decades. A number of studies have investigated adverse affects on human health originating from trace levels of heavy metals in marine source foods present in different trophic levels of the food pathway. In addition, marine shellfish including mussels, oysters and clams also have been widely used to monitor bioaccumulation of heavy metals due to their ability to transport metals without harming themselves. Therefore, marine shellfish are considered a good bioindicator for metallic hazards in marine environments.

Oil spills

In 2010, the Deepwater Horizon oil rig sank in the Gulf of Mexico, making it one of the most environmentally damaging oil spills in history. The spill covered over 43,300 square miles. It killed and harmed dolphins, sea turtles, fish, and a variety of organisms. Over the past half century, statistics for the frequency of spills greater than 7 tonnes from tankers have shown a marked downward trend, as illustrated in Figure 9. The environmental problems associated with oil have many layers. Not only does an oil spill kill wildlife and fishing industries, but oil is also a fossil fuel that contributes to climate change. Although oil is a necessary source of energy in every developed and developing country today, it comes with dire environmental problems. The number of large spills (>700 tonnes) has decreased significantly over the last few decades. The yearly average recorded in the 2010s was 1.8 spills, which is less than a tenth of the average recorded in the 1970's. No large spills were recorded in 2020.

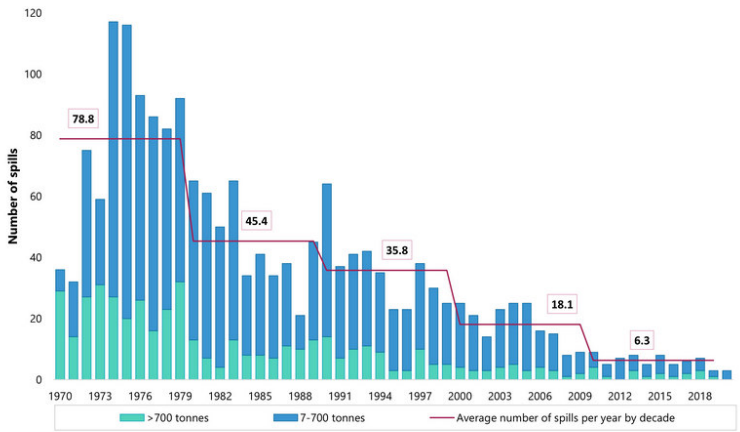


Figure (9) Number of spills (>7 tonnes) from 1970 to 2020 [34]

Similarly, there has been a significant decrease in the quantity of oil spilled through the decades. In the 2010s approximately 164,000 tonnes of oil were lost from tanker spills of 7 tonnes and above, a 95% reduction since the 1970's. [34]

Nuclear issues

Climate change is widely recognized as a major threat to humanity and much of the natural world. According to the IPCC, limiting global warming to 1.5°C above pre-industrial levels in an effort to avert the worst effects of climate change would require energy production and use to be fully decarbonized by 2050. Rapid reductions in GHG emissions would need to start immediately. Nuclear power is a large-scale, concentrated energy source that provides round-the-clock electricity. Yet it is flexible enough to contribute effectively to low carbon energy systems with large shares of variable renewable sources like wind and solar. Its GHG emissions per kilowatt-hour are 40 times less than those of an efficient gas-fired power plant.
Climate Change and Nuclear Power provides an overview of the most important linkages between climate change and nuclear energy's role in mitigating it. Building on statistics and scenarios from organizations including the International Energy Agency (IEA) and the IPCC, this publication summarizes the role of the energy sector in climate change and the possible contribution of nuclear energy in reducing future GHG emissions. Selected issues pertaining to the challenges and development of nuclear energy (waste management, investment costs, technology development, etc.) are also presented. [35] Concern the over

impacts of the world population reliance on nuclear power such as nuclear fallout, nuclear meltdown, and production of long lasting radioactive waste trouble many peoples. Greenpeace considers nuclear energy slow and expensive, concluding that the risks far outweigh its benefits. Nuclear has a strong track record of CO_2 emission avoidance. Annual CO_2 emissions of the global electricity sector would have been around 2 gigatonnes higher over the past decade if electricity from nuclear power plants had instead been supplied using the average global fossil fuel generation mix. [35]

Over the years, many views and concerns have been expressed in the media, by the public and other interested groups in relation to the nuclear industry and in particular its waste. Questions have been raised about whether nuclear power should continue when the issue of how to deal with its waste has apparently not yet been satisfactorily resolved. Questions have been raised about whether nuclear power should continue when the issue of how to deal with its waste has apparently not yet been satisfactorily resolved. Some of the more commonly expressed views and concerns include: [36]

- The nuclear industry still has no solution to the 'waste problem'.
- The transport of this waste poses an unacceptable risk to people and the environment.
- Plutonium is the most dangerous material in the world.
- Nuclear waste is hazardous for tens of thousands of years. This clearly is unprecedented and poses a huge threat to our future generations.
- Even if put into a geological repository, the waste might emerge and threaten future generations.
- Nobody knows the true costs of waste management. The costs are so high that nuclear power can never be economic.
- The waste should be disposed of into space.
- Nuclear waste should be transmuted into harmless materials.
- There is a potential terrorist threat to the large volumes of radioactive waste currently being stored and the risk that this waste could leak or be dispersed as a result of terrorist action.
- Man-made radiation differs from natural radiation.

Soil Degradation

Changes that result in replacing natural vegetation with urban sprawl and farms leads to habitat destruction, fragmentation, lack of free space for people and more C emissions, according to the US Global Change Research Program. Soil loss due to water runoff could increase greatly around the world over the next 50 years due to climate change and intensive land cultivation. This was the conclusion of an international team of researchers led by the University of Basel, which published the results from its model calculation in the scientific journal PNAS. Contemporary societies live on a cultivated planet where agriculture covers ~38% of the land surface. Humans strongly depend on the capacity of soils to sustain agricultural production and livestock, which contributes more than 95% of global food production. The underlying agricultural systems are at the same time major drivers of soil and environmental degradation and a substantial source of major biogenic greenhouse gas emissions. Globally, food security depends on the factor whether or not soils are in good condition to produce crops. According to UN estimates, about 12 million hectares of farmland a year get seriously degraded. Soils get damaged due to many reasons include erosion, overgrazing, overexposure to pollutants, monoculture planting, soil compaction, land-use conversion and many more. Nowadays, a wide range of techniques of soil conservation and restoration exist, from no-till agriculture to crop rotation to water-retention through terrace-building. Soil degradation affects 1.5 billion people around the world according to the UN. It is brought about by farming, grazing, clearing of forests, and logging. Soil erosion is a major global soil degradation threat to land, freshwater, and oceans. Wind and water are the major drivers, withwater erosion over land being the focus of this work; excludinggullying and river bank erosion. Improving knowledge of theprobable future rates of soil erosion, accelerated by human activity. [37] The major anthropogenic drivers of erosion are land use and potentially climate change through a more intense hydrological cycle. Depending on the scenario, the simulations predict that by 2070 soil erosion will increase significantly, by 30% to 66%, compared to 2015 figures. If agricultural practices do not change and measures are not taken to stop global warming, the study predicts that more than 28 billion additional metric tons of soil will be lost annually. This is around two-thirds more than the 43 billion tons estimated for 2015. [37]

Soil contamination

Land and soil pollution is also a global problem. Air and water can transport pollutants, including nitrogen compounds and tiny plastic fragments, across the globe and deposit them on land surfaces. Pollutants are found even on the highest peaks and the most remote beaches. Pollutants released from industry, transport and other economic activities can also travel long distances and reach soils, where they become diluted and are temporarily stored. Soil, a component of land, is considered polluted when contaminants adversely affect human health or the environment. The large variation of contaminants, soils, and climatic and land use conditions makes it costly to monitor and assess the full extent of land and soil pollution. What we know is mostly based on field samples scattered across countries. For example, soil erosion, soil salinization, and soil contamination by waste, pesticides, heavy metals, fertilizers, and persistent organic pollutants. Soil is necessary for supporting life and economy. Many existing and upcoming policy initiatives under the European Green Deal (the circular economy, the farm to fork strategy, the biodiversity strategy, the chemicals strategy, the new soil strategy and the zero pollution action plan) provide a European framework and support national authorities and land users to protect land and soils from pollution. Additional support to local authorities and a more coherent EU policy framework on soil would further reinforce these efforts. After all, pollution is only one of the many threats that soils and land face.[38]

The Nitrogen Cycle

The release of reactive nitrogen (N) into the environment is having severe and ongoing ecosystem, economic and human health impacts. Nitrogen is a crucial component of all life. Problems occur when the N_2-cycle is not balanced. Nitrogen exists in many different forms in the environment. It transforms and moves between the atmosphere, biosphere, and hydrosphere. Detrimental effects to the environment have also resulted in various human health issues. A process through which it is converted or fixed to a more usable form is called fixation. The fixation happens biologically and through lightning, or it can be done industrially. People have learned to convert N_2 gas to ammonia (NH_3^-) and fertilizers that are N-rich to supplement the amount of N fixed naturally. It is estimated that agriculture may be responsible for about 50% of the N_2-fixation on earth through the cultivation of N_2-fixing crops and the production of human-made fertilizers. When N is used more than plant demand, it can leach from soils into waterways and contributes to eutrophication. Excess levels of N in water can hamper marine ecosystems, through overstimulation of plant and algae growth. This blocks the light from getting into deeper waters, thus damaging the rest of the marine population. The problem can also occur during nitrification and denitrification. N_2O can be formed when the chemical process is not completed. N_2O is a potent GHG contributing to global warming.

Overfishing

Fish production is a helping hand as a source of cheap, valuable, and easily digestible protein. In 2015, fish accounted for about 17% of the total world's consumption of animal protein, and this percent continuous to grow up. Actually, catching fish either from natural freshwater or marine resources does not meet the tremendous and continuous increase in human population that is why there is a necessity to focus on fish cultures and to do the best effort to achieve the self-sufficiency of fish productivity. Good nutrition, control of fish pathogens, and maintaining good water quality are the most important ways to sustain aquaculture development and achieve high fish production.

Overfishing occur when more fish are caught then are able to reproduce to repopulate. Because fishing has long been an industry used by humans, Overfishing affects natural ecosystems severely and leads to an imbalance of ocean life. Around 63% of global fish stocks are estimated to be overfished. Overfishing caused fishing fleets to migrate to new waters that would further deplete the fish stocks. Moreover, it has negative effects on coastal communities that rely on fishing to support their living. Many forms of fishing like blast fishing, cyanide fishing, bottom trawling, whaling, and over-fishing have had an adverse effect on aquatic life. Some of the causes of overfishing include:

- Difficulties in regulating fishing areas due to lack of resources and tracking activity.
- Most areas in the world have a total lack of oversight related to their fishing industry, which means the practices and activities of fishing fleets are not or barely monitored.
- In international waters, there are little to no rules regarding fishing practices, which means fishing fleets can bypass areas that do have regulations.
- Lack of knowledge regarding fish populations and quotas in a universal standard.
- Problems with customs and importation where the provenance of fish is not questioned, leading to surreptitious practices such as calling one kind of fish something else.
- Unreported fishing, which is nearly impossible to track.
- Many countries have subsidies for fishermen which keeps their number higher than it needs to be (it is

estimated that there are 2 ½ times more fleets than needed).

- Fishing areas are largely unprotected – only a little over 1.5% of oceans have been declared protective areas, and most of these are still open to fishermen. This means that areas can be harmed or depleted. [40]

According to Mother Nature Network (MNN), there has been a decrease in populations of 36% of species, from sardines to baleen whales, due to over-harvesting. Overfishing leads to a misbalance of ocean life, severely affecting natural ecosystems in the process. Furthermore, it also has negative effects on coastal communities that rely on fishing to support their economies.

Natural Resource Depletion

Another crucial current environmental problem is the depletion of natural resources. Humans, use so many natural resources that it would need almost 1.5 Earths to cover all our needs. This will further increase in the future due to massive industrialization in Asian countries like India and China. Increased use of natural resources leads to a number of other environmental issues, such as industrialization, population growth and air pollution. Most resources are extracted from developing nations, where working conditions are often poor and environmental deterioration is remarkable. The worldwide transformation from a predominantly agricultural society to an industrial regime has rapidly increased our use of resources, such as fossil fuels, metals and timber, especially in the second half of the 20th century. [42] Over time, natural resource depletion will lead to an energy crisis. The chemicals emitted from many natural resources contribute to climate change. Fossil fuel consumption results in the emission of greenhouse gases, which is primarily responsible for global warming and climate change. Globally, people are making efforts to shift to renewable sources of energy like solar, wind, biogas and geothermal energy. As such, the cost of installing the infrastructure and maintaining these sources has plummeted in recent years. Finite natural resources are being over-exploited. Phys.org and Global Agriculture reported in July 2019 of Earth Overshoot Day. The world had used up all the natural resources for the year. This type of unsustainable use poses the danger that the world can run out of necessary materials and affect the economy and human's well-being.

Over-consumption affects the Eartht. Natural resources are finite and are being destroyed by current consumption patterns. In 2019, the PNAS (Proceedings of the National Academy of Sciences) published a paper depicting how commodity production of agricultural crops creates biodiversity losses of significant proportions.

Wasted natural resources

267.8 million tons of municipal solid waste went to landfills instead of being recycled, upcycled, composted, or used for something else in 2017, according to the EPA. There are a lot of wasted natural resources that originally came from nature, in one form or another. In a circular economy, these natural resources would not be wasted. Instead, they could be upcycled, recycled, or used to regenerate other materials.

Landfills: An Unsustainable Form of Waste Management

The huge production of waste due to our hyperconsumption is a major threat to the environment. As per the study, the average person produces 4.3 pounds of waste/day, and the US alone accounting for 220 million tons a year. Since modern technology allows us to access digital environments, many things that you need can be fulfilled in the cloud. This hyperconsumption results in non-biodegradable trash in the form of plastic packaging, toxic e-waste, and harmful chemicals that leach into our waterways. When this waste ends up in landfills, it generates enormous amounts of methane, which ranks as one of the worst greenhouse gases because of its high potential for global warming. It creates severe explosion hazards.

Waste and Waste Production

The average person produces 4.3 pounds of waste/day, with the US alone accounting for 220 million tons/year. Much of this waste ends up in landfills, which generate enormous amounts of methane. Not only does this create explosion hazards, but methane also ranks as one of the worst of the greenhouse gases because of its high global warming potential. Waste generation and management create a slew of environmental issues, such as litter, landfills, incineration, marine debris, e-waste, and contamination of water and soil caused by improper disposal and leaching toxins, according to Encyclopedia.com.

The coronavirus disease 2019 (COVID-19) pandemic has led to an abrupt collapse of waste management

chains. Safely managing medical and domestic waste is crucial to successfully containing the disease [43]. Mismanagement can also lead to increased environmental pollution. All countries facing excess waste should evaluate their management systems to incorporate disaster preparedness and resilience.
Wuhan, the COVID-19 epicenter of China, experienced a massive increase of medical waste from between 40 and 50 tons/day before the outbreak to about 247 tons on 1 March [44]. Cities such as Manila, Kuala Lumpur, Hanoi, and Bangkok experienced similar increases, producing 154 to 280 tons more medical waste per day than before the pandemic [45]. Meanwhile, the widespread lockdown has caused a substantial increase in domestic waste in the United Kingdom [46]. These large amounts of waste require collection and recycling, both of which are compromised as a result of manpower shortages and efforts to enforce infection control measures [47] [48]. Disrupted services have led to waste mismanagement increases of 300% in some rural UK communities [49]. With fewer options available, traditional waste management practices such as landfills and incineration are replacing more sustainable measures such as recycling, with adverse effects on the environment [50]. The U.K. Environment Agency further threatens the environment by allowing temporary storage of waste and incineration ash at sites that have not been granted a permit, as is usually required [51] [52]. The design and analysis of sustainable waste management chains, including logistics, recycling, and treatment technologies and policies, should be prioritized [53]. To reduce the socioeconomic and environmental impacts of waste management, the whole system must be considered, including waste generation, collection, transport, recycling and treatment, recovered resource use, and disposal of remains. Protecting waste management chains will help achieve sustainable cities and communities as outlined in the UN Sustainable Development Goals [54]. The overconsumption of resources and the creation of plastics are creating a global crisis of waste disposal. Developed countries are notorious for producing an excessive amount of waste or garbage and dumping their waste in the oceans and less developed countries. Nuclear waste disposal has tremendous health hazards associated with it. Plastic, fast food, packaging and cheap electronic wastes threaten the well being of humans. Waste disposal is, therefore, one of the urgent current environmental problems**.**

Food Waste

Food waste is a global problem and a modern problem. It occurs at all stages of the food supply chain, from production to post consumer disposal as garbage. While there are a range of factors that contribute to food waste in the production and retail stage of the supply chain, the solution to those problems are being addressed through the collaborative actions and decisions of businesses and government.
Food waste is a big environmental problem. There's a lot of media coverage about how diet is related to the environment. But the majority of that coverage has to do with how individuals should eat, not how agriculture and waste management services should improve. This loss is detrimental to both people going hungry and the environment, considering all of the manufacturing and shipping emissions from products that go uneaten. A third of the food intended for human consumption (around 1.3 billion tons) is wasted or lost. Up to 40% of food is wasted from farm to fork to landfill according to the National Resource Defense Fund. This is enough to feed 3 billion people; this is according to a report by the FAO.
Food waste and loss accounts for 4.4 gigatons of greenhouse gas emissions annually; if it was a country, food waste would be the third highest emitter of GHGs, behind China and the US. Food waste and loss occurs at different stages in developing and developed countries; in developing countries, 40% of food waste occurs at the post-harvest and processing levels, while in developed countries, 40% of food waste occurs at the retail and consumer levels. Many companies are starting initiatives to reduce their food waste by avoiding situations where it arises. For example, Marriott hotels are taking steps like not refilling buffet trays as frequently and using more sustainable practices in preparing meals. Overall, the hotel chain hopes to decrease their food waste by 50% by 2025. Some technologies, such as dehydrators and digesters, are becoming popular methods to manage waste. These systems process food in different ways to reduce the volume that ends up in a landfill. They can also decrease the environmental impact by speeding up decomposition. Food loss and waste must be reduced for greater food security and environmental sustainability. The United States is the global leader in food waste, with Americans discarding nearly 40 million tons of food every year. That’s 80 billion pounds of food and equates to more than $161 billion, approximately 219 pounds of waste/ person and 30-40% of the US food supply. Most of this food is sent to landfills; food is the single largest component taking up space inside US landfills. In fact, it makes up 22% of municipal solid waste. [55] The value of this wasted amount of food is about 680 billion dollars. A waste in food means a waste of the public and private economy, and not making the best use of food losses to feed the

poor means waste in social and human relations that contributes to increasing poverty and hunger. The Middle East is limited in production for its food needs, and it can provide 50% of its food to its people, and the rest will import it. According to statistics, the Middle East and the Arab countries in North Africa are expected to reach about 92.4 billion dollars in 2020. [56] [57]

Urban Sprawl

Urban sprawl refers to the migration of population from high-density urban areas to low-density rural areas, which results in the spreading of the city over more and more rural land. Urban sprawl results in land degradation, increased traffic, environmental issues and health issues. The ever-growing demand for land displaces the natural environment consisting of flora and fauna, instead of being replaced. [58]

Genetic Engineering

Genetic modification of food using biotechnology is called genetic engineering. Genetic modification of food results in increased toxins and diseases as genes from an allergic plant can transfer to the target plant. Genetically modified crops can cause serious environmental problems as an engineered gene may prove toxic to wildlife. Another drawback is that increased use of toxins to make insect resistant plants can cause resultant organisms to become resistant to antibiotics. The need for change in our daily lives and the movements of our government is growing.

Since so many different factors come into play, such as voting, governmental issues, the desire to stick to a routine, many people don't consider that what they do will affect future generations. If humans continue moving forward in such a harmful way towards the future, then there will be no future to consider. Although it's a fact that humans cannot physically stop ozone layer from thinning, there are still so many things we can do to try and put a dent in what we already know. By raising awareness in your local community and within your families about these issues, you can help contribute to a more environmentally conscious and friendly place for you and your future generations to live.

For generations, the field of biology has been largely defined by its discoveries. Now, because many crucial aspects of biology have begun the transition from an empirical science to an engineering discipline, the pendulum is shifting from "What can we discover?" to "What can we solve? (Figure 11) [59]". Nowhere is this perhaps more evident than in the global scientific community's collective response to combat a global pandemic—pushing us even further into one of the most prolific periods in the world of bio in both scientific and commercial development we have ever seen.

As our engineering toolkit in bio expands to be more powerful than ever before, and the infrastructure to deliver, produce, and scale these solutions comes increasingly online, a whole new world of problems in biology begin to feel approachable. Here are the 16 biggest and potentially most rewarding challenges we see coming in the world of bio.

The same way sequencing DNA led us to a new universe of drug development, the next generation of platforms and screening techniques for additional biological dimensions will allow us to drug entirely new targets of disease. Just a 5-10% efficiency on cost or time—a Moore's Law for clinical trials—would mean that in 7 years, it might cost half as much to run a new therapeutic through clinical trials, and an order of magnitude more diseases cured. We are finally entering an era in which the engineering principles of abstraction, modularity, and hierarchy can be applied towards the design of biology itself. [59]

Genetic Modification of Crops

Environmental issues caused by man-made chemicals are becoming clearer. For example, there has been a 90% reduction in the Monarch butterfly population in the US that can be linked to weed killers that contain glyphosate. There is also some speculation that genetically-modified plants may leak chemical compounds into soil through their roots, possibly affecting communities of microorganisms. People are concerned about genetically modified foods (GMOs) and genetic pollution. The US Center for Food Safety reports, genetically engineered foods are prominent in the food supply chain. The percentages of GE foods include 92% corn, 94% of cotton, 94% of soybeans and 72% of all processed foods. However, creating genetically modified organisms does not proceed without conflicts. One part of the equation concerns objections made by disputants of GMOs to the manipulation of life, as opposed to defenders who argue that it is essentially an extension of traditional plant cultivation and animal breeding techniques. There are conflicts regarding the risks to the environment and human health from using GMOs. Concerns about the risks to the environment and human health from GM products have been the subject of much debate, which has led to the development of regulatory frameworks for the evaluation of GM crops. However, the absence of a globally accepted framework has the effect of slowing down technological development with negative consequences for areas of the world that could benefit from new technologies. [60] Possible risks of using genetically modified products: 1) Environmental Hazards and 2) Risks to Human Health. Basic concepts related to genetically modified products: 1) The Notion of Substantial Equivalence; 2) The Precautionary Principle; 3) The Safeguard Clause; 4) The Cartagena Protocol; 5) Labeling of Genetically Modified Products; 6) Ethical Concerns; 7) Ethics and the Environment; 8) Ethics and Animal Rights and 9) Patenting Living (Genetically Modified) Organisms. [60]

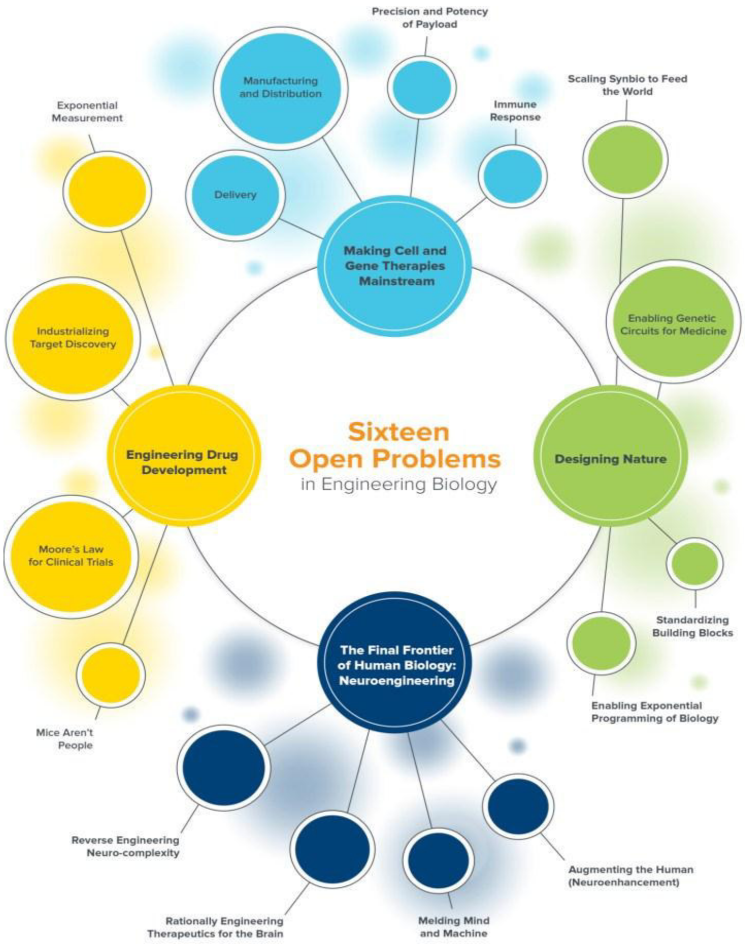


Figure (11) Sixteen open problem in engineering biology [59]

Carbon Footprint

A carbon footprint is the amount of C emissions each individual living organism creates (Figure 12). [61] Individuals can reduce this footprint and their effect on the environment, through use of renewable energy sources (e.g., solar power, geothermal heat pumps), recycling, and sustainable living.

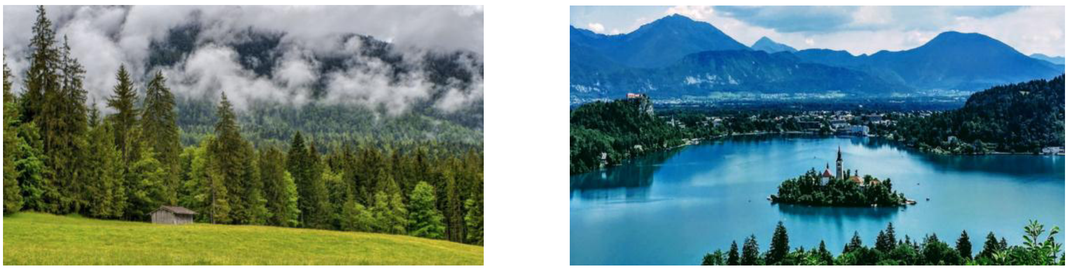


Figure (12) Amount of C emission [61] [64]

Today, the term "C footprint" is often used as shorthand for the amount of C (usually in tonnes) being emitted by an individual activity or organization. The C footprint is an important component of the Ecological Footprint, since it is one competing demand for biologically productive space. Carbon emissions from burning fossil fuel accumulate in the atmosphere if there is not enough biocapacity dedicated to absorb these emissions. Therefore, when the C footprint is reported within the context of the total Ecological Footprint, the tonnes of CO_2 emissions are expressed as the amount of productive land area required to sequester those CO_2 emissions. This tells us how much biocapacity is necessary to neutralize the emissions from burning fossil fuels. The C Footprint is a descriptive, widely-used term for the GHG emission balance of an entire organization, or alternatively, of a single product or service. It includes emissions of CO_2 and other GHG (measured in CO_2 equivalents/CO_2-eq). In the case of an organization like a company or public institution, the C Footprint includes all emissions that are directly or indirectly caused by the activities of the organization over a certain time, usually a year. The C Footprint of a product or service, in turn, includes all emissions occurring over its lifecycle. Researchers say global C emissions (Figure 13) dropped by an estimated 2.4 billion metric tons in 2020 by 7% due to the coronavirus-induced lockdowns. They have warned that the emissions may rebound once the pandemic ends. Researchers say the emissions are down mainly because more people stayed home and traveled less by car or plane this year. [62]

The Ecological Footprint framework addresses climate change in a comprehensive way beyond measuring carbon emissions. It shows how C emissions compare and contrast with other human demands on our Earth planet, such as food, fibers, timber, and land for dwellings and roads (Figure 14). [63]

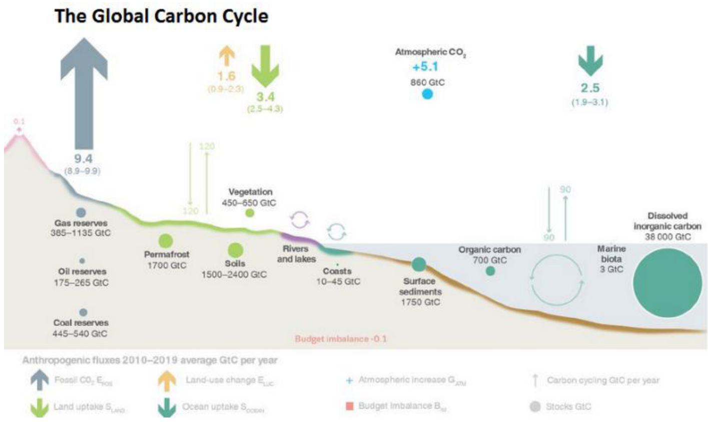


Figure (13) Human and natural sources and sinks of CO_2, updated to 2020 [62]

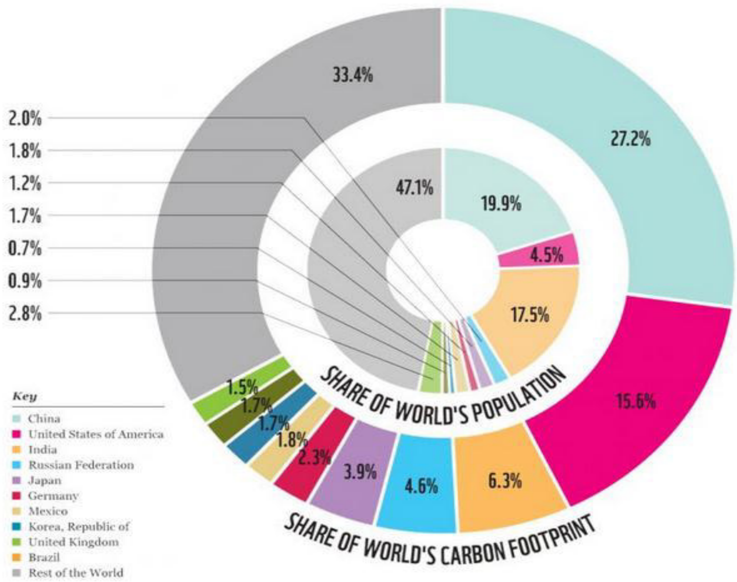


Figure (14) The combination of all forces (consumption, deforestation, agriculture and food, emissions) underscores more than ever the value of a comprehensive measure like the Ecological Footprint that takes into account all competing demands on the biosphere, including CO_2 emissions and the capacity of our forests and oceans to absorb C. [63]

Dams and their impact on the environment

WWF reports there are 48,000 dams in the world, built to provide water for drinking and irrigation, and energy. However, they lead to habitat destruction, species loss, and displacing millions of people.

Five ways mega-dams harm the environment: Dams are often touted as environmentally friendly. Although they do represent a renewable source of energy, a closer look reveals that they are far from green. DW lays out the biggest environmental problems of mega-dams [65]:

- Dams alter ecosystems
- Dams reduce biodiversity and cause extinction
- Dams contribute to climate change
- Dams reduce water quality
- Dams waste water

Sustainable communities

Development of sustainable communities depends on reducing reliance on fossil fuels, supporting local farmers and merchants, encouraging green practices and building, consideration of native wildlife, adoption of mass transportation and cleaner methods of commuting. Sustainable development is necessary to ensure human needs like housing are met, to protect resources and biodiversity, to control climate change, and for a stable economy. The environment and the climate need to be fully protected. This can only be achieved if we open ourselves to a sustainable life. The concept of "sustainable communities" is a broad one, and several definitions can be found. In this review, we focus on the definition proposed by the World Bank's Social, Urban, Rural, and Resilience Global Practice, which includes the following four key dimensions: First, sustainable communities are environmentally sustainable in terms of cleanliness and efficiency. Second, sustainable communities are resilient to social, economic, and natural shocks. Third, sustainable communities are inclusive communities. Finally, sustainable communities are competitive communities that can stay productive and generate jobs for members of the community. The steadily growing consumption is the engine that drives the steady growth of our economy. This in turn results in major environmental impacts worldwide and the climate change and is increasingly endangering our natural basis of life and living together on earth. The five global risks of the coming years that are highest in terms of their likelihood are all environmental:

- Extreme weather events with great damage to property, infrastructure and human life.
- Governments and businesses fail to mitigate and adapt to climate change.
- Man-made environmental damages and disasters.
- Great loss of biodiversity and collapse of ecosystems with irreversible consequences for the environment, which leads to a severe depletion of resources for humanity and industry.
- Major natural disasters such as earthquakes, tsunamis, volcanic eruptions and geomagnetic storms.

Natural disasters

Since the 20th century, substantial population growth and the continuous increase in living standards have encouraged the large-scale manufacture of pharmaceuticals, medicines, chemicals, dyes, pigments, organic pesticides, fertilizers and other synthetic ingredients. Hence, the amount of these artificial ingredients has gradually increased in aquatic environments. Out of the various kinds of organic pollutants detected in aquatic environments, the amount of pesticides and their derivatives is considerable. Pesticides are a kind of chemical substances that have been generally used to safeguard produces frommicrobial, fungal, or pest attacks. The use of pesticides has certainly helped to raise agronomic growth and yield. These pesticide residues move into water in various pathways and contaminate surface water.

Earthquakes, volcanoes, tsunamis, floods, tornadoes, hurricanes, avalanches, landslides and forest fires are natural disasters that threaten people and the environment. As the Unified Computing System (UCS) report on global warming points out that, there has been an increase in extreme weather events like snow fall, storms and floods in US linked to climate change. Statista reports that besides the US, China and the Philippines are the worst affected, with total fatalities amounting to several hundred thousands.

A record-breaking Atlantic hurricane season, flash floods, earthquakes, volcanic eruptions and wildfires plagued already reeling communities from Australia to Turkey this year, as thousands of people lost their lives. According to the UNs Office for Disaster Risk Reductions, there has been a rise in climate-related disasters during the past 20 years. Between 1980 and 1999, there were 3,656 climate-related events, as opposed to 6,681 between 2000 and 2019. Those differences are reflected in the number of floods, which has more than doubled in the past 20 years, while the incidence of storms increased from around 1,457 to around 2,034. [66] At least 207 natural disasters were recorded globally in the first six months of 2020 — this is above the 21st century average (2000-2019) of 185 disasters. The number of events exceeded average in all regions except the Americas. There was an increase of at least 27 per cent in natural disasters recorded during the same time in 2019. Between January and June 2019, at least 163 natural disasters were recorded. These disasters cost the world $75 billion, according to the Aon catastrophe report, titled *Global Catastrophe Recap: First Half of 2020*, released on July 23, 2020. This is close to the average loss of $78 billion during 1980-2019. These numbers are preliminary and will change as losses continue to develop, according to the report. At least $71 billion, over 95% of the loss, was due to the weather-related disasters. In fact, around 92% of these disasters between January and June were weather-related. The economic loss is due to tropical cyclone increased by 270% above the average of 2000-2019.

Drought

Vegetation can geavily influence the underground water distribution. The team of researchers investigated how the process of evaporation and groundwater recharge differed under various kinds of soils and land uses. They examined the storage, distribution and quality of water within the landscape. Brandenburg has the lowest rainfall in the region. The annual rainfall there is 560 liters per square metre. In 2018, there was about 390 litres of water per square meter, which is 40% less precipitation than normal. Under the grassland, the water continuously recharged the groundwater. The soil could store more water. As the plants only took water from the upper soil, this led to “older” soil water. Even under normal climatic conditions, about 90% of the precipitation is said to be released back into the atmosphere; it does not flow into rivers or groundwater. The researchers have been working together with the forestry as well as the agricultural sectors to bring their research results into practice. Accordingly, groundwater levels continued to in 2020. The vegetation has still not been able to recover due to the low rainfall in the winter months. Unfortunately, people are far from ‘normal’ conditions. To improve the resistance of Brandenburg’s ecosystems to droughts and other climate changes, measures must be implemented that promote groundwater recharge and create soils that can store more water. Our results underline the central role of vegetation in the development of such strategies. [67]

Nanotechnology and future effects of nanopollution/Nanotoxicology

Nanotechnology has become one of the most important interdisciplinary sciences, and it integrates physics, chemistry, engineering and biology. It gains global public interest due to its rapidly evolving and expanding in many applications in engineering, electronics, agriculture, medicine, food industry, and environment.

According to the nano-size of nano-materials, nanoparticles have new unique physicochemical properties, overcome high pressure and temperature, and participate in many applications. Nanoparticles could pollute soil and groundwater, and eventually get into the food chain, where they can be a health risk. However, the health risks they pose are unknown since research in this area has been deemed irresponsible and therefore unfeasible. The impact of nanotechnology extends from its medical, ethical, mental, legal and environmental applications, to fields such as engineering, biology, chemistry, computing, materials science, and communications. Major benefits of nanotechnology include improved manufacturing methods, water purification systems, energy systems, physical enhancement, nano medicine, better food production methods, nutrition and large-scale infrastructure auto-fabrication. Nanotechnology's reduced size may allow for automation of tasks which were previously inaccessible due to physical restrictions, which in turn may reduce labor, land, or maintenance requirements placed on humans. Potential risks include environmental, health, and safety issues; transitional effects such as displacement of traditional industries as the products of nanotechnology become dominant, which are of concern to privacy rights advocates. These may be particularly important if potential negative effects of nano particles are overlooked.

Nanotoxicology deals with structure-activity relationships: it seeks to pin-point the specific properties that drive biological effects. Research in Nanotoxicology offers an opportunity to explore the interactions between engineered or incidental materials and biological systems at the nanoscale. [68] This has important ramifications for nanomedicine: understanding interactions at the nano-bio interface is a prerequisite for the safe and efficacious deployment of nanomaterials in patients. [69]. Toxicology deals with the cellular and molecular mechanisms that are triggered or perturbed by a toxicant. Cell death research is intimately and obviously linked to toxicology. Nanotoxicology is a relatively new discipline that embraces new developments in toxicology including the application of systems biology approaches with which to model and predict perturbations inflicted by nanomaterials in a living system. [70] Nanotoxicology can be viewed as a lesson in interdisciplinarity, and a comprehensive understanding of nano-bio interactions can only be obtained through a combination of different perspectives found in chemistry, physics, molecular biology, immunology, pharmacology, computational sciences, and so forth. Continuous communication across scientific disciplines is, therefore, critically important. The future of nanotoxicology may provide a useful template. The health impacts of nanotechnology are the possible effects that the use of nanotechnological materials and devices will have on human health. As nanotechnology is an emerging field, there is great debate regarding to what extent nanotechnology will benefit or pose risks for human health. Nanotechnology's health impacts can be split into two aspects: the potential for nanotechnological innovations to have medical applications to cure disease, and the potential health hazards posed by exposure to nanomaterials. [71]

The nanotechnology revolution is extended to include fish cultures, to participate in their growth, and to overcome their challenges. [72] Applications of nanotechnology in fish cultures include direct and indirect applications. Direct applications of nanotechnology are dealing mainly with fish: growth, reproduction, and health. Indirect applications of nanotechnology in fish cultures are concerned mainly with water quality: sterilization of ponds, reducing the rate of water exchange, reducing nitrogenous compounds concentration, water treatment, and remediation of either chemical or biological contaminants. [73]

Despite the abovementioned advantages of nanotechnology applications in fish cultures, some challenges raise several questions about their complete safety on fish health, human health, and the surrounding environment. Toxicity of nanoparticles especially metal nanoparticles can affect various fish physiological functions, antioxidant and enzyme activities, reproductive hormones, survivability of early developmental stages, and histopathological pictures. [74] Moreover, the environmental transformation of nanoparticles that is affected by many physical, chemical, or biological factors produces secondary pollutants in the environment that affect the untargeted living organisms, affect the biodiversity, and bioaccumulate within the food chain to finally affect human health. [75]

Based on what mentioned above, there are many implications of nanotechnology applications in fish farms, and they need more efforts and studies to increase the knowledge about the possible toxicity on fish and untargeted organisms. Further studies about the lowest effective dose, duration, lethal and sublethal concentrations, bioaccumulation, residues concentration, and environmental fate are required. Moreover, legislation and rules of nanomaterials synthesis and field applications should be triggered to ensure environmental safety.

Medical applications: Nanomedicine is the medical application of nanotechnology. The approaches to nanomedicine range from the medical use of nanomaterials, to nanoelectronic biosensors, and even possible future applications of molecular nanotechnology. Nanomedicine seeks to deliver a valuable set of research tools and clinically helpful devices in the near future. The National Nanotechnology Initiative expects new commercial applications in the pharmaceutical industry that may include advanced drug delivery systems, new therapies, and in vivo imaging. Neuro-electronic interfaces and other nanoelectronics-based sensors are another active goal of research. Further down the line, the speculative field of molecular nanotechnology believes that cell repair machines could revolutionize medicine and the medical field. [71]

Health hazards: Nanotoxicology is the field which studies potential health risks of nanomaterials. The extremely small size of nanomaterials means that they are much more readily taken up by the human body than larger sized particles. How these nanoparticles behave inside the organism is one of the significant issues that need to be resolved. The behavior of nanoparticles is a function of their size, shape and surface reactivity with the surrounding tissue. Apart from what happens if non-degradable or slowly degradable nanoparticles accumulate in organs, another concern is their potential interaction with biological processes inside the body: because of their large surface, nanoparticles on exposure to tissue and fluids will immediately adsorb onto their surface some of the macromolecules they encounter. The large number of variables influencing toxicity means that it is difficult to generalise about health risks associated with exposure to nano materials each new nanomaterial must be assessed individually and all material properties must be taken into account. Health and environmental issues combine in the workplace of companies engaged in producing or using nanomaterials and in the laboratories engaged in nanoscience and nanotechnology research. It is safe to say that current workplace exposure standards for dusts cannot be applied directly to nanoparticle dusts. [71] The extremely small size of nanomaterials also means that they are much more readily taken up by the human body than larger sized particles. How these nanoparticles behave inside the body is one of the issues that need to be resolved. The behavior of nanoparticles is a function of their size, shape and surface reactivity with the surrounding tissue. They could cause overload on

phagocytes, cells that ingest and destroy foreign matter, thereby triggering stress reactions that lead to inflammation and weaken the body's defense against other pathogens. Apart from what happens if non-degradable or slowly degradable nanoparticles accumulate in organs, another concern is their potential interaction with biological processes inside the body: because of their large surface, nanoparticles on exposure to tissue and fluids will immediately adsorb onto their surface some of the macromolecules they encounter. This may, for instance, affect the regulatory mechanisms of enzymes and other proteins. [71]
Environmental Impact: The environmental impact of nanotechnology is the possible effects that the use of nanotechnological materials and devices will have on the environment. As nanotechnology is an emerging field, there is debate regarding to what extent industrial and commercial use of nanomaterials will affect organisms and ecosystems. Nanotechnology's environmental impact can be split into two aspects: the potential for nanotechnological innovations to help improve the environment, and the possibly novel type of pollution that nanotechnological materials might cause if released into the environment. [71]
Environmental applications: Green nanotechnology refers to the use of nanotechnology to enhance the environmental sustainability of processes producing negative externalities. It also refers to the use of the products of nanotechnology to enhance sustainability. It includes making green nano-products and using nano-products in support of sustainability. Green nanotechnology has been described as the development of clean technologies, to minimize potential environmental and human health risks associated with the manufacture and use of nanotechnology products, and to encourage replacement of existing products with new nano-products that are more environmentally friendly throughout their lifecycle. Green nanotechnology has two goals: producing nanomaterials and products without harming the environment or human health, and producing nano-products that provide solutions to environmental problems. It uses existing principles of green chemistry and green engineering to make nanomaterials and nano-products without toxic ingredients, at low temperatures using less energy and renewable inputs wherever possible, and using lifecycle thinking in all design and engineering stages. [71]
Pollution: Nanopollution is a generic name for all waste generated by nanodevices or during the nanomaterials manufacturing process. Nanowaste is mainly the group of particles that are released into the environment, or the particles that are thrown away when still on their products. [71]
Social impact: Beyond the toxicity risks to human health and the environment which are associated with first-generation nano materials, nanotechnology has broader societal impact and poses broader social challenges. Social scientists have suggested that nanotechnology's social issues should be understood and assessed not simply as downstream risks or impacts. Rather, the challenges should be factored into upstream research and decision-making in order to ensure technology development that meets social objectives. [71]
Many social scientists and organizations in civil society suggest that technology assessment and governance should also involve public participation Over 800 nano-related patents were granted in 2003, with numbers increasing to nearly 19,000 internationally by 2012. Corporations are already taking out broad-ranging patents on nanoscale discoveries and inventions. For example, two corporations, NEC and IBM, hold the basic patents on carbon nanotubes, one of the current cornerstones of nanotechnology. Carbon nanotubes have a wide range of uses, and look set to become crucial to several industries from electronics and computers, to strengthened materials to drug delivery and diagnostics. Carbon nanotubes are poised to become a major traded commodity with the potential to replace major conventional raw materials. [71]
Nanotechnologies may provide new solutions for the millions of people in developing countries who lack access to basic services, such as safe water, reliable energy, health care, and education. The 2004 UN Task Force on Science, Technology and Innovation noted that some of the advantages of nanotechnology include production using little labor, land, or maintenance, high productivity, low cost, and modest requirements for materials and energy. However, concerns are frequently raised that the claimed benefits of nanotechnology will not be evenly distributed, and that any benefits associated with nanotechnology will only reach affluent nations. [71] Longer-term concerns center on the impact that new technologies will have for society at large, and whether these could possibly lead to either a post-scarcity economy, or alternatively exacerbate the wealth gap between developed and developing nations. The effects of nanotechnology on the society as a whole, on human health and the environment, on trade, on security, on food systems and even on the definition of "human", have not been characterized or politicized. [71]

Risks and Opportunities for Mining: Global Outlook 2020

Mining has negatively impacted natural forests and wildlife, hurt living environment for people, leads to leaching of toxic pollutants and heavy metals that pollute water, land, and air, points out Patagonia Alliance, and therefore recommends responsible mining practices. Acid mine drainage also threaten water resources The mining industry is facing new challenges. In the past, mining companies simply had to plan their production on the basis of “highest volumes at the lowest production cost” to keep stakeholders happy. Today, mining companies have to address an increasing list of demands from a wide range of stakeholders to be not only profitable and productive but also responsible and sustainable. Environmental, Social and governance matters are key considerations in this age of stakeholder capitalism. The global mining & metals sector spent 2019 balancing two competing forces. Concerns surrounding the macro picture grew, as a Chinese slowdown that started in 2018 was exacerbated by global trade tensions and slowing manufacturing across Europe and the US. However, this was partially offset by increasingly tight supplies of metals amid dwindling stockpiles, demonstrating that the underlying fundamentals of the industry remained strong (Figure 15). [76]

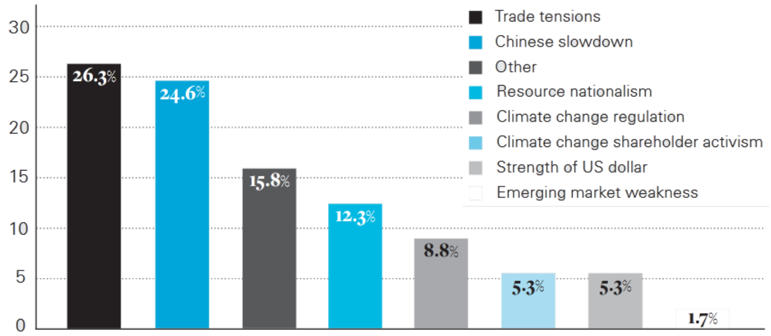


Figure (15) Key risk for mining & metals in 2020 [76]

Ecosystem destruction

One-fifth of the world’s countries are at risk of their ecosystems collapsing because of the destruction of wildlife and their habitats. Natural “services” such as food, clean water and air, and flood protection have already been damaged by human activity. More than half of global GDP depends on high-functioning biodiversity. Shrinking habitats such as aquaculture, estuaries, shellfish protection, landscaping, and wetlands are responsible for species loss, and can be protected through ecological restoration. Though global initiatives, like the Convention on Biological Diversity that was signed by 150 countries in 1992, increasingly protect ecosystems a scientific review in 2016 found nearly half of habitats are still severely threatened. Cellulose, one of the main components of wood, is proving to be remarkably useful when broken into nano-sized bits. As inventors find new uses for the versatile material, demand is growing a hefty 18%/year. Use of nanocellulose for packaging and construction can help remove CO_2, a primary contributor to climate change, from the atmosphere, and reduce demand for environment-harming plastics. But it could also increase pressure to turn diverse forests into biodiversity-bereft plantations and otherwise disrupt habitat. Habitat loss poses the greatest threat to species. The world's forests, swamps, plains, lakes, and other habitats continue to disappear as they are harvested for human consumption and cleared to make way for agriculture, housing, roads, pipelines and the other hallmarks of industrial development. Without a strong plan to create terrestrial and marine protected areas important ecological habitats will continue to be lost.

Energy conservation

Use of renewable energy for home and business can affect energy efficiency, and avoiding fossil fuel use to mitigate climate change and protect the environment. The European Union committed itself in 2009 to the reduction of its GHG emissions by between 80 and 95% by 2050. The European Climate Foundation (ECF) has commissioned a series of reports from various sector experts to quantify that goal, assess how it can be achieved and what its impacts might be. Energy Savings 2020 is the latest report in the series. The role of this report is to assess the impact of current EU energy and climate policies and to make recommendations on the design of an overarching energy saving policy framework to achieve Europe’s 20% energy savings target by 2020 as a vital step to meet its 2050 GHG commitment. [77]

Intensive farming

Monoculture, irrigation, and excessive use of chemical fertilizers and pesticides can leads to loss of soil fertility and increase in carbon emissions according to the Union of Concerned Scientists. Similarly cattle rearing in industrial farming rely on antibiotics that pose a health risk for people. Moreover, as WWF points out in many parts of the world, cattle rearing cause overgrazing, forest destruction and degradation, and methane emissions. Agricultural products, food and culinary traditions are a major part of the European Union's (EU's) regional and cultural identity. This is, at least in part, due to a diverse range of natural environments, climates and farming practices that feed through into a wide array of agricultural products. A growing share of consumers gives importance to the provenance of their food, for example choosing regional products or traditional specialities. This may be contrasted with the growing share of consumers who choose to shop in discount retailers that have radically changed the market for groceries in several EU Member States. Around two fifths of the EU's land is farmed: this underlines the important impact that farming can have on natural environments, natural resources, wildlife as well as soil and water quality. Farmers are increasingly being asked to manage the countryside for the benefit of everyone; delivering a public good, so that the whole of society can benefit from a countryside that is carefully managed and well looked after. There are a range of environmental issues that affect farmers in the EU, among which: the impact of climate change on agriculture and of agriculture on climate change; water pollution and scarcity; soil erosion and compaction; the impact of agriculture on air quality; preserving landscapes and biodiversity. [78]

CONCLUSION

Nowadays, the rapid economic development brings great damage to the environment and seriously restricts the sustainable development. Therefore, the worldwide intervention in pollution control and environmental protection is particularly important

Depending on the great challenges facing humanity is the increase in food production and environmental protection as well as the waste management to meet the ever-growing human population, economists and environmentalists have urged policymakers for years to increase the price of activities that emit GHGs (one of our biggest environmental problems), the lack of which constitutes the largest market failure, for example through C taxes, which will stimulate innovations in low-carbon technologies. Research on the relationship between environmental regulation and technological innovation should be the focus of scholarly attention in future as the main task for environmental and global protection.

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