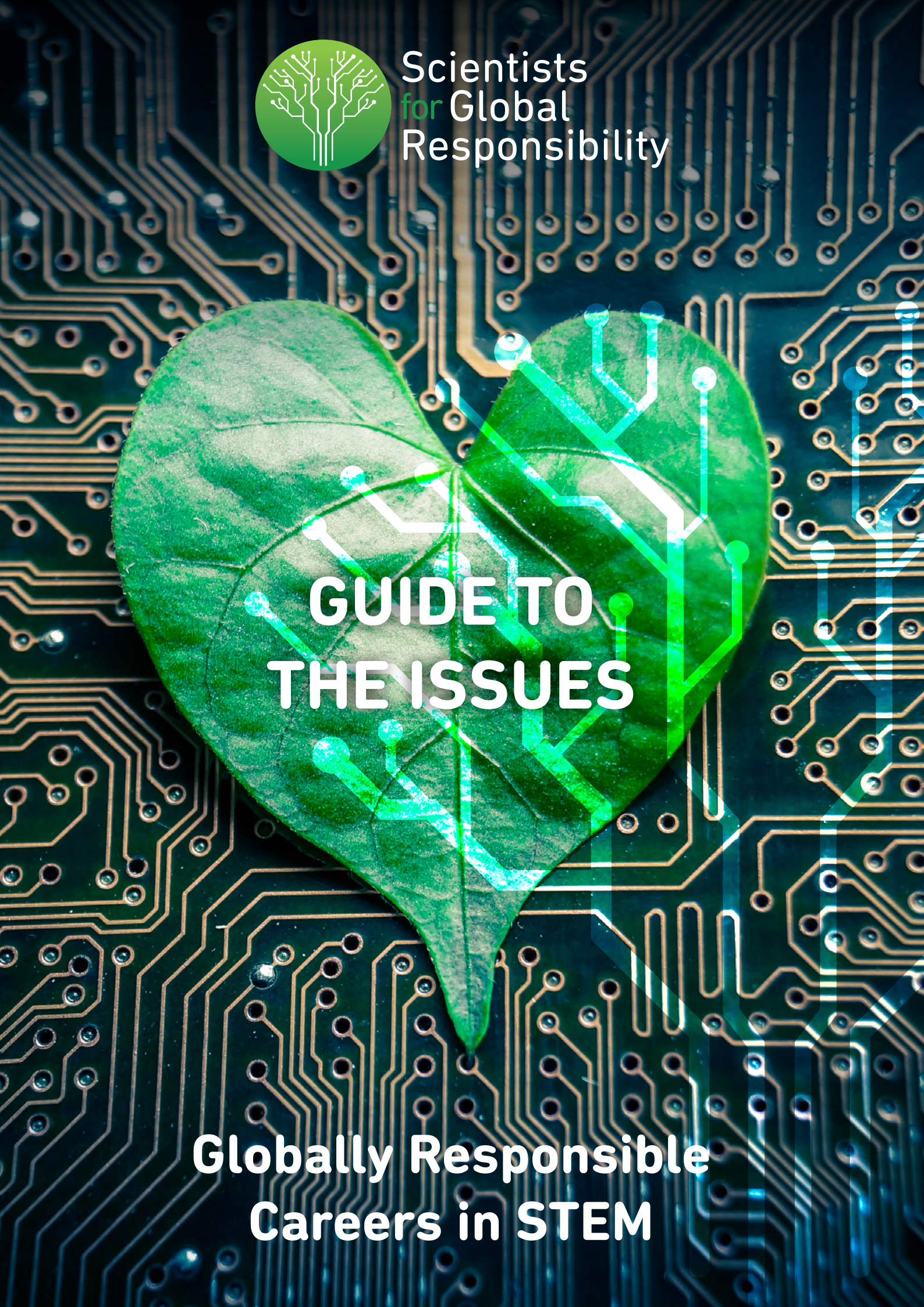

Scientists
for Global
Responsibility
GUIDE TO
THE ISSUES
Globally Responsible
Careers in STEM

Issues in STEM Careers

Some of the issues you could be concerned about in your STEM career are outlined with consideration of their impact relative to the UN sustainable development goals:

1 NO POVERTY
2 ZERO HUNGER

- Public investment in sustainable agriculture can help reduce hunger and poverty and enhance productivity, however the investment in agriculture, compared to its contribution to the economy, is on the decline. Rising food prices is another problem influencing hunger, particularly in less developed countries.
- It is vital that nutrition is improved, and that sustainable agriculture is promoted and encouraged. There are many implications of the climate crisis on food and hunger, such as soil degradation, water shortages and pollution, and changing climates affecting crops, and in many places, people may be forced to relocate.
- Globally it is important to improve food security (food security is a measure of the availability of food and individuals' ability to access it), with food insecurity having risen from 23.2% of the population affected by either moderate or severe food insecurity in 2014 to 26.4% in 2018 [1].
- Developing countries already struggle with lack of infrastructure, and fewer resources, all hindering their ability to adapt. These countries are dependent on existing resources to tackle high rates of poverty and income inequality, both of which will be intensified with climate change.
- Disasters, including natural disasters that are exaggerated by climate change, exacerbate poverty. Public funds that could have originally been used towards, for example education, will now have to fund adaptations such as sea walls, increased irrigation, or storm water systems to tackle the effects of climate change.

CAREERS

Biotechnologist – Microbiologist – Soil scientist – Chemical engineer – General practice doctor – Food technologist – International aid / development worker

3 GOOD HEALTH AND WELL-BEING
6 CLEAN WATER AND SANITATION

- The progress in health needs to be accelerated across the world, with less than half of the global population covered by essential health services in 2017 [1].
- Environmental changes are creating new health challenges, such as those caused by pollution, or the increased likelihood of the emergence of new diseases, due to farming, illegal animal trade, and overcrowding. Health concerns associated with climate change are heat-related ailments from higher temperatures, malnourishment due to increased strain on food supplies/ increased prices, and diseases that can be associated with increased flooding and pollution.
- Antibiotic resistance is one of the biggest threats to global health, food security, and development today and misuse of antibiotics in humans and animals is accelerating the process means they are becoming less effective which has led to the emergence of bacteria that have developed resistance to many different types of antibiotics. To prevent and control the spread of antibiotic resistance, the health industry can invest in research and development of new antibiotics, vaccines, diagnostics and other tools. The agriculture sector can contribute through: not using antibiotics for growth promotion or to prevent diseases in healthy animals; vaccinating animals to reduce the need for antibiotics and use alternatives to antibiotics when available; promote and apply good practices at all steps of production and processing of foods from animal and plant sources; and preventing infections through improved hygiene and animal welfare.
- Environmental pollution has a cumulative effect on human health, these include air pollution, water pollution, chemical pollution, and noise pollution. Air pollution can cause respiratory problems such as allergies, asthma, eye and nose irritation and bronchial infections. Both ambient (outdoor) and household (indoor) air pollution are responsible for about 7 million deaths globally per year [2].
- As of 2017 2.2 billion people lacked safely managed drinking water and 4.2 billion people lacked safely managed sanitation, both of which are incredibly important for good health and quality of life [1]. Lack of sanitation can increase the spread of diseases, as can drinking contaminated water. Human activities have had a detrimental effect on water supplies, with the spread of industrialisation being the leading cause of pollution. Dealing with contaminated water or drinking it poses real health risks, including diseases such as typhoid and cholera, and other disorders and problems, such as hormonal disorders, cancers, and brain dysfunction.

3 & 6 CONTINUED >>

- Many places lacking clean water and sanitation need improvements in infrastructure and will require the engineering skills to make these things available, and to have them managed sustainably within the communities. Many regions and less developed countries are experiencing disturbing levels of water stress – where more fresh water is withdrawn from natural resources than is available which will be made worse with climate change.
- Armed violence is among the leading causes of premature death, and it victimises even more people by spreading injuries, disability, psychological distress and disease. Disarmament and arms control reduce the impact of conflict on human health.

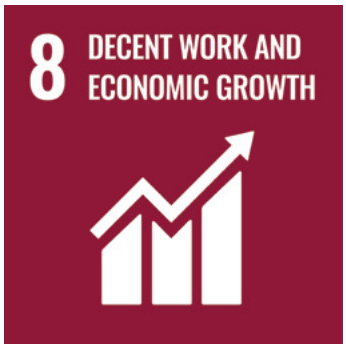
CAREERS

Anaesthetist — Analytical chemist — Biotechnologist — Cardiologist — Chemical engineer — Clinical radiologist — Clinical scientist, biochemistry — Clinical scientist, genomics — Clinical scientist, medical physics — Consulting civil engineer — Contracting civil engineer — Cyber security analyst — Data analyst — Database administrator — Design engineer — Environmental consultant — Environmental engineer — Environmental manager — Epidemiologist — General practice doctor — Geophysicist — Hospital doctor — International aid / development worker — Mechanical engineer — Microbiologist — Nature conservation officer — Neurologist — Ophthalmologist — Paramedic — Pathologist — Pharmacologist — Psychiatrist — Radiation protection practitioner — Structural engineer — Surgeon — Sustainability consultant — Toxicologist — Water engineer

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION, AND INFRASTRUCTURE

12 RESPONSIBLE CONSUMPTION AND PRODUCTION



- Inclusive and sustainable industrialisation needs to be promoted, building resilient infrastructure, facilitated in developing countries through enhanced financial, technological, and technical support. Full and productive employment, safe and secure working environments, and decent work for all are essential for sustainable economic development.
- Higher levels of economic productivity through diversification, technological upgrading and innovation are needed. Global resource efficiency in consumption and production needs to be improved, and to decouple economic growth from environmental degradation. Economic research feeds into how economic development happens, how the economic system needs to be reformed and how science and technology feeds into this system.
- Many of the least developed countries are behind in industrialisation, which also means a lot of the industrial infrastructure these countries have are higher polluting than more advanced industrialisation.
- Fostering innovation is essential to help developing countries have access to the same, modern industries as developed countries, to keep improving industrial processes and infrastructure, and to help combat the climate crisis.
- Consumption and production are key to the global economy. However, they are ravaging the health of the planet, through natural resources being used unsustainably. Unequal and unfair subsidies, such as for fossil fuels, are still a serious concern. An unacceptably high proportion of waste, such as with food, is lost along the supply chain, and the amount of waste is increasing. A circular economy process of production needs to be implemented.

8, 9 AND 12 CONTINUED >>

- Excessive military spending harms economic growth and can produce undesirable social and political consequences. Stemming the proliferation and easy availability of arms can counter the recruitment and use of child soldiers. Opportunities to build decent livelihoods can attract young men away from armed groups or gangs. Adequate arms regulation helps prevent illicit transfers of weapons in support of human trafficking, modern slavery or forced labour.

CAREERS

Application analyst — Architect — Chemical engineer — Consulting civil engineer — Contracting civil engineer — Cyber security analyst — Data analyst — Database administrator — Design engineer — Electrical engineer — Electronics engineer —Environmental consultant — Environmental engineer — Environmental manager — Food technologist — Forensic scientist — Geophysicist — International aid / development worker — Mathematics — Mechanical engineer — Metallurgist — Nanotechnologist — Radiation protection practitioner — Software/ systems engineer/developer — Soil scientist — Structural engineer — Sustainability consultant — Systems analyst — Toxicologist — Water engineer — Web designer — Web developer

7 AFFORDABLE AND CLEAN ENERGY
13 CLIMATE ACTION

- Access to clean, affordable energy is lacking, even in developed countries, this needs to be improved to meet carbon targets to help tackle climate change. As of 2017 only 17% of global energy consumption was renewable, and the energy efficiency improvement rate fell short of the 3% target at 1.7%. As of 2018, 789 million people lacked electricity globally. In sub-Saharan Africa, 53% of the population are affected by this electricity deficit [1].
- Coal is still used in many less developed countries, and some more developed countries, and many more coal plants are planned around the world. Modern, cleaner, and more sustainable renewable energy is already available in many countries, which is an important part of them meeting long-term climate goals. However, the international flow of funds for these issues is not reaching the least developed countries proportionally.
- Many materials created during the operation of a nuclear reactor are radioactive and as they decay, they emit radiation. The energy carried by this radiation is often sufficient to cause damage to biological cells and is therefore a health risk. Thus, radiation is the primary cause of both the waste and safety concerns related to nuclear energy.
- 2020 was the second warmest year on record, at the end of the warmest decade (2010-2019), and many climate disasters were documented across continents. This is the decade when we need to take action.
- We are off track to meet the Paris agreement target of limiting global warming to 1.5 °C. Many different aspects of life need to be improved to reach this target, and will require a great deal of scientific, and social innovation. It is imperative that we take urgent action to combat climate change and its impact, and although financing for this action has substantially increased, it is still less than the money invested in fossil fuels.
- Measures for disarmament can reduce military expenditures and redirect public resources/ spending towards social and economic initiatives that can contribute to greater equality.

CAREERS

Analytical chemist — Biotechnologist — Chemical engineer — Consulting civil engineer — Contracting civil engineer — Data analyst — Database administrator — Design engineer — Electrical engineer — Electronics engineer —Environmental consultant — Environmental engineer — Environmental manager — Geophysicist — International aid / development worker — Marine biologist — Mathematics — Mechanical engineer — Metallurgist — Microbiologist — Nature conservation officer — Radiation protection practitioner — Soil scientist — Structural engineer — Sustainability consultant — Water engineer — Web designer — Web developer

4 QUALITY EDUCATION
5 GENDER EQUALITY
10 REDUCED INEQUALITIES

- It is important that education is inclusive and of equitable quality everywhere, not just in STEM subjects but across all subjects, and current projections show that over 200 million children will still be out of school in 2030, and only 60% of students are projected to complete secondary school [1].
- Lifelong learning opportunities for all must be promoted, whether furthering studies or completing studies previously unavailable for whatever reasons. All students must be encouraged to participate in STEM education. All learners should acquire the knowledge and skills needed to promote sustainable development. This should include education about sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, appreciation of cultural diversity and of culture's contribution to sustainable development.
- Whilst fewer girls are forced into early marriage and more women are in leadership roles, full gender equality has not been reached, and 45% of women globally do not have decision-making power over their sexual and reproductive health and rights, which is one of many reasons why it is vital to empower all women and girls.
- Orderly, safe, regular and responsible migration and mobility of people should be facilitated, including through the implementation of planned and well managed migration policies.
- The use of enabling technology must be enhanced, in particular information and communications technology, to promote the empowerment of women, because women and children, who tend to be vulnerable groups in society, will become even more so with the effects of climate change.
- Limiting the proliferation and uncontrolled circulation of weapons in communities contributes to safe and non-violent learning environments for all. Disarmament education contributes to education on peace and non-violence, conflict resolution, sustainable development, gender equality, economic justice, human rights and tolerance of cultural diversity.

4, 5 AND 10 CONTINUED >>

- Young men are overwhelmingly responsible for the misuse of small arms. While men make up most direct casualties, women are more frequently victims of gender-based violence that small arms facilitate. Empowering women and ensuring their equal and meaningful participation in disarmament and arms control decision-making processes can lead to more inclusive, effective and sustainable policy outcomes
- Measures for disarmament can reduce military expenditures and redirect public resources/ spending towards social and economic initiatives that can contribute to greater equality.

CAREERS

Database administrator — Epidemiologist — International aid / development worker — Teacher — Toxicologist

11 SUSTAINABLE CITIES AND COMMUNITIES

- To make cities and human settlements inclusive, safe, resilient, and sustainable will involve many innovations and progress in many areas such as:
- Buildings – building for the future, ensuring buildings are sustainable, including access for all to adequate, safe and affordable housing and basic services, and to upgrade slums.
- Transport. Public transport – only around half of the urban population of the world has easy access to public transport; this needs improvement to ensure there is access to low cost, efficient public transport. Approximately 1.35 million people die each year as a result of road traffic crashes [3]. The climate crisis has shown the need to make significant changes to the way we live, work and travel if we are to move towards an environmentally sustainable pathway. The modal shift is needed to much more active travel, cycling and walking; much greater use of public transport; where private or fleet vehicle use is necessary, zero-emission vehicles (such as EVs).
- Open public spaces – access to open public spaces is often limited in towns and cities, these spaces promote health and productivity, and can also increase biodiversity in urban areas.
- Consumption – in many places, particularly in developed countries, consumption of things, such as energy and materials, is high. This needs to be addressed to help lower carbon footprints and the impact this has on climate change.
- Pollution – in 2016, 9 out of 10 people in urban areas across the world were breathing air that did not meet the WHO's guidelines for particulate matter [1]. Cities are often polluted, increasing the chances of health problems.
- Society and Community – working together as a society to deal with the issues we face, and reigniting a sense of community
- Cities and human settlements need to implement integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and to implement holistic disaster risk management at all levels.

CAREERS

Architect — Consulting civil engineer — Contracting civil engineer — Cyber security analyst — Data analyst — Database administrator — Design engineer — Electrical engineer — Electronics engineer — Environmental consultant — Environmental engineer — Environmental manager — Geophysicist — International aid / development worker — Radiation protection practitioner — Structural engineer — Sustainability consultant — Water engineer

14 LIFE BELOW WATER
15 LIFE ON LAND

- The oceans, seas and marine resources need to be conserved and used for sustainable development. They are sometimes known as the Earth's life support, as they help regulate climate systems. Protecting marine environments, particularly key biodiversity areas, is vital, as these fragile ecosystems once lost will be impossible to revive. Overfishing and illegal fishing are huge issues when it comes to the sustainability of fish populations.
- Ocean acidification is a growing problem, as the ocean is the largest carbon sink, absorbing a large amount (approximately 23%) of the CO_2 emissions emitted through human activity. This absorbed CO_2 makes the ocean more acidic, with a large drop in pH recorded since preindustrial times.
- The sustainable use of terrestrial ecosystems needs to be protected, restored, and promoted. One fifth of the land on Earth is degraded, which means it can no longer be used to grow crops, or even grow wild plants that would have previously grown, increasing the amount of desert land there is on Earth. This affects 3.2 billion people [1], pushing species to extinction and escalating climate change. Halting and reversing land degradation will be a vital part in making sure there is enough food, and safe habitats for humans and animals.
- Forests, which are declining at an alarming rate with many species still threatened with extinction, must be sustainably managed. Deforestation is still a huge issue with forests destroyed to make way for things such as plantations, or land for livestock, which is driven by consumerism. Biodiversity losses must be halted to retain the fine balance within important ecosystems.
- Wildlife crime endangers the animal species involved, and human health, through trafficking, the spread of disease, and the emergence of new deadly diseases
- Land may be polluted by chemicals from the use of industrial materials such as cleaning materials, cosmetics, car oils, preservatives, industrial colours, food flavourings, chemical and insecticidal fertilizers, pesticides and other manufactured materials that are frequently used by humans. These could potentially cause birth defects, skin diseases, breathing disorders, and cancers. liver infections, diarrhoea, and some hormonal disorders.
- Contamination from remnants of war and the testing and use of nuclear, chemical and biological weapons have disastrous environmental consequences. Disarmament and arms regulation reduce the impact of weapons on the environment.

14 AND 15
CONTINUED >>

CAREERS

Analytical chemist — Architect — Biotechnologist — Chemical engineer — Consulting civil engineer — Contracting civil engineer — Data analyst — Database administrator — Design engineer — Environmental consultant — Environmental engineer — Environmental manager — Geophysicist — Marine biologist — Metallurgist — Nature conservation officer — Radiation protection practitioner — Soil scientist — Structural engineer — Sustainability consultant — Toxicologist — Water engineer

16 PEACE, JUSTICE, AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS

- Peaceful and inclusive societies for sustainable development must be promoted, access to justice for all must be provided, and effective, accountable, and inclusive institutions must be built at all levels.
- Despite civilians being protected in armed conflicts under international law, between 2015 and 2017 more than 100,000 civilian deaths were recorded [1]. One in eight of those was either a woman or a child. The trade in illegal arms must be tackled along with detecting the use banned technologies. These are fuelling human rights abuse. There is also the cost of clearing up after conflicts.
- Militarism, as the belief that a nation should develop, maintain, and use a strong military to expand its interests, contributes to poverty in developing nations and diverts resources. Money for high-technology equipment cannot be used for infrastructure, health care, education, or other economic needs. Militarism suppresses dissent, creates environmental damage, institutes classism, and leads to crime and terrorism [2].
- Disarmament, non-proliferation and arms control play a vital role in preventing conflict, and in forging and sustaining peace.
- Mobilising sufficient resources in support of disarmament and arms regulation is critical to achieving the 2030 Agenda for Sustainable Development. Increased availability of high quality, timely, disaggregated and reliable arms-related data can inform discussions about the relationship between disarmament, development, peace and security, leading to better decisions and policies.
- The means of implementation and revitalising the global partnership for sustainable development needs to be strengthened through promoting the development, transfer, dissemination, and diffusion of environmentally sound technologies to developing countries on favourable terms.

CAREERS

Cyber security analyst — Data analyst — Database administrator — International aid / development worker

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