
GEO-6
FOR YOUTH
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GEO-6
FOR YOUTH

ISBN No: 978-92-807-3781-3
Job No: DEW/2279/NA

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Disclaimers

Suggested citation
United Nations Environment Programme (2021).
GEO-6 for Youth. UNEP, Nairobi.
https://www.unenvironment.org/resources/assessment/global-environment-outlook-6-youth

Table of Contents

Acknowledgments VII
GEO-6 for Youth Foreword IX
Co-chairs' Preface X
Executive Summary XIII
General Introduction XVIII
#GEO4Youth Survey XIX
#YouthMatters XIX
Reading tools XXI

1 Our Changing Environment 1

1.1 Introduction 3
1.2 Human Impacts on the Environment 4
1.3 The Earth System 7
1.4 Key Environmental Challenges for 32
1.5 Conclusion 35
References 37

2 Towards a Sustainable Future Earth 47

2.1 Introduction 49
2.2 Healthy Planet, Healthy People 50
2.3 Different visions of a sustainable future 53
2.4 A Look into the Future 59
2.5 We need transformational change 77
2.6 Conclusion 80
References 82

3 From Empathy to Action 87

3.1 Introduction 89
3.2 From a Linear to a Circular Economy 89
3.3 Facing Challenges to Action: What are the perceived challenges in creating a sustainable world? 92
3.4 Change Starts with Us! Guidance for 96
3.5 Spread the Actions Across Generations: 107
3.6 Build Back Better 114
3.7 United We Stand! 116
3.8 Conclusion 122
References 124

4	**Your Career, Our Future**	**128**
4.1	Your Career Choice Matters	130
4.2	Working Greener	131
4.3	Can Any Job Be Green(er)?	149
4.4	Conclusion	176
	References	178
	The way forward	188
	References	206
	GEO-6 for Youth: Abbreviations and Acronyms	207
	Glossary	209
	GEO-6 for Youth Reviewers	219

Acknowledgments

The sixth Global Environment Outlook (GEO-6) for Youth report is a product of the generous dedication and extraordinary investment of numerous individuals. Their knowledge, expertise and insight helped shape this important publication. A complete list of reviewers follows the annexes of this publication. Special thanks are extended to:

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GEO-6 funding
The following organizations provided funding directly or indirectly to the sixth Global Environment Outlook (GEO-6 for Youth): the European Union, the Government of Norway, the Swedish International Development Cooperation Agency.

Together with UN Environment's Environment Fund and Regular Budget, these contributions have made the production of the GEO-6 for Youth possible.

Co-funded by the European Union

Sida

Norwegian Ministry of Climate and Environment

GEO-6 for Youth Foreword

The global pandemic COVID-19 has disrupted every aspect of our life. But unfortunately the pandemic is not the only crisis facing humanity. Environmental crises are part and parcel of the journey ahead. Wildfires, hurricanes, record temperatures, plagues of locusts, floods and droughts have become so commonplace they do not even always make the news. And whether we speak of the health crisis or the planetary crisis, both will have a disproportionate, severe and long-lasting impact on young people.

But it is clear that young people are not willing to sit back and let us leave them with massive debt and a broken planet. They know what's at stake. Youth groups, movements and voices have seen young people take center stage in the global fight to protect the Earth from harm. The GEO-6 for Youth report, developed by a team of young experts and authors, aims to contribute to this movement by providing a "one-stop-shop" for young people who are looking to understand the state of the environment and to find out what they can do about it – in their daily lives, in their communities, as well as in their choice of careers. The important choices that young people make will help us all build back sustainably, build back with equity and inclusion, and ultimately, put the planet on a more environmentally sustainable course.

It is easy to understand why the world's youth are taking such a powerful stand to protect the environment. From climate change and species loss, to air and plastic pollution – young people are being forced to live with severe environmental challenges they did not create. But they are not wallowing in a sense of injustice. Instead, they are pushing the rest of us to step outside our comfort zones and take the ambitious steps that a healthy planet requires. This world is theirs to inherit, and we owe it to them to support them in their courageous efforts, while also doing our best to heed their call for urgent action.

This publication aims to capture the enormous strategic opportunity that young people hold to drive global transformative change. The report's recommendations should serve as an inspiration to everyone, no matter their age, to tackle our planet's urgent challenges with the youth's zeal and idealism because that is precisely what the world needs.

Inger Andersen

Executive Director
United Nations Environment Programme

Co-chairs' Preface

The GEO-6 for Youth report is being released at a turbulent time, as the world grapples with the COVID-19 pandemic (possibly of zoonotic origin). The pandemic has had profound social, ecological and economic impacts globally and forced us to take stock of the strong link between planetary health and human health. It has emphasized the urgent need to rethink our interactions with and impacts on the environment. The pandemic has also laid bare the stark inequalities and inequities that affect all human beings in different ways.

Due to the pandemic, global trade is expected to contract by between 13-32 per cent, supply chains have been disrupted and there is increased COVID-19 related waste. Measures taken during this pandemic such as global lockdowns, social distancing, restricted movement and closure of schools and businesses have adversely impacted people's lives and livelihoods. About 1.6 billion workers have lost their jobs in the informal sector due to COVID-19. The cracks in a range of pivotal societal systems (healthcare, financial system, education, international aid, intergenerational support and ecological support) are more apparent now than ever before. There has been a 30 per cent increase in domestic violence globally while child marriage and teenage pregnancy are on the rise in many countries. Remote or virtual learning, which has been encouraged to limit the spread of the pandemic, remains out of reach for at least 500 million students. This highlights the issues around the digital divide at a global scale. In addition, the pandemic could reverse decades of improvement in education, child mortality and child labour, among others.

To recover from this pandemic we need to better understand our relationship with nature, improve social cohesion and build stronger resilience networks. This pandemic amplifies the immediate need for conserving global biodiversity and greater respect for our environment. It also show us the need to combat illegal wildlife trade to prevent future epidemics like this in the future. Finding the ways to bring about these changes will surely be transformational and the GEO-6 for Youth report is one step in that direction.

The Global Environment Outlook for Youth (GEO-6 for Youth) shows us what the science says on key environmental issues and how these can affect the world's youth. One-sixth of the human global population of our changing planet consists of young people who will experience the greatest share of the consequences of environmental degradation over time. It is estimated that young workers are twice as likely to be living in extreme poverty as adult workers. The choices young people make today – or the lack of them – will have a profound impact on the planet and on our survival as a species.

The GEO-6 for Youth report shows a variety of evidence-informed approaches that could help move us toward an environmentally sustainable future for all. The environmental challenges

described in this report offer significant opportunities for green entrepreneurship and emphasize the need for lifestyle changes. National governments and international organizations have already committed trillions of dollars to help us recover from this pandemic, support the economy and protect livelihoods. While the emphasis may be on short term recovery, we must not lose sight of the long-term gains for sustainable development and the need to build resilience into systems that support us every day. It is crucial that the funds committed by governments support a greener recovery by supporting green(er) jobs. The world is looking to young people to inspire and drive the transformation towards an environmentally sustainable world. Their individual actions, when scaled up, could have monumental global impacts.

As co-chairs of this report, we are honored to have worked with an incredible team of dedicated young authors and experts from around the world. Multiple brainstorming sessions, three in-person meetings (in Thailand, Kenya and Austria) and two rounds of peer review have kept us on track to deliver a report that is global in its vision and yet sensitive to local realities. We are grateful to the European Union, United Nations Member States and to all the institutions that have supported this initiative, as well as to the United Nations Environment Programme (UNEP) Secretariat for their constant support, patience and guidance. We also thank the reviewers for their valuable comments, and the graphics and communications teams for their support.

We humbly present this report to the world's youth and hope that we can all work together to bend the curve before it is too late.

Nibedita Mukherjee

Charles Mwangi

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Executive Summary

The Global Environment Outlook (GEO) is the United Nations Environment Programme's most important publication that periodically assesses the state of the global environment. The sixth edition (GEO-6), published in March 2019, presents a stark picture of the state of the environment and prospects for the future. GEO-6 states that unless we radically and urgently change our economies and our societies, we will not be able to achieve the United Nations Sustainable Development Goals by 2030.

Such radical change needs to include everyone and all organizations at every level regardless of age, disability, gender/sexual orientation, religion, or level of governance or business. During their lifetime young people, in particular, will face the environmental consequences of actions taken or not taken today. Their active engagement in understanding the state of our environment (and the importance of protecting it) is critical if we are to achieve sustainable development globally.

Young people need a strong voice and must play a key role in achieving environmental sustainability. The GEO-6 for Youth report provides them with a platform: this report is both a guide for action and a manifesto on how to achieve sustainability within a generation.

What is the current state of the environment and how will this affect today's young people?

- **Young people between the ages of 15 to 24 account for one-sixth of the global population.** The world's youth today are 1.2 billion strong.

- **The United Nations Sustainable Development Goals (SDGs) have environmental, social and economic dimensions.** We are not currently on track to achieve any of the environmental dimensions of the SDGs. Failure to meet the SDGs will disproportionately affect young people around the world.

- **Our planet's resources are not infinite and its ecosystems are not invincible.** It is estimated that humanity has already exceeded the safe limits of two planetary boundaries: biosphere integrity and biochemical flows. Other boundaries are in danger of being exceeded.

- **Current environmental problems are largely driven by human activities that adversely affect our well-being.** The impacts of the main human drivers (population growth, economic development, urbanization, technology and climate change) present urgent challenges with respect to managing environmental problems.

- **The COVID-19 pandemic has shown once more that there is a strong link between planetary and human health.** Research shows that 60 per cent of all known infectious diseases in humans and 75 per cent of all emerging infectious diseases are zoonotic. Unsustainable human activities, including exploitation of natural habitats and wildlife are increasing the development and spreading of infectious diseases.

- **Currently, 91 per cent of the world's population lives in areas which are above the safe air quality limits set by WHO guidelines.** Outdoor air pollution could cause 6 to 9 million premature deaths a year by 2060 and cost 1 per cent of global GDP – around USD 2.6 trillion annually. Air pollution is expected to reduce the yield of staple crops such as wheat, maize and rice by 26 per cent by 2030.

- **Changes in land use and land cover are occurring at an alarming rate.** We are losing 12 million hectares of productive land every year due to drought and desertification. Particularly in areas prone to drought, the long-term consequences of changes in land use and land cover include biodiversity loss, food, water and fuel insecurity, unemployment, disrupted education, increased child labour, forced displacement and armed conflict.

- **Currently, 50 per cent of habitable land is used for food production.** Livestock production uses 77 per cent of agricultural land, but it provides only 16 per cent of humans' energy needs and 32 per cent of their protein needs. Livestock production contributes very significantly to climate change and is a major source of land and water degradation.

- **Globally we face a tremendous loss of biodiversity. We are in the midst of a major species extinction.** An estimated 1 million out of 8 million plant and animal species on Earth are at risk of extinction, many within decades. Extractive industries, such as mining and agriculture, are responsible for more than 80 per cent of biodiversity loss.

- **Human activities have affected 40 per cent of the world's oceans.** The impacts of these activities include exhaustion of fish stocks, loss of habitats, coral reef bleaching, and pollution by plastic debris. On average, 8 million tons of plastic waste finds its way into the oceans annually. Only some 9 per cent of the world's waste plastic is being recycled, while the rest is dumped in the natural environment. Tiny plastic particles (microplastics) are found in, for example, seafood, sea salt, and tap and bottled water. Scientists are concerned about the implications for both marine life and human health.

- **Only 3 per cent of global water resources is freshwater. Only 0.5 per cent of this freshwater is suitable for drinking.** More than 2.1 billion people do not have access to freshwater at home. When children are required to fetch water, they have less time to spend at school.

- **One-third of edible food (an estimated 1.3 billion tons annually) is lost or wasted globally.** This is enough to feed as many as 2 billion people every year.

What does the future hold if we continue on the same path? And how can we achieve a sustainable world by 2050?

- **Around 60 per cent more primary energy will be consumed in 2050 than today.** Most of it is expected to come from fossil fuels, which contribute to air pollution and climate change. For a more sustainable future, there is a need to invest heavily in renewable energy.

- **Air quality will continue to become worse. It is estimated that poor air quality will reduce global Gross Domestic Product (GDP) by 1 per cent by 2060, while increasing health care costs and reducing food production.** For a more sustainable future, lifestyle changes are needed, together with stronger legal and financial measures to prevent air pollution.

- **Greenhouse gas (GHG) emissions are projected to increase by 50 per cent by 2050, resulting in the planet becoming more than 2°C warmer.** This would lead to a global loss of over 99 per cent of all coral reefs, significant sea level rise, and more frequent and more intense extreme weather events, accompanied by severe economic losses. **For a more sustainable future, we need to drastically reduce GHG emissions and keep the global temperature increase below 1.5°C.**

- **Demand for animal protein-based diets could increase agricultural production by 50-60 per cent by 2050.** For a more sustainable future, we need to reduce meat and dairy consumption and drastically reduce food waste.

- **Human water demand will increase by an estimated 26 per cent globally by 2050, while water quality is projected to become significantly worse (e.g. due to chemical pollution and temperature rise).** Poor water quality could lead to 1.4 million deaths every year. To be more sustainable, we need to increase water-use efficiency, improve water quality and conserve freshwater systems.

- **The COVID-19 crisis is having profound economic, social and ecological impacts globally and provides us with a moment to take stock and rethink our relationship with the environment and the other species of the planet.** The recovery from this crisis needs to be more environmentally sustainable and inclusive. We cannot go back to our previous economic pathways and behaviours. We need to build back better through policies that focus on well-being of humans and all species, reduction of GHGs emission, nature-based solutions, circular economy practices and behavioural change.

- **To change current environmental trends, a radically different approach to development is needed.** Such an approach is needed in order to ensure a sustainable future. Young people, as well as governments and businesses, need to adopt completely different ways of thinking, particularly with regard to the energy, food and waste systems.

How can today's young people contribute to solutions through their daily choices and the types of careers they choose?

- **A global shift is needed towards a circular economy (or green economy)**, in which resource efficiency contributes to economic growth and human well-being as well as greater sustainability. In a circular economy fewer resources would be extracted and wasted. Instead, the life of materials would be extended and resources would be used as long as possible.

- **Changes in the day-to-day actions of young people** have the potential to bring about a sustainable future through the adoption of a circular lifestyle, especially in regard to use of resources and energy.

- **Young people often face challenges in changing their lifestyles and taking actions that will influence society towards change.** These challenges include feeling powerless, a lack of awareness, communication problems, the presence of corruption, and limited opportunities and funding for sustainable jobs.

- **Although some young people perceive their actions to be insignificant, small changes in their daily lifestyles have the potential to influence the economy and society globally.** For example, about 15,000 litres of water is used to produce 1 kg of beef, compared with 4,000 litres for 1 kg of pulses (lentils, peas and beans). Eating pulses instead of beef can reduce water use by 74 per cent and GHG emissions by 95 per cent. Another lifestyle change is flying less, and travelling lighter and perhaps buying carbon offsets if you do fly.

- **Cutting food waste** can reduce our environmental footprint by saving water, reducing GHG emissions and helping to restore cropland to a natural habitat for biodiversity.

- **Transformation to a circular (green) economy could generate 15 to 60 million additional jobs globally in the next two decades and lift tens of millions of people out of poverty.** The largest generation of young people in history is entering the workforce. Their career choices will have a considerable impact on the world's future.

- **The transition to a circular (green) economy requires a new mindset and skills for emerging jobs, as well as making changes in existing jobs so that they are greener.** Vocational training programmes and other initiatives focused on developing life skills can help ensure that the world's youth are in a better position to secure and retain green jobs.

- **90 per cent of the young people consulted during the preparation of this report felt that jobs can be made greener in the future.** Currently some of the fastest growing green jobs are in the food, energy and waste sectors.

- **Young people can play a pivotal role in spreading actions across generations** by being agents of change, joining collective activities, and raising awareness.

Collaborative action can influence policies, for example through voting, taking part in advocacy groups and preparing to become future local, national and global leaders.

- **We are living at a critical moment. It is time to think in terms of transformative change,** use our resources responsibly, and aspire towards a circular (green) economy in which there is less natural resource extraction while the greatest benefits are created for society.

“Arise! Awake! And stop not until the goal is reached!” –

Swami Vivekananda

General Introduction

About every five years since 1997, the United Nations Environment Programme has gathered some of the best minds on the planet to assess the health of our environment. This assessment is presented in the flagship report, the Global Environment Outlook (GEO). The sixth edition (GEO-6), launched in March 2019, is currently the most comprehensive assessment of the status of the global environment, the effectiveness of policy approaches, and possible pathways to achieve a sustainable world. GEO-6 stresses that we need to drastically alter food, energy and waste systems to ensure a healthy planet and healthy people (United Nations Environment Programme [UNEP] 2019a; UNEP 2019b).

The purpose of the GEO-6 for Youth report is to inform and engage young people, using the main findings of GEO-6. Together with the GEO for Cities and GEO for Business reports, this report is a key derivative product of GEO-6. One of the greatest challenges facing young people today is that we live on a planet with limited resources. The GEO-6 for Youth report aims to assist young people in making sustainable choices about their jobs and lifestyles, and in influencing markets to offer more sustainable products and services.

We hope that, together, we can improve environmental decision-making from the individual to the global level.

How to navigate through the report

The GEO-6 for Youth report consists of four chapters:

- **Chapter 1 – Our Changing Environment explores the impacts of human activities on environmental systems (land and biodiversity, oceans and freshwater, air and climate). This chapter also touches upon the five key drivers of environmental change.**
- **Chapter 2 – Towards a Sustainable Future Earth introduces the current trajectory and environmentally sustainable scenarios from GEO-6, while exploring what these scenarios mean for the world's youth.**
- **Chapter 3 – From Empathy to Action presents individual and collective actions young people can take which, if scaled up, would address environmental challenges associated with the food, energy and waste systems.**
- **Chapter 4 – Your Career, Our Future highlights the need for a shift in skills, and for new types of jobs, as we make progress towards a more environmentally sustainable world.**

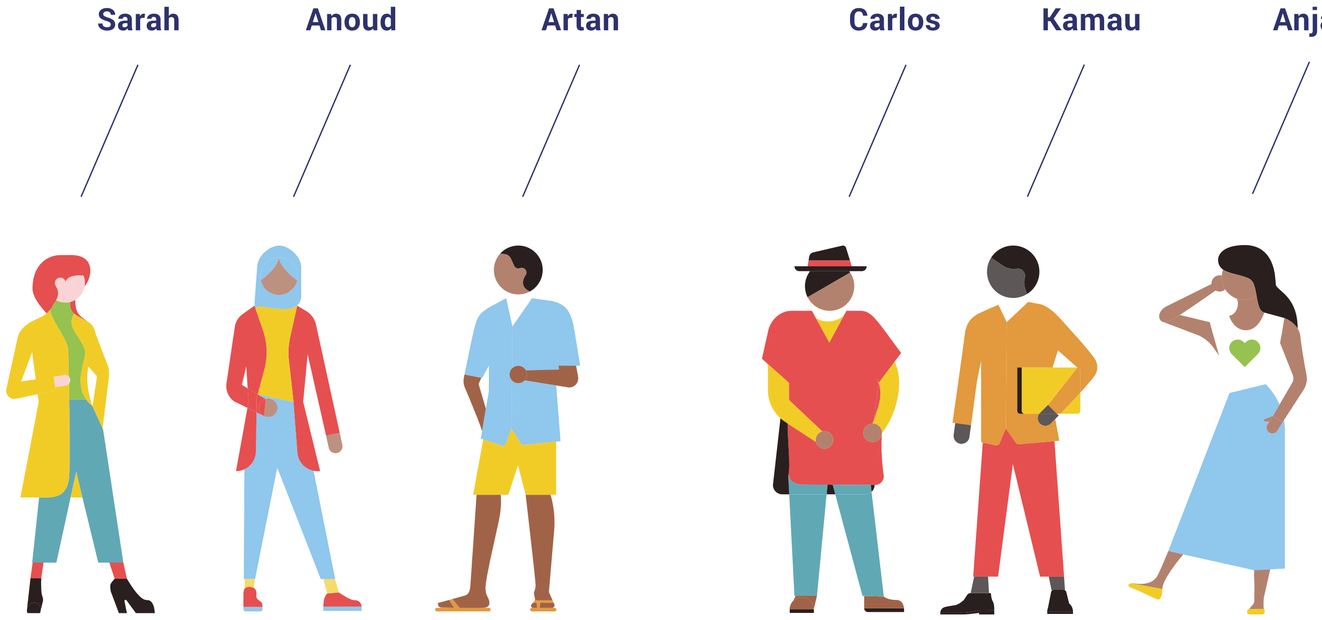
#GEO4Youth Survey

As part of the process of preparing the GEO-6 for Youth report, young people from around the world were invited to share their ideas through a survey conducted between December 2018 and April 2019. A total of 1,929 of them responded. The purpose of the survey was to gather perspectives from every world region on key environmental challenges faced by the world's youth and possible solutions to overcome them. The survey was translated into ten languages. The perspectives obtained were used in preparing Chapters 2, 3 and 4. To learn more about the survey, see Annex 1.

#YouthMatters

Young people are increasingly aware of diverse environmental challenges. They are well placed to observe the environmental problems that may impact them disproportionately, depending on where they live.

Six imaginary characters have been introduced in the report to contextualize the survey responses. The aim is to illustrate the experiences and concerns of youth through the voices of characters reporting from different parts of the world. This is meant to help readers better understand the global scope of environmental challenges. The characters are:



Ko na mauri! I am Artan. I live in Kiribati. Last year a tidal surge swept over a large area of my remote, low-lying country. It was horrible. It smashed through the doors and windows of my home. I feel hopeless that we are suffering because of rising sea levels, but I also have hope that we will try to find a way to adapt.

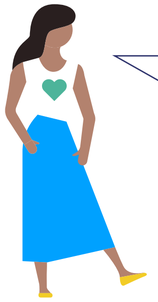
Artan, 24
Kiribati, Pacific Islands

Sarah, 23
United Kingdom

Hello! I am Sarah and I live in London. Although London's air often appears clear, I am sure I can taste the pollution. Many people I know develop coughs and eye irritation because of it. Air quality has improved since the lockdowns from the COVID-19 pandemic. But as we return to our normal path, air pollution is again on the rise. We need a long term plan!

Carlos, 19
Bolivia

¡Hola! I am Carlos from Bolivia. I used to live near Lake Poopó. It was our only source of food and income. Without this lake, where do we go? It was Bolivia's second largest lake, but now is just a dry expanse. We never thought we would have to leave our home and become refugees, fleeing not war but the effects of climate change!



Anjali, 16
India

Namaste! I am Anjali from India. I am concerned about where we throw our waste. There is a terrible lack of safe garbage disposal systems in my town. Most recyclable waste ends up in a dump yard.

Sasa! I am Kamau from Kenya. I live in a village near the Mau forest. Many wood products in your home might have come from a forest in Africa where elephants, rhinos, lions and other wild animals roam freely. Most of these forests are being cleared through illegal logging.

Kamau, 20
Kenya

Anoud, 21
Kuwait

Salam! I am Alanoud from Kuwait. As a child I would go for camping to an area which had dense vegetation. However, now there are almost no more shrubs and the grass does not grow any more. Where will we go for camping?

Reading tools

Look out for these reading tools throughout the report to help you navigate key elements:

Interactive

If this icon accompanies a graphic or box, you should be able to click on it. You can then explore that graphic or box completely or just some part of it.

Checkpoint

Checkpoints encourage you to stop and think about the facts, figures and concepts presented in the report.

Glossary

The glossary at the end of this report will help you better understand some terms. Look out for words in bold in the text. Words that are defined in the glossary are underlined the first time they are used in each chapter.

Did you Know?

Interesting facts and figures are provided throughout the report. Look out for the "Did you Know?" flag if you want to learn more about particular environmental problems and solutions.

Young people have enormous potential to influence change, from the individual level to a macro scale. We hope the GEO-6 for Youth report will help you make your voices heard and empower you to participate in decision-making processes locally, in your region and globally.

Like you, we hope an environmentally sustainable future can be achieved for all of us and for future generations.

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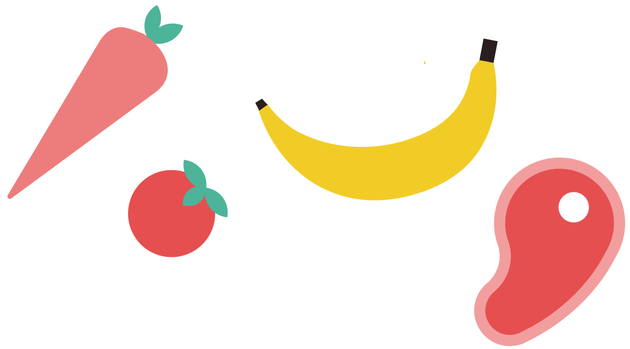
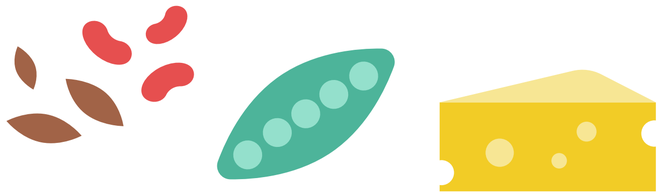
United Nations Environment Programme (2019b). *Global Environment Outlook – GEO-6: Healthy Planet, Healthy People:* Summary for Policymakers. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108639217. Or: https://www.unenvironment.org/resources/assessment/global-environment-outlook-6-summary-policymakers

“I was driven by a visceral feeling that throwing good food into a garbage can is wrong, as well as a deep desire to recover that and get it to people in need in our community. Food Recovery Network recovered 15,000 pounds in our first semester, which was good encouragement to keep going and before long, spread the movement all around the country. Our motivation was simply to solve the injustice.

There isn’t one solution to the problems that exist in our food system and environment. There are no ideas that are too crazy or ‘not good enough’ to try when it comes to environmental change. The only thing you can do that’s not good enough is to do nothing. Whether it’s joining/starting a student organization, putting together a protest, or founding a social impact business, just start doing something! I’ve just seen problems and injustices that didn’t sit right with me, and had the drive to try to change them. Anybody can do that, you just need to take the first step and try.”

Ben Simon,
CEO & co-founder of
Imperfect Produce and Food Recovery Network





1 Our Changing Environment

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1.1 Introduction

Have you noticed how rapidly our environment is changing?

Expansive wildfires in Australia, Brazil, and the United States; record breaking heat in the Arctic, Europe, and the Middle East; devastating floods across South and East Asia; historic locust swarms in Asia and East Africa; and a pandemic that has upended peoples' lives in all corners of the world – these 2020 events are not stand-alone events indicative of an unlucky year, but rather a part of a rapidly intensifying trend of a planet out of balance. Addressing these challenges, all of which are directly tied to our relationship with the environment, will be incredibly challenging.

Many people are aware of the scale and intensity of the environmental changes that have taken place during the last several decades. However, before diving into solutions, the first step towards achieving greater sustainability is understanding both the causes and the impacts of these changes.

According to a recent definition, sustainable development is "the shared, holistic and long-term vision that countries have agreed upon to be the best path forward for improving the lives of people everywhere. Sustainable Development promotes prosperity and economic opportunity, greater social well-being, and protection of the environment. We want to grow together, transforming into a more just and equitable society. We also want to prosper in the present but without compromising the resources of the future" (Hwang and Kim 2019, p. 11).

> "Only if we understand, can we care. Only if we care, we will help. Only if we help, we shall be saved."
>
> Dr. Jane Goodall,
> UN Messenger of Peace

As of 2019, there are approximately 1.2 billion young people in the world between the ages of 15 and 24 (United Nations 2018). They account for about 16 per cent of the global population. These young people are in an important position to understand and help solve the environmental problems around us. So where do we start? The sixth edition of UNEP's environmental assessment report, the Global Environment Outlook (GEO-6) (United Nations Environment Programme [UNEP] 2019a; UNEP 2019b), provides us with basic information about the environment. This chapter is organized around the main environmental themes in the GEO-6 report. Section 1.2 describes major human impacts on the environment. This is followed in section 1.3 by a description of the Earth System, its main subsystems (air and climate; land and biodiversity; and oceans and freshwater), and how they are changing. We then summarize environmental challenges for young people (section 1.4). The chapter concludes with a call to action (section 1.5).

There is an opportunity to test your environmental knowledge in the "connecting the dots" box following the conclusion.

1.2
Human Impacts on the Environment

Human activities affect the environment in both positive and negative ways. The GEO-6 report identifies five ways in which they are driving environmental change:

- **Population growth.** The world population is currently growing by around 1 per cent per year (2018-2019). The annual average population increase is estimated at 82 million people (United Nations 2019a). Generally speaking, if there are more people on the planet – and they are consuming more resources – there will be greater pressure on the environment.

- **Economic development.** Improving human well-being usually depends on increased economic well-being through the consumption of natural resources (for example; oil, water, minerals, metals). Other important factors include the condition of the natural environment. Individual consumption is expected to continue to grow in the foreseeable future increasing environmental pressures (UNEP 2019a).

- **Urbanization.** More than half the world population lives in urban areas, with rural-to-urban migration expected to continue (UNEP 2019a). Higher population density makes air and water pollution worse. It also creates challenges related to water availability, waste disposal and energy consumption.

- **Technology.** Technological progress have been accompanied by increased pollution, waste generation and environmental disruption, as well as increase in health and environmental risks associated with toxic materials. On the positive side, however, advances in technology can help us meet human needs using fewer resources.

- **Climate change.** Never before in history has Earth's climate warmed so quickly. We see this in the increased average temperatures globally, together with the melting of glaciers and rising sea levels. The impacts of human activities on the climate are clear. Even if we could stop greenhouse gas (GHG) emissions now, it is likely that the impacts of climate change would continue to be felt for centuries to come (Intergovernmental Panel on Climate Change [IPCC] 2018; UNEP 2019a).

We can move towards sustainable development by reducing the impacts of human activities, and by thinking and acting with a view to realizing transformational change. We need to use an Earth System approach and accept that there are planetary boundaries that must not be exceeded.

Box 1.1
Human and Planetary Health

The COVID-19 pandemic has had devastating impacts on communities, and particularly youth who have been disproportionately affected by economic shutdowns and social distancing measures. Youth globally have seen their education paused and their future hopes abruptly changed due to the unprecedented impacts of the pandemic. This type of crisis can be prevented in future.

Experts continue to study the exact origins of COVID-19, but the science is clear: human actions on the environment are increasing the risks of infectious diseases. Infectious diseases that are transmissible from animals to humans are known as zoonoses, and research has shown that seventy-five percent of all new and emerging infectious diseases in humans over the last 30 years have originated from animals (Taylor *et al.* 2001). COVID-19 is likely one of these zoonotic diseases from wildlife. Most zoonoses are transmitted indirectly, for example via the food system. (UNEP, 2020).

Seven human-mediated factors have been identified as more likely to be driving the emergence of zoonotic diseases (UNEP, 2020):

1. increasing human demand for animal protein;
2. unsustainable agricultural intensification;
3. increased use and exploitation of wildlife;
4. unsustainable utilization of natural resources accelerated by urbanization, land use change and extractive industries;
5. increased travel and transportation;
6. changes in food supply; and
7. climate change.

Human activities increase the risks of zoonotic diseases by threatening ecosystems and wildlife. These actions push wildlife and humans into closer contact which increases the potential for infectious diseases to jump from animals to humans. As we reimagine our relationship with the environment, it is critical to keep in mind that the poor health of ecosystems threatens the health of humans.

In an effort to “build back better” (further explained in Chapter 3) and to establish a healthier relationship between humans, other species and the environment, the ‘One Health’ approach has been identified as the optimal way of preventing future pandemics. The ‘One Health’ approach brings together experts from multiple disciplines—public health, animal health, plant health and the environment —to deliver outcomes that improve the health of

people, wildlife and the planet (UNEP 2020).

The World Health organization (WHO) defines the ‘One Health’ Approach as “an approach to designing and implementing programmes, policies, legislation and research in which multiple sectors communicate and work together to achieve better public health outcomes” (WHO 2017). This approach emphasizes multisectoral collaboration for interventions aimed at achieving not only human health goals but also animal and environment health targets. This has been suggested as the most efficient way for both controlling the ongoing COVID-19 pandemic and for reducing the risk of future zoonotic disease outbreaks. It is now being implemented in the recovery measures of many countries.

1.3
The Earth System

1.3.1
Introduction to the Earth System

The Earth System is a complex social-environmental system of interacting physical, chemical, biological and social components and processes that determine the state and evolution of the planet and the life on it (UNEP 2019a). The Earth System can be understood more easily through its many subsystems. In this report, these subsystems are organized as follows: (1) air and climate; (2) land and biodiversity; and (3) oceans and freshwater. The increasing scale and speed of changes caused by the drivers shown in **Figure 1.1** present us with urgent challenges. Changes caused by activities in sectors such as transport and energy (not represented in the figure) are also damaging the environment. Nine "planetary boundaries" have been identified. These boundaries are considered to mark the "safe zone" for the planet as long as they are not crossed (**Box 1.2**).

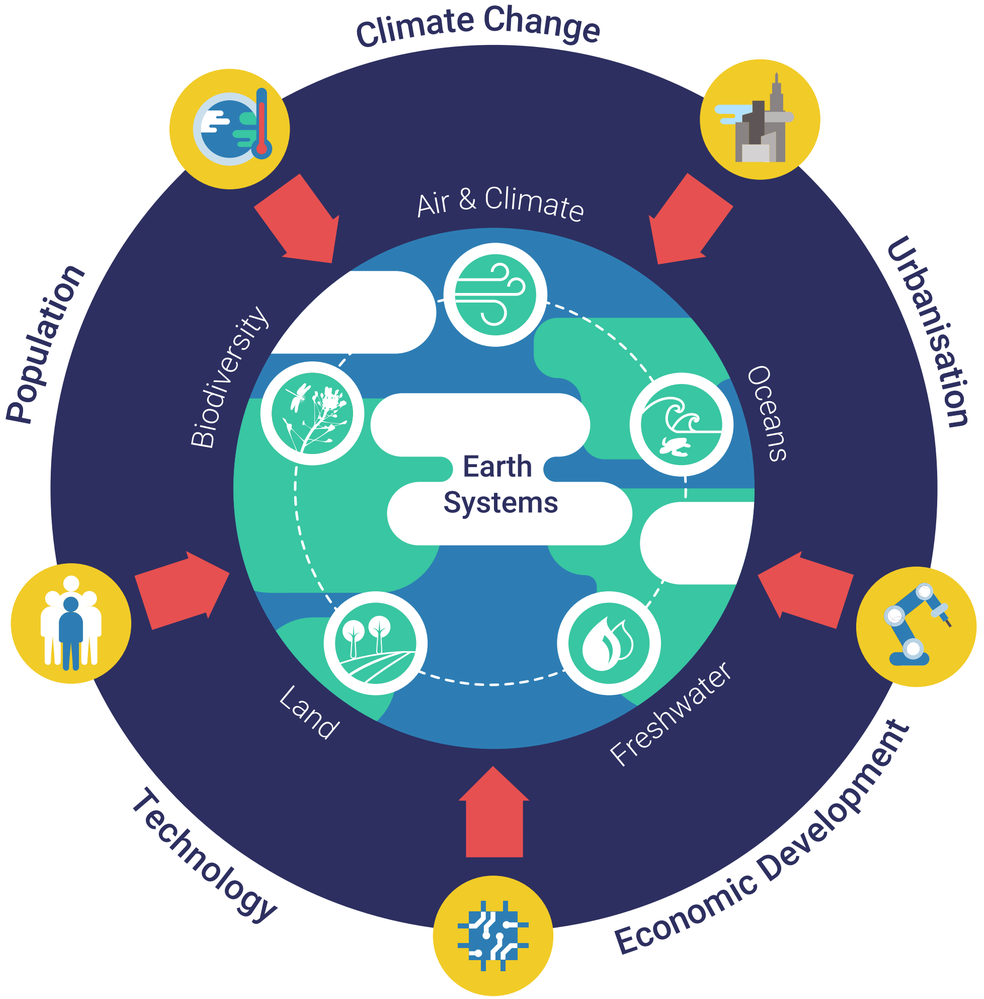


Figure 1.1 Major drivers of changes to the Earth System and its main three subsystems: air and climate, land and biodiversity, and oceans and freshwater

Box 1.2
Planetary boundaries

The concept of "planetary boundaries" is based on the fact that human actions are the main drivers of environmental changes, while the planet has a limited ability to adjust to these changes (Rockström *et al.* 2009; Rockström 2018a; Rockström 2018b). Nine planetary boundaries have been identified (**Figure 1.2**). It is estimated that humanity has already exceeded two of them: biosphere integrity and biochemical flows. Other boundaries are in danger of being exceeded. We lack adequate data about some of these boundaries, such as atmospheric aerosol loading. More information about planetary boundaries and tipping points is presented on the website of the Stockholm Resilience Centre, which includes several online videos (Stockholm Resilience Centre 2019; Lenton *et al.* 2019).

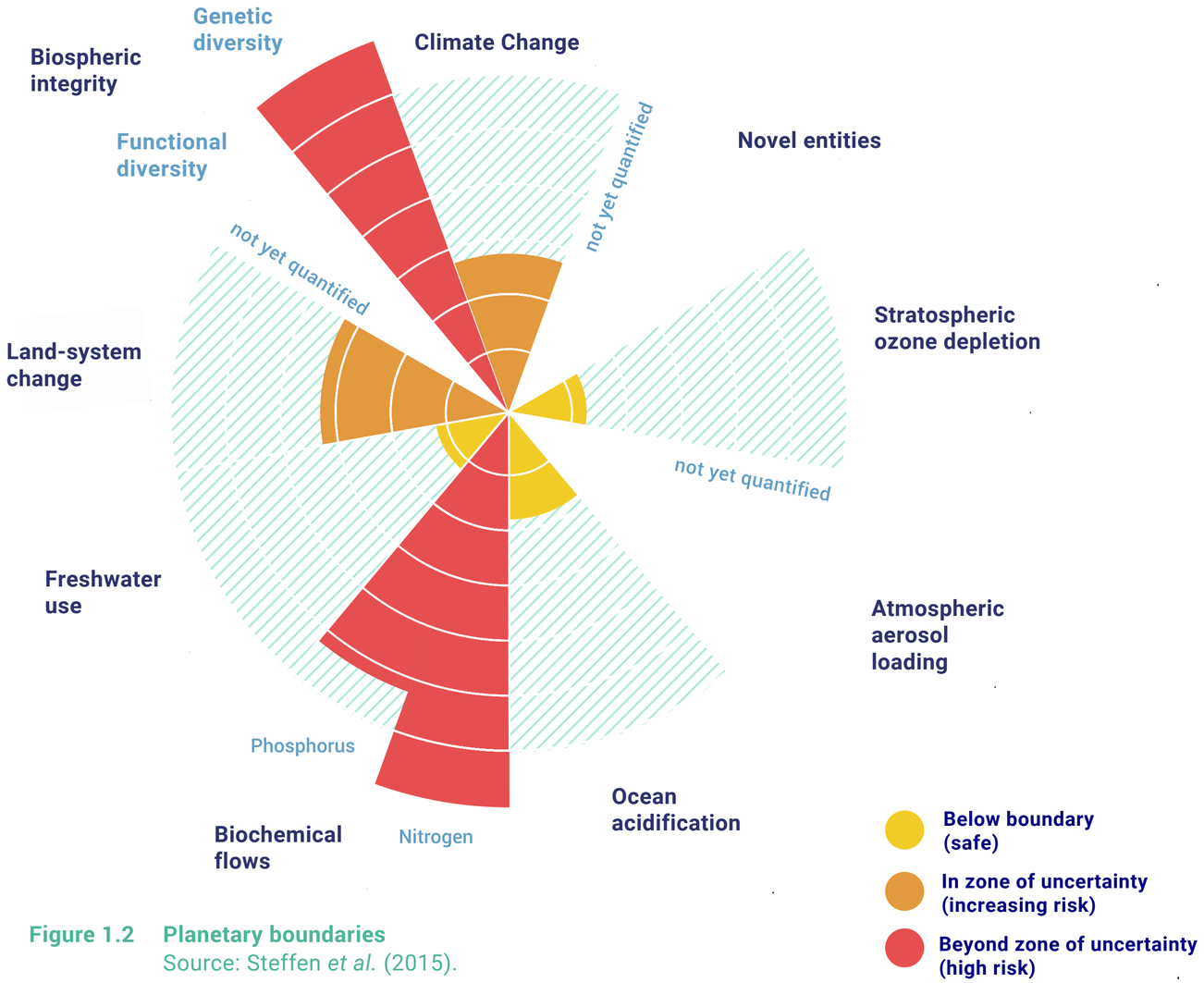


Figure 1.2 **Planetary boundaries**
Source: Steffen *et al.* (2015).

1.3.2
Current State of Air and Climate Systems

In their daily activities, humans produce many types of emissions that affect the atmosphere. These emissions come, for example, from agriculture and land use, industry, electricity production, transportation and buildings (UNEP 2019a).

Air pollution

Air pollution affects every region of the world (World Health Organization [WHO] 2017; WHO 2018a; WHO 2018b). People in low-income cities are the most impacted. Around 97 per cent of cities in low- and middle-income countries with more than 100,000 inhabitants do not meet WHO air quality guidelines. In high-income countries, that percentage decreases to some 49 per cent (WHO 2018a; WHO 2018b).

Figure 1.3 shows some of these pollutants, how they enter the atmosphere, and their impacts on human health and the environment. Air pollution is the main environmental contributor to the global burden of disease, with impacts that are especially prominent in cities (WHO 2018a; WHO 2018b; UNEP 2019a).

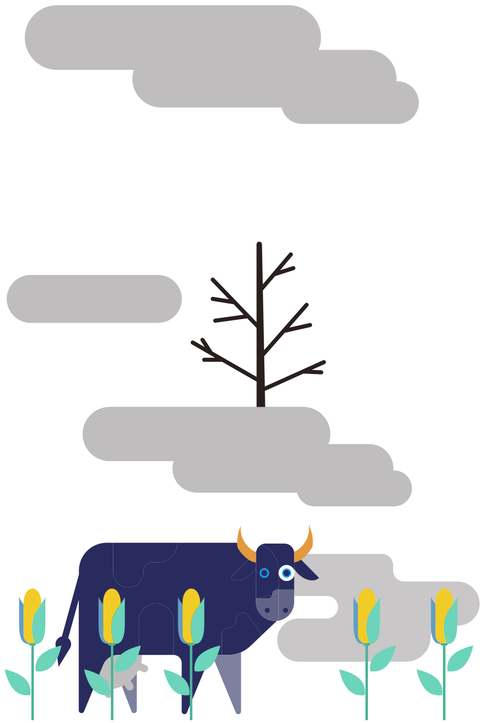
Cities frequently attract young people because of their employment and educational opportunities.

Box 1.3
Primary and secondary air pollutants

Primary pollutants enter the atmosphere directly. They include carbon oxides (CO, CO_2), nitrogen oxides (NO, NO_2), sulphur oxides (SO_2, SO_3), small particles of ash, dust and other materials (called particulate matter and black carbon), lead, and volatile organic compounds (VOCs) such as methane and chlorofluorocarbons. Secondary pollutants react with existing chemicals in the atmosphere. They include the nitrogen oxides and ozone that are most well-known for the smog they often form in many cities globally.

Some pollutants are greenhouse gases (GHGs) that keep heat within the atmosphere. When these gases are in balance, they are the reason Earth has a livable climate. When they are out of balance, however, this leads to climate change. Other chemicals, such as small particulate matter, do not act as GHGs but can cause significant harm to human health (through breathing in of particles) and the environment. Many chemicals are both GHGs and are threats to human and environmental health. For example, black carbon is harmful to human respiratory and cardiovascular systems, can contribute to acid rain and is a greenhouse gas.

The majority of global GHG emissions are carbon dioxide (CO_2), which is emitted to the atmosphere from the burning of fossil fuels, industrial processes, deforestation and agriculture (Hoegh-Guldberg *et al.* 2014). Emissions of methane (CH_4) and nitrous oxide (N_2O), GHGs which capture more heat than CO_2, are also major causes of global warming.



Sectors

Electricity & Fuel
CO · BC & OC · CO_2 · CH_4 · N_2O · NH_3 · NO_x · SO_2 · NM VOC · HG

Transportation
CO · CO_2 · NO_x · N_2O · HG · Pb · NM VOC · POPs

Industry
CH_4 · CO_2 · BC & OC · NH_3 · N_2O · NO_x · SO_2 · ODS · POPs · HG

Buildings
CO · CO_2 · BC & OC · NM VOC · ODS · NO_x · NH_3

Waste
CH_4 · NH_3 · N_2O · POPs · HG

Agriculture
BC & OC · CH_4 · CO_2 · NH_3 · N_2O · POPs

Natural
BC & OC · NH_3 · N_2O · NM VOC · POPs · HG

Major Pollutants

Carbon Compounds
- CO — Carbon Monoxide
- CO_2 — Carbon Dioxide
- BC & OC — Black Carbon and Organic Carbon
- CH_4 — Methane

Nitrogen Compounds
- NO_x — Nitrogen Oxides
- N_2O — Nitrogen Oxide
- NH_3 — Ammonia

Others
- S & D — Sand and Dust
- ODS — Ozone-Depleting Substances
- NM VOC — Non-Methane Volatile Organic Compounds
- POPs — Persistent Organic Pollutants
- SO_2 — Sulphur Dioxide

Metals
- HG — Mercury
- Pb — Lead

Figure 1.3 Air and Climate

Did you know?

The cost of air pollution

- **Every year, an estimated 6 to 7 million people die prematurely** because of exposure to air pollution (UNEP 2019a). In Asia and the Pacific about 4 billion people, who make up 92 per cent of the region's population, are exposed to levels of air pollution that pose a significant risk to their health (UNEP 2018a).

- **Over 90 per cent of the people in the world are estimated to breathe polluted air,** with the worst air pollution levels in the Eastern Mediterranean Region and South-East Asia (WHO 2018a; WHO 2018b). Emissions from motor vehicles, fossil fuel power plants, industrial activities, slash-and-burn agriculture, deforestation and many other activities in both urban and rural areas make it nearly impossible for many people today to avoid air pollution.

- **Air pollution represents a huge economic burden,** especially in highly urbanized countries. The cost of premature deaths, in welfare costs, due to air pollution has been estimated at around USD 5 trillion (UNEP 2019a).

- **Pollution leading to ground-level or tropospheric ozone pollution** could reduce the yield of crops such as wheat, soybean and corn by up to 26 per cent by 2030 (Avnery *et al.* 2011).

- **Around USD 4.7 trillion was spent by governments in 2015** to subsidize fossil fuel production. It is estimated that efficient fossil fuel pricing would have reduced global carbon emissions by 28 per cent and fossil fuel pollution-related deaths by 46 per cent (International Monetary Fund 2019).

Climate change

The world's youth are seeing the impacts of a changing climate and are speaking up. Because the atmosphere is warming as a result of GHG emissions, the climate has become more unpredictable locally, regionally and globally (Nature 2017; Schiermeier 2018). Until now, human civilization has never experienced a period with these levels of GHG concentrations or such intense environmental changes (IPCC 2018; UNEP 2019a).

We can expect to see even more severe climate change in the future. Global average temperatures are more than 1.0°C higher than a century ago, and this warming is accelerating (IPCC 2018). Twenty of the warmest years on record occurred in the past 22 years, with the years 2015-2018 the four warmest on record (World Meteorological Organization 2018; United States National Oceanic and Atmospheric Administration [NOAA] 2019a). A child born today could experience a world more than four degrees warmer than the pre-industrial average, with the impacts of climate

change affecting human health from infancy and adolescence on through to adulthood and old age (Watts *et al.* 2019).

Climate change has two types of impacts:

- quick onset impacts, such as the greater number and intensity of extreme weather events; and
- slow onset impacts, such as droughts and famine, changing rain and snow patterns, and changing temperatures (UNEP 2019a).

Climate change is a "threat multiplier". It increases the likelihood of food, water and fuel scarcity, malnutrition, disease transmission, migration and even armed conflict (UN News Service 2019).

"The risks associated with climate-related disasters do not represent a scenario of some distant future. They are already a reality for millions of people around the globe – and they are not going away…"

Rosemary DiCarlo,
United Nations Under-Secretary-General for Political and Peacebuilding Affairs

Did you know?

- Human-induced global warming is increasing at an estimated 0.2°C per decade (IPCC 2018).
- In May 2019 a record atmospheric concentration of 414.7 ppm (parts per million) of CO_2 was recorded (NOAA 2019b), well above the level of 280 ppm before the beginning of the industrial era and the 350 ppm most research indicates is the limit for a safe climate.
- With global warming of 1.5°C by the end of this century, it is estimated that the Arctic Ocean would be ice-free during the summer at least once per century. With warming of 2°C it is estimated that it would be ice-free at least once per decade (IPCC 2018).
- An average of 21.5 million people per year were forcibly displaced between 2008 and 2016 as a result of sudden onset weather

events such as storms, fires, floods and extreme temperatures (United Nations High Commissioner for Refugees [UNHCR] 2016a; UNHCR 2016b).

- Natural disasters, which are increasing in frequency and intensity because of climate change, force some 26 million people per year into poverty and lead to losses of over USD 500 billion in annual consumption (World Bank 2016; Hallegatte *et al.* 2017).

- By 2030, it has been estimated that severe climate impacts and inequitable economic growth could push up to 77 million urban residents, who have escaped poverty, back into poverty (World Bank 2015).

Box 1.4
Climate change and food supply

Food production is directly affected by climate change. One of the main areas of concern is changes in rainfall and temperature patterns. The amount of rain during a season and its distribution at different stages of crop growth determine crop yield. Wheat and other cereal crops of importance for global food security are also affected by varying temperatures. Temperature change can reduce crop growth and yield, with impacts on food supply, which affect food prices worldwide. Many young people and their families depend on rainfed agriculture for food and income, especially in developing countries.

© UNICEF Kenya/2017/Oloo

The impacts of climate change are global, but these impacts are experienced in different ways in different places. Young people and their families in a vulnerable developing country may become aware of climate change more quickly and directly than if they lived in a developed country, owing to their different social and economic circumstances (which can also affect their ability to respond to climate change, including through adaptation). Without adaptation, climate change could reduce growth in global agriculture yields up to 30 per cent by 2050 – with the world's 500 million small farms most affected (Global Commission on Adaptation 2019).

We've known for a while that conflict and political instability – especially when coupled with extreme weather events such as hurricanes or drought – inevitably lead to poverty, food insecurity, limited access to clean water and sanitation, unreliable infrastructure and displacement. What we've learned more recently is how global warming exacerbates all this, at a rapid pace. We know, unequivocally, that the climate crisis will hurt the world's most vulnerable populations first and hardest, but will the 193 United Nations Member States who pledged to "leave no one behind" live up to their promise?

Matthews and Nel (2019)

1.3.3
Current State of Land and Biodiversity Systems

Land use change, environmental degradation and biodiversity loss are increasing at alarming rates both locally and globally. Land and the various forms of life it supports are critical for our survival. They are also embedded in our cultures and identities, with profound spiritual and physical connections for many young people and their families. The way that land and biodiversity work together (which is one way to describe ecosystem services) defines what nature can contribute to people.

Land use change

As the global population continues to grow, human activities are increasingly affecting nature's ability to provide food, fibre, timber, fodder and other vital natural resources. Human demands and consumption patterns, which continuously increase our environmental footprint, are the greatest threat to the health of the planet (Weinzetell, Vačkář and Medková

Soil erosion in Tanzania: fertile soil is being lost around the world at the alarming rate of 24 billion tons per year.
Photo source: Carey Marks.

In Australia, a study by UNICEF (2017) found that children and young people are struggling under significant pressures, with drought-related stress and psychological distress among younger farmers.

2018; World Wild Fund for Nature [WWF] 2018a). Food production is the largest use of land (50 per cent of habitable land) (Roser and Ritchie 2019). While livestock production (including the production of animal feed) uses 77 per cent of agricultural land, it only provides 16 per cent of the energy and 32 per cent of the protein humans need (Foley *et al*. 2011; Alexander *et al.* 2017).

One-quarter of all life on Earth is beneath our feet. Soils contain a multitude of organisms that make critically important ecosystems work. However, soils are being degraded so rapidly that we now have only about 60 years of topsoil left (topsoil is the layer in which plants grow) (Arsenault 2014). Loss of arable land is estimated to be taking place at 30 to 35 times the historical rate, with 12 million hectares of land per year lost through soil degradation related to drought and desertification (United Nations 2019b). Degradation of the world's cropland and grazing land costs some USD 300 billion per year (Nkonya *et al.* 2016).

More than 40 per cent of the world's poor rely on degraded lands for essential services such as food, fuel, raw material and water purification. Sustainable Development Goal target 15.3 sets out the ambition to achieve Land Degradation Neutrality (LDN), which aims for no net loss through a balance between three processes: degradation, rehabilitation/restoration and sustainable management (United Nations Convention to Combat Desertification [UNCCD] 2018; United Nations 2019c).

Land degradation can affect young people and their families in different ways. In the global South, land degradation and desertification can have long-lasting consequences including falling crop yields, weakened resilience to climate change, massive displacement, disruption of children's education and increased child labour (Hyland and Russ 2019). In 2019, over 45 million people across Africa, mostly in Eastern and Southern Africa, are food insecure due to prolonged droughts (UNCCD 2019).

In many countries, the impacts of drought and desertification (and other climate-related impacts) may be complicated by tensions over natural resources (Jones and Natalini

2019; Sikiti da Silva 2019; Vidal 2019). Armed conflicts have heavy human costs (United Nations Office of the Special Representative of the Secretary-General for Children and Armed Conflict 2013). It also results in environmental degradation (Mitri *et al.* 2014; Gleick 2019).

Competition for land and water between cities and agriculture results in the loss of cropland (Bagan and Yamagata 2014; Ahmad *et al.* 2016). It has been proposed that investing in improvements in agricultural water use efficiency would free up sufficient water for urban use (Flörke, Schneider and Mcdonald 2018).

During the last decade, the acquisition of long-term rights over large areas of land in developing countries for agriculture has received considerable attention (Cotula, Vermeulen and Keeley 2009; De Schutter 2012; International Institute for Environment and Development [IIED] 2013). These large-scale acquisitions raise important social, economic and environmental concerns. "Land grabbing", as it is often called, has been seen to displace poor, vulnerable populations and damage the environment, which in turn worsens poverty and food insecurity. To better understand the impacts of land grabbing, and develop appropriate policy and regulatory responses, an approach that considers both sustainable development and human rights is needed (Djiré, Keita and Diawara 2013; Grant and Das 2015; Gilbert 2017; Cotula 2019).

Deforestation and forest loss have increased in tropical forests that contain some of the highest levels of biodiversity and some of the most forest-dependent communities in the world. In May 2019 the Amazon rainforest lost 739 km^2 in 31 days, the equivalent of two football pitches every minute; in view of the almost 75,000 fires reported between January and August 2019, the highest number since 2010, the situation can only get worse (British Broadcasting Corporation 2019; Butler 2019; WWF 2019a).

Poor land use management also increases the risk of zoonotic diseases such as COVID-19. Expanding infrastructure, intensified agriculture, resource extraction, deforestation and forest fragmentation all reduce the quality of our wild spaces and bring humans closer to wildlife. This wildlife can be the source of diseases that cause great health and economic harm. Two million people in low and medium income countries perish annually due to endemic zoonotic diseases, and prior to COVID-19, zoonotic diseases led to economic damage of USD 100 billion over the past two decades. The more humans encroach on wild spaces and interact with wildlife, the greater the risk of zoonotic diseases becomes (UNEP 2020).

Biodiversity loss

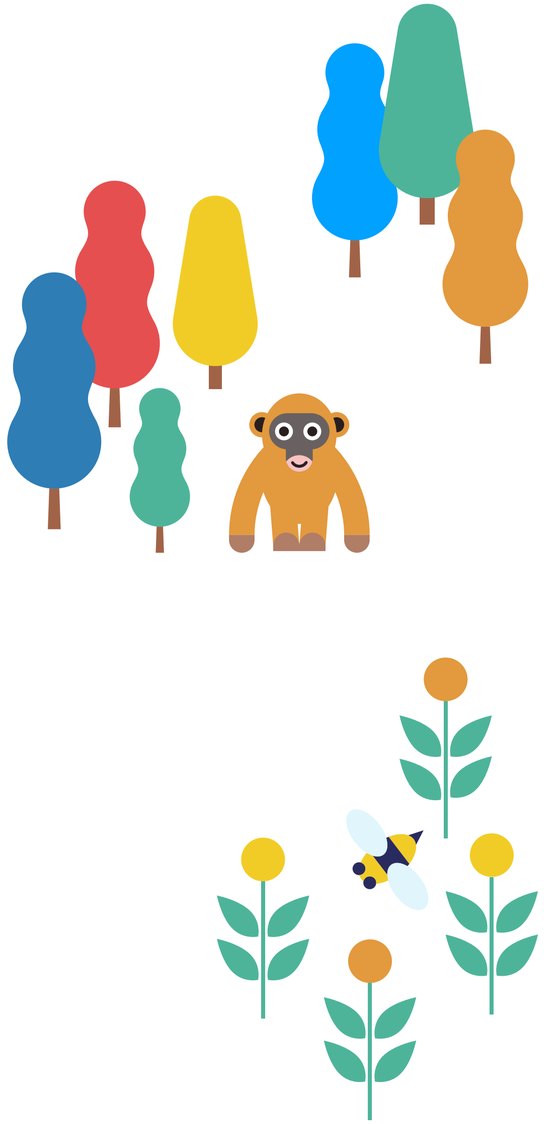
Losses of land and changes in land use drive losses of biodiversity and ecosystem function; they can also contribute to disease in people, wildlife, domestic animals and plants (UNEP 2019a). Losing habitat through land loss or changes in land use can also lead to human-wildlife conflict (Martinez-Abrain, Jiménez and Oro 2019). We are not only losing biodiversity in terms of species and ecosystems: we are also losing genetic diversity both in the number and variety of animals and crops being cultivated (FAO 2015a) and those in the wild, leading to less genetic variation (McRae, Deinet and Freeman 2017).

In addition to land use change, other pressures on biodiversity (such as exploitation of species, climate change, pollution and invasive alien species) are leading to a decline in species worldwide. Illegal trade in wildlife, fish and forest products has been estimated to be worth between USD 90 billion and USD 270 billion per year (UNEP 2014; Stimson Center 2016; Stoett 2018). This illegal trade is leading to the loss of

Figure 1.4 The steady demand for palm oil, found in everything from pizza dough to shampoo to lipstick, threatens the future of wild orangutans, because of the deforestation caused by palm oil plantations. In Borneo, where the vast majority of orangutans live, their population has declined by 80 per cent over the last 75 years
Source: Gonchar 2017.
Credit: National Geographic

iconic species (**Figure 1.4**). It also contributes to a rise in invasive species (Secretariat of the Convention on Biological Diversity [CBD] 2014). Alien species that become invasive are considered to be the main direct drivers of biodiversity loss across the globe (CBD 2019). Changes in land use and a changing climate can also lead to animal migrations, again resulting in more invasive species. These examples show that environmental pressures often overlap and interact with one another, creating reactions that further damage biodiversity (UNEP 2019a).

The biodiversity remaining on our planet is therefore of immeasurable value; it is on loan from the young and future generations. Any changes we make now, and in the near future, to conserve biodiversity will have tremendous effects.



"Globally, statistics show that forest loss has slowed, due largely to net increases due to reforestation and plantations (Song *et al.* 2018). However, hiding behind the statistics, there lies some detail – these plantations, if not well managed, do not provide the same range of ecosystem services as natural forests and are often more vulnerable to extreme climatic events..."

Bremer and Farley (2010)

Did you Know?

Land degradation and management

- **Some 2.6 billion people are badly affected by land degradation** and desertification; more than half of them are women and children (Samandari 2017).
- **Current ways of managing land are responsible for about 25 per cent of the world's greenhouse gas emissions**, while land degradation is both a cause and a result of poverty and vulnerability (UNCCD 2018).
- **Humans have changed at least 70 million km^2**, or more than 50 per cent of Earth's ice-free land area (Hooke, Martín-Duque and Pedraza 2012).
- **Land and soil degradation currently affect 75 per cent of terrestrial ecosystems** and the welfare of more than 3.2 billion people, with huge social and economic costs (Leahy 2018).
- **One-third of the planet's soils are already degraded** (FAO 2018). Ten out of fourteen terrestrial habitat types (such as most grasslands and forests) have seen a decrease in vegetation productivity (UNEP 2019a).
- A major species extinction event is unfolding. There was an estimated overall **decline of 60 per cent in the world's vertebrate species populations** between 1970 and 2014 (WWF 2018a).
- **Extractive industries (such as mining and agriculture) are responsible for 80 per cent of biodiversity loss** (UNEP and International Resource Panel 2019).
- As a direct result of drought in 2017, **in Kenya alone at least 175,000 children did not attend school** (United Nations 2017a).
- **About 25 per cent of the global cropland area**, with its associated use of water and other inputs, produces commodities that are exported to land-poor but cash-rich countries (UNCCD 2018).
- **As urban areas have expanded, more than 60 per cent of the world's irrigated cropland** is now located near urban areas (Thebo, Dreschel and Lambin 2014; Bren d'Amour *et al.* 2017).

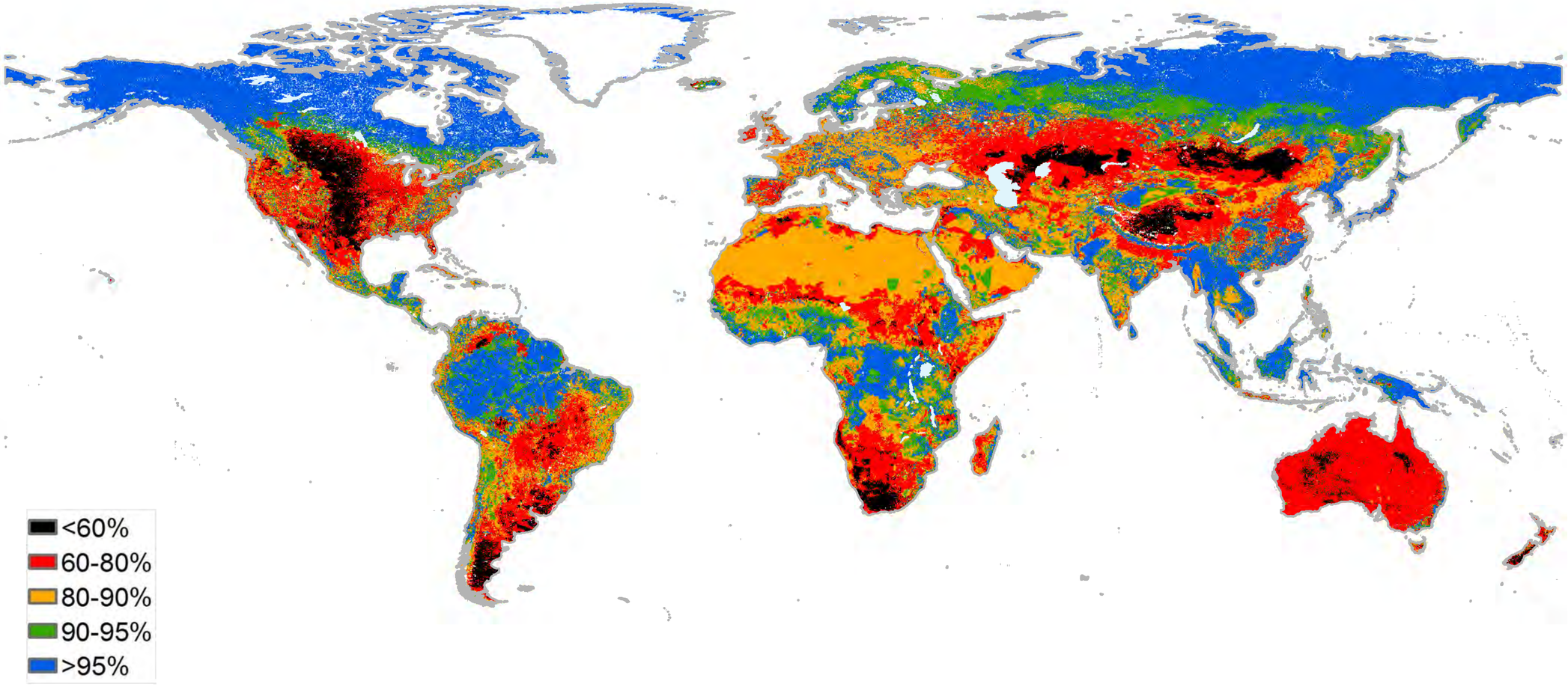


Figure 1.5 Terrestrial Biodiversity Intactness Index: the greater amount of biodiversity in an ecosystem that is globally intact (i.e. close to its original state), the greater resilience the ecosystem will have in the face of change and the more ecosystem services it can provide.
Source: Newbold *et al.* (2016).

Box 1.5
What is the bee-g deal?

"If the bee disappeared off the surface of the globe then man would only have four years of life left. No more bees, no more pollination, no more plants, no more animals, no more man."

Albert Einstein

Food production depends heavily upon pollinators. Pollinators include a wide range of animals that play a crucial role in transferring pollen between flowers and help with their fertilization process. More than 75 per cent of the leading global food crops (accounting for 90 per cent of global food production) require pollination (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services 2016). One of the ways pollinators are lost is through changes in land use and land cover (Simmons *et al.* 2019).

Checkpoint 1

What per cent of the world's nutrition sources is pollinated by bees?

1.3.4
Current State of Ocean and Freshwater Systems

Earth is called the “blue planet” because of the abundance of water on its surface (**Figure 1.6**). Water is transferred between the oceans and freshwater bodies (lakes, reservoirs, running waters, wetlands) by means of the water cycle (Gattuso, Frankignoulle and Wollast 1998; Rinke *et al.* 2019; United States Geological Survey [USGS] 2019a). Marine and freshwater ecosystems are degraded by pollution from nutrients, suspended solids, pathogens, siltation, oxygen-depleting substances, metals and organic contaminants. Natural wetlands play a significant role in reducing the adverse impacts on water quality associated with pollution. Constructed or restored wetlands also contribute to pollution reduction (Metcalfe *et al.* 2018). The water cycle helps to regulate the climate by absorbing CO_2 from the atmosphere (Kayranli, Scholz and Hedmark 2010; Toomey 2018).

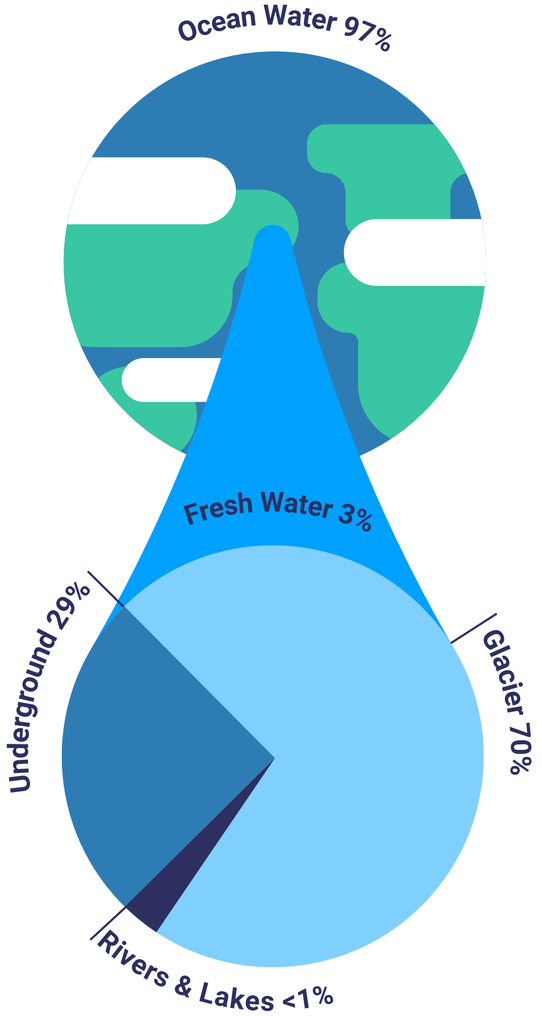


Figure 1.6 Water distribution on Earth.
Source: Earth Vision Institute (2014).

There is increasing alarm about the state of global water resources and their accessibility (United Nations World Water Assessment Programme [WWAP] 2018; WWAP 2019). Humans change the hydrosphere in various ways, including through inappropriate disposal of waste and sewage, overfishing, illegal fishing, over-use of pesticides and fertilizers, and coastal dredging and reclamation (Mateo-Sagasta *et al.* 2017; United Nations 2017b; WWAP 2017). As much as 40 per cent of the ocean is heavily affected by pollution, fisheries depletion, loss of coastal habitats, and other impacts of human activities (Halpern *et al.* 2008; United Nations Development Programme [UNDP] 2019).

Decline of freshwater availability and quality

Although water covers 71 per cent of Earth’s surface, only 3 per cent is freshwater and only 0.5 per cent of that freshwater is suitable for human consumption (United States Department of the Interior 2017). Freshwater

is not only limited, but unevenly distributed across the globe. With increasing population growth, the amount of available freshwater per person is decreasing (UNEP 2019a). Conflicts take place over access to water and its use, and the number of such conflicts may increase (Goldenburg 2014; Gleick 2019; National Geographic 2019).

Precious water resources are being polluted through the dumping of garbage, discharging of untreated wastewater, excessive use of pesticides and fertilizers, mining, and oil and gas extraction (WWF 2019b). Groundwater comprises a much larger freshwater volume than surface water. Some major aquifers are threatened by poor management, which can lead to unsustainable water withdrawal, groundwater pollution and saltwater intrusion (UNEP 2019a) (**Figure 1.7**).

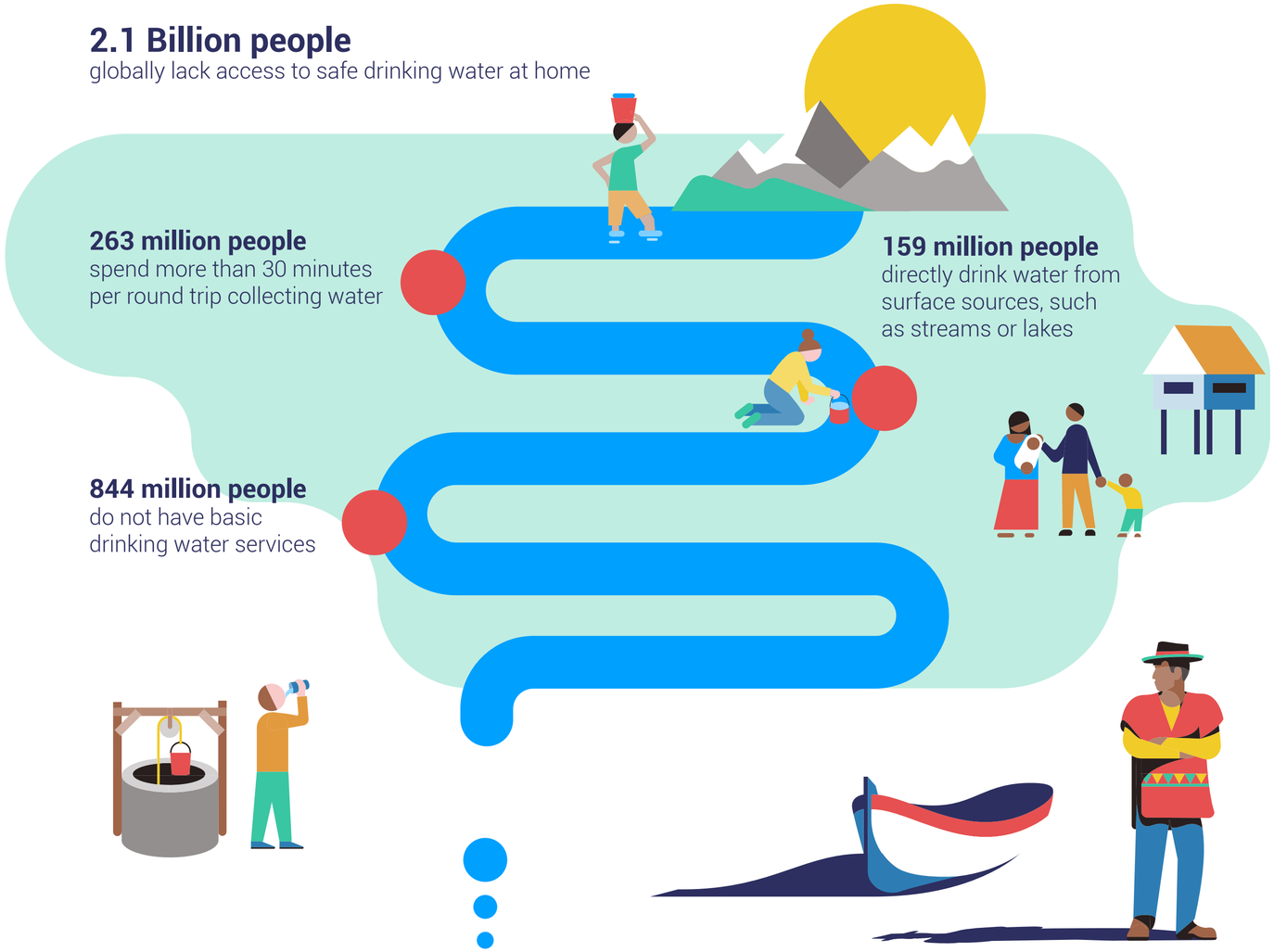


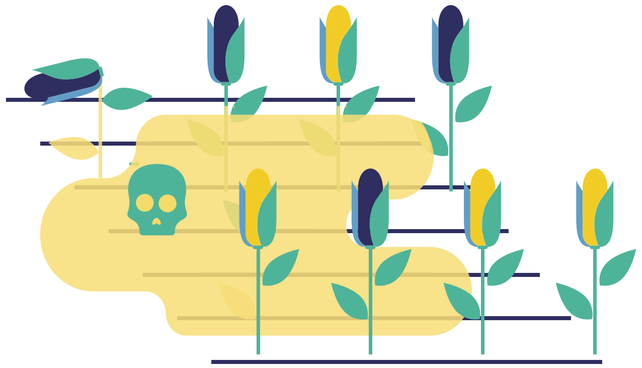
Figure 1.7 **Freshwater Accessibility**
Source: WHO and United Nations Children's Fund (UNICEF) (2017)

Box 1.6
The water-health-education nexus

For about 40 per cent of people living in Sub-Saharan Africa (around 313 million people in all), safe, clean water is not accessible (The Last Well 2019). Instead, they must rely on unsafe water which causes the spread of waterborne diseases including diarrhea, typhoid, malaria, cholera, typhus, dysentery, and trachoma (which can lead to blindness) (WHO 2000; AQUARISTA 2010; WHO 2019a). Having access to only unclean water means that young people and their families cannot bathe, wash their clothes or clean their houses properly. Moreover, children in this region are often responsible for collecting water for their families, which reduces their time at school (Graham, Hirai and Kim 2016).

To obtain water, this young Tanzanian is digging a hole in a dry, polluted riverbed
Credit: Tajiel Urioh 2014.

The main sources of water pollution are human settlements, industries and agriculture (FAO 2017). If crops are irrigated with polluted water, they may be dangerous for human consumption or feeding to livestock. Pesticides are easily washed away by rain into surface and groundwater, where they accumulate in fish and other aquatic organisms and in the food chain, eventually reaching our bodies. Water is also used for food and energy production. Therefore, there is competition with agriculture for these uses.



Did you know?

Water in numbers

- Roughly 2.5 billion people rely on water in the ground below our feet as a main source of freshwater to satisfy their daily needs (United Nations Educational, Scientific and Cultural Organization [UNESCO] 2012; USGS 2019b).
- About 36 per cent of the global population (2.5 billion people) lives in water-scarce regions (High Level Panel on Water 2018).
- More than 2.1 billion people do not have access to clean drinking water (WHO and United Nations Children's Fund [UNICEF] 2017).
- 263 million people spend over 30 minutes per trip collecting water from sources outside their homes (UNICEF 2017). For both boys and girls, water collection can take time away from their education or even prevent them from attending school altogether (UNICEF 2016).
- In Malawi, it was estimated that women who collected water spent 54 minutes on average, while men who collected water spent only six minutes (UNICEF 2016).

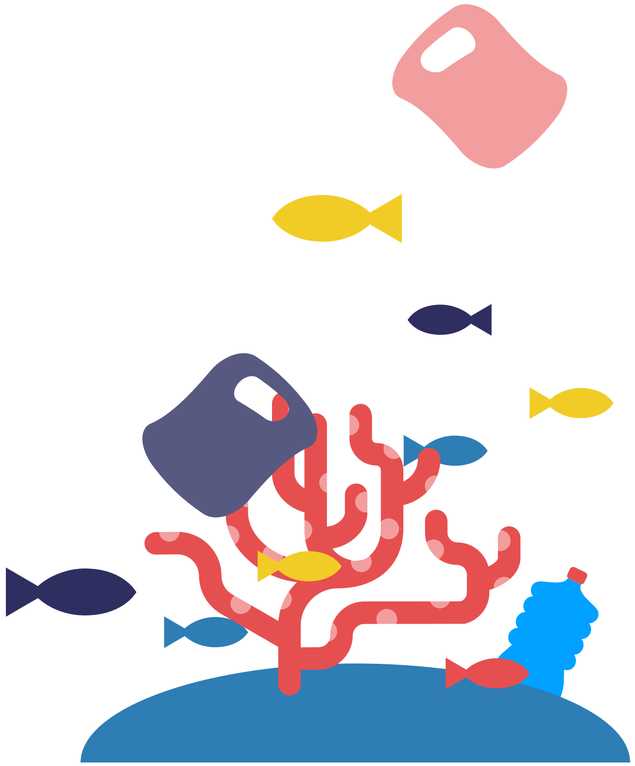
A sea turtle captured by a ghost fishing net made of plastic. Ghost fishing takes place when fishing gear is abandoned or lost but continues to trap sea life and damage coral. Fishing gear represents 10 per cent of all marine debris left in the oceans (Morris 2017).

Marine debris

Human pressures on ocean health have increased during the last decade because of the growing world population and expanded use of the oceans (UNEP 2019a). Marine debris (including plastics) is one of the greatest threats to oceans, wildlife and human health. Today sea turtles mistake plastic bags for jellyfish, seabirds are caught in the plastic rings that are part of the packaging of bottles and cans, and fish become trapped in plastic gloves and other items in the open ocean (Butterworth, Clegg, and Bass 2012; Morris 2017). Microplastics are tiny plastic particles found in lakes, rivers and oceans. They may be primary microplastics – that is, they have been directly manufactured in the form of microscopic particles for use in products and in other applications – or secondary microplastics produced by the breakdown of larger plastic objects (Boucher and Friot 2017; Joint Group of Experts on Scientific Aspects of Marine Environmental Protection [GESAMP] 2017, pp. 18-19; UNEP

2019c). Microplastics may travel through the food web, which has created concerns about potential harmful effects on marine life and human health (Seltenrich 2015; GESAMP 2017, pp. 45-53; Bhargava *et al.* 2018; Woods Hole Oceanographic Institute 2019).

Microbeads are a type of primary microplastic. They are used in personal care products, other consumer applications, and a number of industrial applications (GESAMP 2017; UNEP 2019c, pp. 325-326). Several countries have taken regulatory actions to restrict the manufacture, import and sale of microbeads in cosmetics and personal care products (USGS 2016; Government of the United Kingdom 2018; ChemSafetyPro 2019). In terms of the history of the planet, the presence of plastics can now be used as a geological indicator of the Anthropocene epoch (Zalasiewicz *et al.* 2016). One of the indicators used to determine progress in achieving Target 14.1 of the Sustainable Development Goals (SDGs) ("By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution") is to track the density of floating plastic debris (United Nations 2019d) .



Did you know?

Marine pollution

- Approximately 80 per cent of the world's marine pollution comes from land-based sources. These sources include agricultural run-off, discharges of untreated sewage, and plastic (UNESCO 2017).
- Plastic debris makes up some 60-95 per cent of all the wastes in the ocean (Le Guern 2019).
- At least 13 million tons of plastic ends up in the ocean every year, which is equivalent to more than five grocery bags filled with plastic for every foot of coastline in the world (Jambeck *et al.* 2015; Le Guern 2019; UNDP 2019).

- **Every year 100,000 sea turtles and marine mammals around the world are killed because of plastic marine litter (WWF 2018b).**
- **At least 640,000 tons of fishing gear is estimated to be left in the ocean every year, killing and maiming millions of marine animals including endangered whales, seals and turtles. The large majority of entanglements cause serious harm or death (World Animal Protection 2018).**
- **Only around 9 per cent of the world's plastic is recycled, while most of the plastic produced is dumped in the natural environment (Geyer, Jambeck and Law 2017; UNEP 2018b).**

Coral reefs are threatened by climate change

Coral reefs are among the most biologically diverse ecosystems on Earth. Millions of people, above all in developing countries, depend on them for their livelihoods (Burke *et al.* 2011; Cinner 2014; Hoegh-Guldberg, Cai *et al.* 2014). Coral reefs provide food and income (Hoegh-Guldberg 2011), recreational and cultural services (Forsyth 2011) and coastal protection (Ferrario *et al.* 2014). However, they are suffering extraordinary damage due to warmer and more acidic oceans (Hoegh-Guldberg 1999; Pendleton *et al.* 2016).

Coral bleaching is becoming a "regular episode" for coral reefs (Hughes *et al.* 2018; UNEP 2019a). Almost 40 per cent of coral cover has been lost in the last 40 years (DeCarlo *et al.* 2017). Higher sea surface temperatures, especially during El Niño years caused widespread coral bleaching in 1998, 2010 and 2016 (Heron *et al.* 2016; Hughes *et al.* 2018). The coral bleaching event in 2016 is considered to have been possibly the worst ever (**Box 1.7**). Ocean acidification, due to higher atmospheric CO_2 levels, is also an increasing threat to coral reefs (Hoegh-Guldberg, Mumby *et al.* 2007). Reef calcifiers (hard corals and giant clams) are usually affected by acidification because of reduced calcification rates and productivity (Anthony *et al.* 2008).

> "Reef bleaching events now have a recurrence interval of about six years while reef recovery rates are known to exceed ten years. This means that, on average, coral reefs will not have sufficient time to recover between bleaching events."
>
> (UNEP 2019a)

Bleaching and ocean acidification can lead to the loss of ecosystem services provided by coral reefs (Pendleton *et al*. 2016). In turn, this can jeopardize nutrition, livelihoods, tourism, community health, local incomes and biodiversity (UNEP 2019a).

Box 1.7
Damage to the Great Barrier Reef, the world's largest coral reef system

The most recent ocean tragedy is the worst coral die-off ever recorded in Australia's Great Barrier Reef (GBR). Driven by climate change, in early 2014 warming seawater temperatures triggered a global bleaching event. By 2016, global bleaching was affecting and killing coral reefs all over the Pacific Ocean. In that year the northern part of the GBR lost two-thirds of its coral over a stretch of 700 kilometres (Hughes, Schaffelke and Kerry 2016; Innis 2016). This is the single largest known coral die-off in bleaching history. Another episode of bleaching in the middle part of the GBR occurred the following year. In June 2017 seawater temperatures started to cool and return to normal levels.

This bleaching event lasted almost three years, during which almost 29 per cent of the GBR coral died. There were also wider impacts on reef ecosystems. For example, many reef animals lost their homes. There was also significant economic loss due to reduced fishing, recreation and tourism.

Figure 1.8 **Coral at Lizard Island on the Great Barrier Reef turned completely white (coral bleaching) and died in March 2016; in May 2016 it was covered with algae**

Credit: The Ocean Agency/XL Catlin Seaview Survey

1.4
Key Environmental Challenges for Young People

Based on severe threats to the Earth System and the human drivers of environmental change, the key environmental challenges for young people can be highlighted under three themes: the food, energy and waste systems. In Chapter 3 of this report, we will use these three themes to look at how to address environmental challenges through individual actions and throughout our lifetimes.

a) Food: Food systems involve all the activities required to produce, process, store, package, distribute, consume and dispose of food. These systems are driven by trends in demand, including population growth, urbanization, income distribution and food supply (FAO 2018; World Food Programme 2019).

Food systems are highly vulnerable to climate change. This has repercussions on all the components of food security: availability, access, utilization and stability. Poorer countries are particularly vulnerable, with the greatest number of undernourished people living predominantly in Sub-Saharan Africa and South Asia.

An important way to help ensure food security is to reduce food loss and waste along food chains. Some 24 per cent of food loss and waste occurs during production and another 28 per cent during handling and storage (Lipinski *et al.* 2013). In high-income countries, about 56 per cent of total food loss and waste has been estimated to occur at the time food is consumed (FAO 2011; Lipinski *et al.* 2013). In emerging economies, on the other hand, 44 per cent of food is lost during the production phase (Ishangulyyev, Kim and Lee 2019).

Global food systems are struggling to deliver food and nutrition to a growing number of people. In 2019, for the third year in a row, both hunger and malnutrition are on the rise (United Nations Human Rights Council 2019). A sustainable system is needed to deliver nutritious, safe and affordable food (FAO 2018).

Did you know?

Food consumption

- **Global food consumption per person is expected to rise by 12 per cent by 2050 (FAO 2015a). This will be accompanied by changes in food preferences, with increasing consumption of livestock products.**
- **Approximately 30 per cent of the food produced globally for human consumption is lost or wasted. This wasted food could feed over 2 billion people, more than twice the number estimated to be undernourished globally (FAO 2015b).**
- **Food systems are estimated to contribute approximately 20-30 per cent of global GHG emissions (Vermeulen, Campbell and Ingram 2012; Fanzo *et al.* 2018). Most emissions are related to agricultural production. They are caused mainly by**

deforestation for farm expansion, methane emissions from livestock production, and overuse of fertilizers.

Most of the increased production of meat comes from industrial farms, which are responsible for soil degradation and water pollution due to high concentrations of waste.

b) Energy: Energy production and consumption impact ecosystems, water supplies, air and food. As energy demand grows, there is an increasing demand for natural resources, leading to their unequal distribution and often causing disputes and conflicts at several levels. By 2015 global energy consumption reached around 13.5 billion tons of oil equivalent, and that is expected to grow to around 19 billion tons of oil equivalent by 2040 (UNEP 2019a). Energy generation using fossil fuels has a large environmental footprint. The energy sector remains the leading contributor to climate change, accounting for around 60 per cent of total global GHG emissions (UNEP 2019d).

c) Waste: There are more than 7 billion people on the planet. We produce waste every day. A staggering one-half of all waste is not collected, treated or safely disposed of, causing a global waste crisis. About 2 billion people worldwide don't have access to solid waste collection services, while 3 billion lack access to safe waste disposal facilities. Total urban waste generation (including municipal solid waste, commercial and industrial waste, and construction and demolition waste) amounts to around 7-10 billion tons per year (UNEP 2019a).

Among other health impacts, waste and harmful substances cause respiratory problems. The daily lives of approximately 64 million people are directly affected by uncontrolled dumping and open burning at the world's 50 largest dumpsites (International Solid Waste Association [ISWA] 2017).

In 2016 it was estimated that 44.7 million tons of electronic waste (e-waste) per year was generated globally (Baldé *et al*. 2017). E-waste contains heavy metals, such as lead and mercury, which are harmful to humans and the environment and need to be properly handled (WHO 2019b). However, only around 20 per cent of e-waste is recycled though appropriate channels (ISWA 2017). In the context of increasing global demand for resources, illegal trafficking of end-of-life electrical and electronic equipment has become a critical issue.

Large quantities of often hazardous waste are being unlawfully exported to developing countries, with the potential to cause significant environmental and human health problems.

Box 1.8

How the energy and mining sectors affect the quality of life of young people in vulnerable communities in Latin America?

Latin America is rich in oil, gas and mineral resources. In Colombia, Brazil, Ecuador, Peru and Venezuela, for example, oil and gas extraction takes place in areas where young people and their families live. In addition, illegal artisanal mining in protected natural areas is a threat to human health and to the environment because of the exposure to mercury. Local inhabitants have experienced loss of livelihoods, forced displacement, community tensions and environmental degradation because of these activities.

The Amazon rainforest supports at least 10 per cent of the world's known species and 350 different ethnic groups. Its rivers account for 15-16 per cent of the world's total river discharge to the oceans (WWF 2019c). In this region, young people are important actors in the shift towards sustainability. In Colombia in 2018, a group of 25 children and young adults sued the Colombian government, demanding the protection of their constitutional rights to health, food, water, and a healthy environment. They argued that climate change endangers these rights and that the government violated plaintiffs' rights through their acts of omission and breach of their duty to protect the Colombian Amazon. According to the plaintiffs, the resulting rate of deforestation in the Amazon has increased emissions of the greenhouse gases that cause climate change (Pinto-Bazurco 2018).

1.5 Conclusion

This chapter has provided a brief overview of the current state of the environment. More details can be found in the GEO-6 report (UNEP 2019a). It is clear that human activities have caused long-term environmental damage. However, the decisions we make now, and in the future, can still determine the extent of global environmental change.

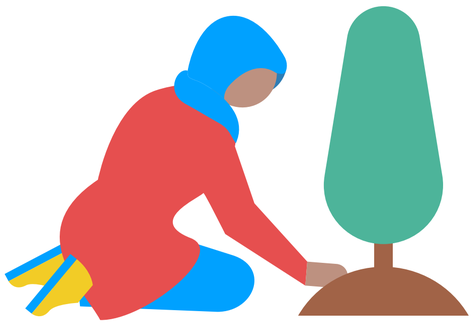
These are not just environmental decisions. They are also moral ones. How much current and future damage to our planet do we consider acceptable? Should governments let many species become extinct (International Union for Conservation Red List [IUCN] 2019; Milman 2019)? Are we comfortable with international environmental objectives such as those in the 2015 Paris Agreement, which could allow catastrophic sea level rise, the destruction of coral reefs, the loss of insect, plant and vertebrate habitats – and the many other impacts of climate change described in the GEO-6 for Youth report – even if all countries met the goal of limiting global warming to well below 2°C while pursuing efforts to limit warming to 1.5°C (Al Jazeera News 2018; Gabbatis 2018a; Gabbatis 2018b; Lenton *et al*. 2019)?

Knowing where we are is only the start.

Knowing where we want to go and how to get there is equally important. The better educated and more aware we are, the more likely we will be able to take appropriate actions.

The next chapter explores where we are headed, and where we should aim to be in the future.

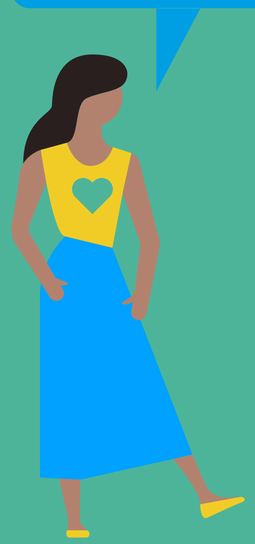
> "We are the first generation that has a clear picture of the value of nature and our impact on it. We may also be the last that can take action to reverse this trend. The next five years are likely to be a critical moment in the protection of our essential resources."
>
> **World Wide Fund for Nature (WWF), 2018a**



Checkpoint 2

You may take this match and drop quiz in the interactive version.

Connecting the dots
To test your knowledge of environmental challenges faced by people across the globe, try matching the statements in the left column with the other half in the right column.



A great number of environmental problems	
More than a billion people in the world live in rural areas.	threatened by overfishing.
Soon there will be lack of	pressure on resources.
Life in oceans is	live in extreme poverty.
Lack of freshwater is	caused by deforestation.
The rapid loss of species is	increase in population and resource demand.
The major contributor to climate change is	are caused by people.
The growing human population puts	release of greenhouse gases.
Many poor people	clean, fresh water in some regions of the world.
The leading cause of food insecurity is	one of the biggest issues of the 21st century.

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2 Towards a Sustainable Future Earth

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The Path
We Are On
The Path
We Should Take

2.1 Introduction

“Modern man does not experience himself as part of nature but as an outside force destined to dominate and to conquer it. He even talks of a battle with nature, forgetting that if he won the battle, he would find himself on the losing side.”

E.F. Schumacher (1973)

Chapter 1 demonstrated that we have not been taking good care of the planet. Chapter 2 will look at what lies ahead: environmental problems are becoming worse, but we can still change the path we are on.

Earthrise on 24 December 2003
Source: NASA 2003

This chapter begins by discussing the importance of achieving a healthy planet in order to have healthy people (section 2.2). In section 2.3 there is a brief description of how young people see their desired future through the lens of the United Nations Sustainable Development Goals (SDGs). In section 2.4 we look at two different possible futures: business-as-usual ("the path we are on") and a more sustainable scenario ("the path we should take"). Section 2.5 elaborates on the changes needed to achieve the sustainable future we want.

2.2
Healthy Planet, Healthy People

We know Earth and its inhabitants need a lot of help. Around 736 million people live in extreme poverty while the basic human needs of many more are not being met (World Bank 2018). At the same time, we have already overshot some planetary boundaries; this threatens Earth's capacity to operate sustainably, with potentially catastrophic consequences (see Chapter 1, Box 1.3) (Jha *et al.* 2013; Raworth 2017).

Unless ambitious steps are taken to change the path we are on, our pattern of growth will irreversibly change the global environment – leading to loss of quality of life and increased conflicts (Dietz and O'Neill 2013; Jones and Natalini 2019; Russel 2019; Vidal 2019).

The COVID-19 crisis, which is still unfolding at the time of the completion of this report, serves to illustrate how society is susceptible to risks posed by unsustainable interactions between society and the environment. This pandemic has demonstrated the importance of healthy people and a healthy planet. It has also shown us the impacts of human activities that reduce natural and ecological buffers and how we have been pushing the limits of these planetary boundaries and proving how fragile the Earth can be. In addition, this pandemic has revealed how far we need to go to build a resilient and sustainable society.

The greatest challenge facing the more than 7 billion people on Earth today is to carry out a transformational change to meet the needs and help ensure the well-being of the 9-10 billion people who will be alive in 2050. This means reducing human impacts on the environment (United Nations Environment Programme [UNEP] 2014).

Young people have an important role to play. Because of increasing environmental pressures, they not only need to help current generations meet their future needs. They also have to consider the needs of future generations. A sustainable environment approach helps us to live healthier and more productive lives without using up Earth's resources. A sustainable future also means providing equal rights and equity in the way resources are distributed, and in educational and employment opportunities.

We have briefly examined the relationship between the world's youth and a sustainable environment. What we have not yet considered is how they themselves think about sustainability. Is it something that influences their choices in daily life? What are their biggest concerns when they think about the future?

To find out, we asked those who responded to the GEO-6 for Youth Survey to tell us about their opinions and their priorities when it comes to the future of the planet (see Appendix 1 for details of the survey).

The survey responses show that, in general, young people are concerned about how we treat the environment. At a global level they are most worried about climate change, air pollution and chemical pollution. When asked which environmental problems they expect to have the greatest impact on them in the future, however, their perceptions differed according to region (**Figure 2.1**).

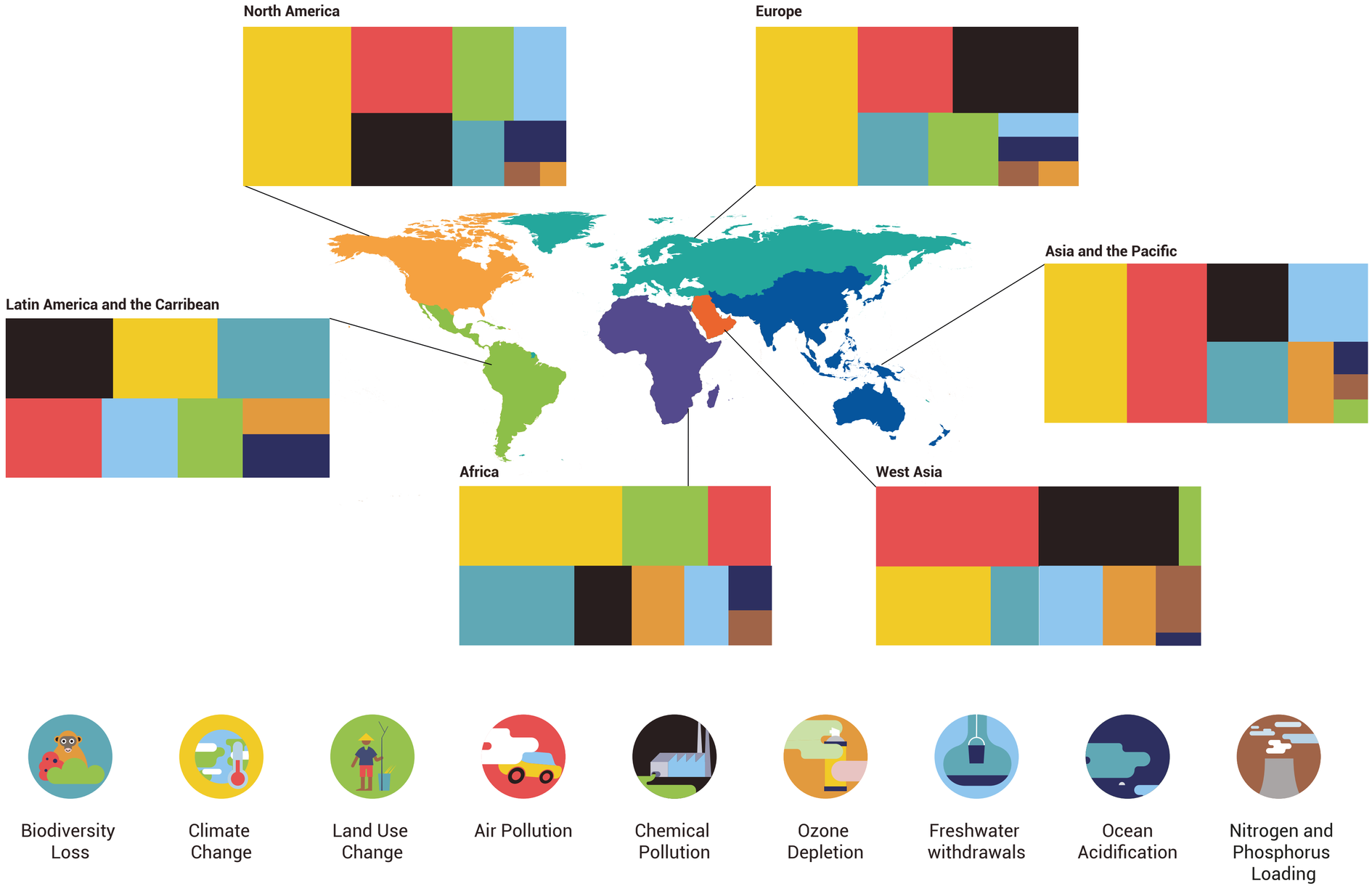


Figure 2.1 Environmental problems of concern to young people (according to region) Source: GEO-6 for Youth survey.

What we already know about planetary boundaries (Chapter 1, Box 1.3) shows that young people's number one concern, climate change, could exceed Earth's capacity to deal with the consequences. While the planetary boundaries for air pollution and chemical pollution are difficult to quantify, both problems are becoming worse globally every year. Biodiversity loss is another top priority if we hope to avoid massive extinctions in the future. Although nitrogen and phosphorus loading were least prioritized, this planetary boundary has already been exceeded.

A well-managed environment in the future will keep these environmental problems from becoming worse.

2.3 Different visions of a sustainable future

We should all aspire to a sustainable future, in which benefits are created for a society that takes good care of the environment. Such a future can be achieved through making responsible choices and acknowledging the need for change. But there isn't just one way to be part of that change. There are a number of ways to contribute to a positive future.

We can learn how to take part in building a sustainable future by understanding our own desires for the future and the priorities of the international community. What is the future you want and how do we define a sustainable future for all?

2.3.1 The world's vision of a sustainable future

In 2015, the Member States of the United Nations adopted the Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) (**Figure 2.2**). The SDGs call for action by all countries to promote prosperity and protect the planet. They address climate change and environmental protection, as well as a range of social needs including education, health, social protection and job opportunities (United Nations 2019a; United Nations 2019b [published in Arabic, Spanish, English, French, Russian and Spanish]).

Figure 2.3 shows how all the SDGs are connected. A sustainable future can be defined by the intersection of these goals' environmental, social and economic dimensions. In other words: to live in prosperity and in good health, we need a healthy planet and a harmonious coexistence with nature. The outbreak of COVID-19 reminds us once again of the fact that we are currently not in balance with the environment. It is another wake-up call that hopefully makes us understand the value of the natural world and how it sustains us. By respecting and allowing other forms of life to thrive we can work to create a healthy and prosperous society. A sustainable economy means a combination of a productive society, healthy environment and fair chances for everyone. Look around, there are so many examples of people already working on this! Such a society would be creative and innovative, understand the value of everyone's well-being and leave no one behind. Where there is both a healthy environment and a productive society, an economy based on sustainable development can be forward-looking and provide opportunities for all of us to work together.

Figure 2.2 Transforming our world: the 2030 Agenda for Sustainable Development.

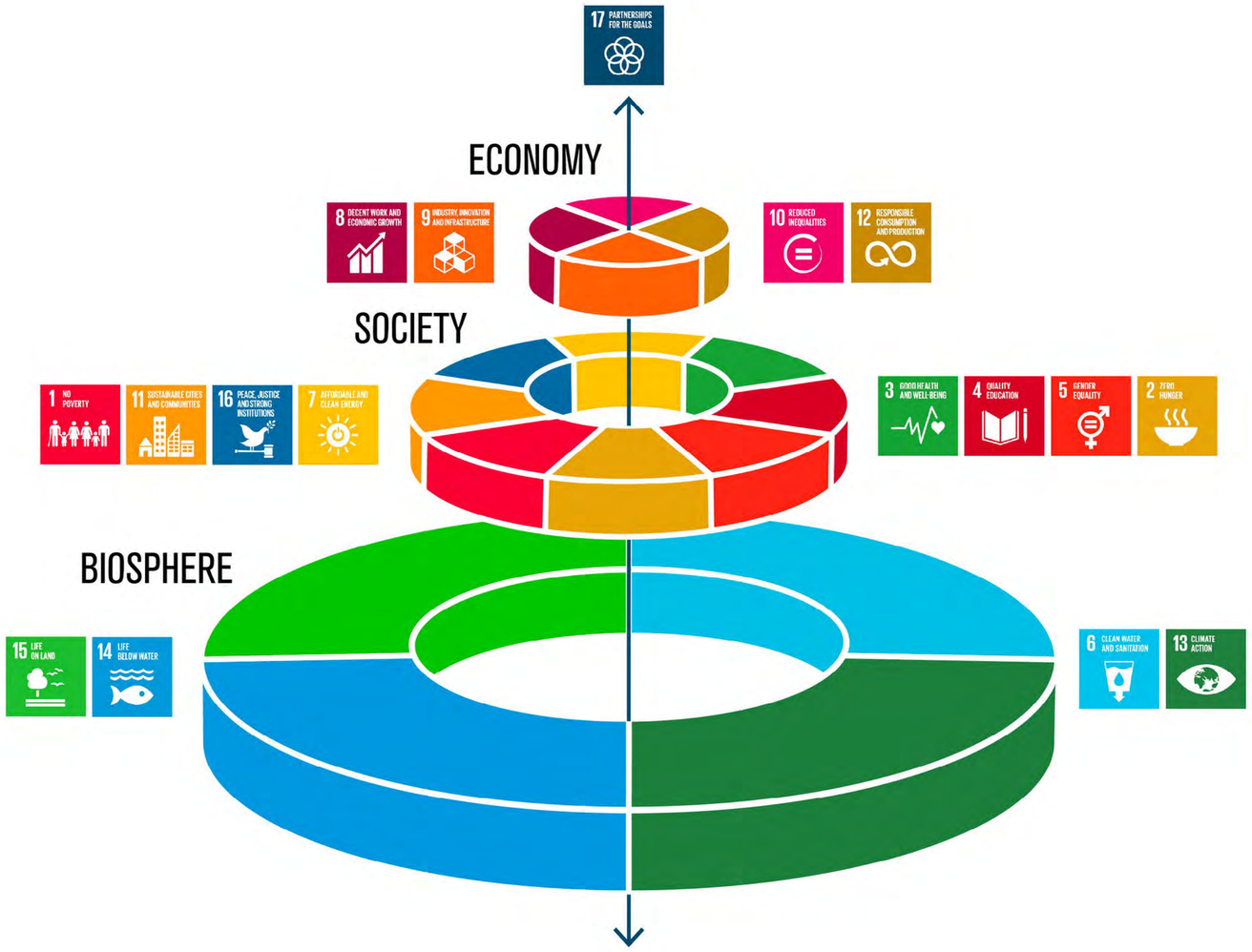


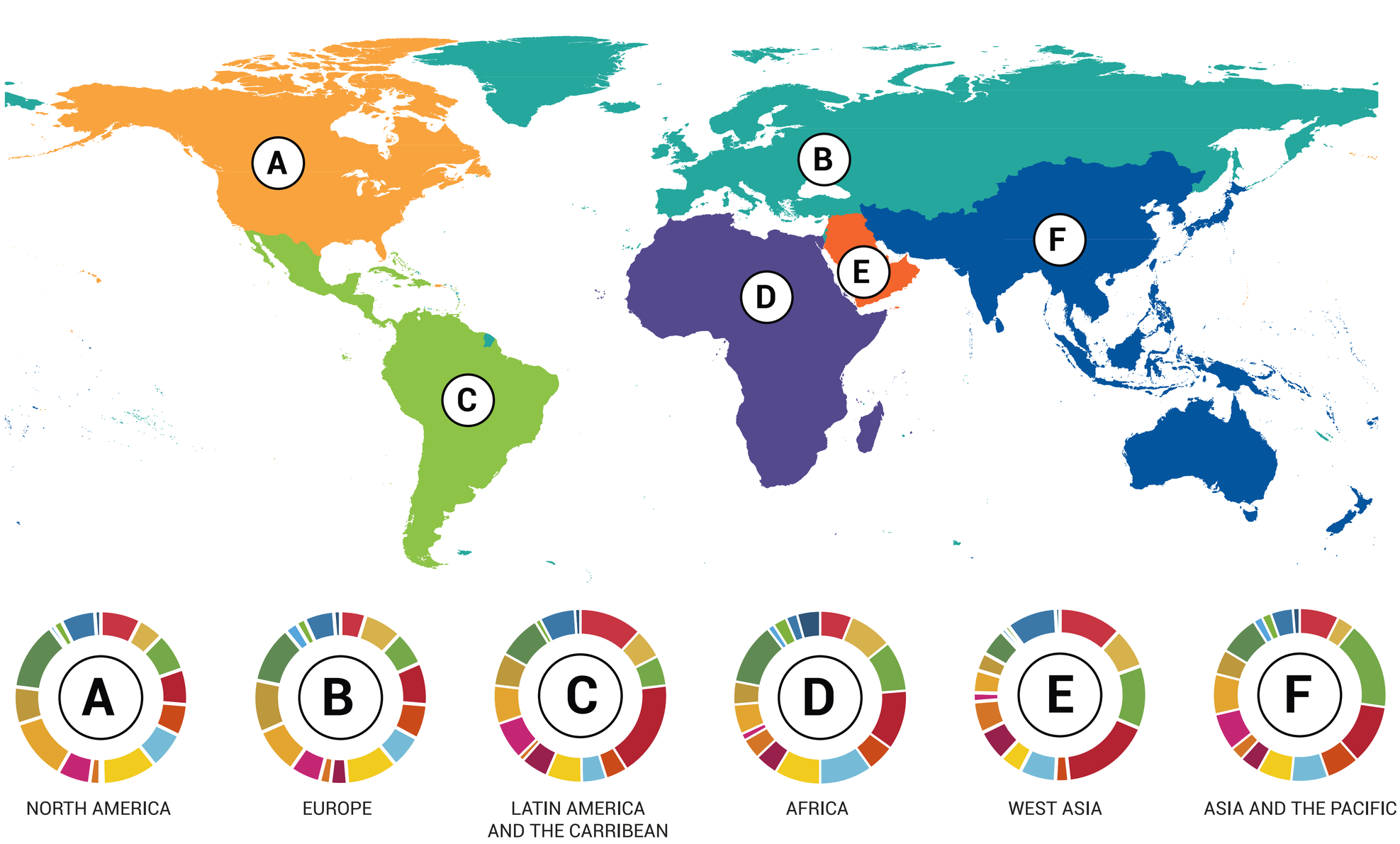
Figure 2.3 **Clusters of the Sustainable Development Goals showing how they are connected**
© Azote Images for Stockholm Resilience Centre, Stockholm University.

2.3.2
Young people's visions of a sustainable future

Each of the Sustainable Development Goals has a list of targets whose achievement is measured using indicators. There are 169 targets in all, with 243 indicators. The contributions that young people can make to a sustainable society are recognized in youth-specific targets, particularly those associated with Goals 4 (quality education), 8 (decent work and economic growth) and 13 (climate action).

Since the world's youth are a driving force for a sustainable future (Ban 2016; Hwang and Kim 2019; UNEP 2019b), we wanted to understand their ideas, perceptions and visions. However, only about 65 per cent of those who responded to the GEO-6 for Youth Survey had heard of the SDGs (see Annex 1). If young people's awareness of the SDGs improved, there would be more engagement to work towards a sustainable future.

To better understand how young people see their future in 2050, we asked them for their own visions of a desired future in the light of the SDGs. **Figure 2.4** shows that the SDGs mentioned most often were Climate Action (SDG 13), Quality Education (SDG 4), and Good Health and Well-being (SDG 3).



NORTH AMERICA

EUROPE

LATIN AMERICA AND THE CARRIBEAN

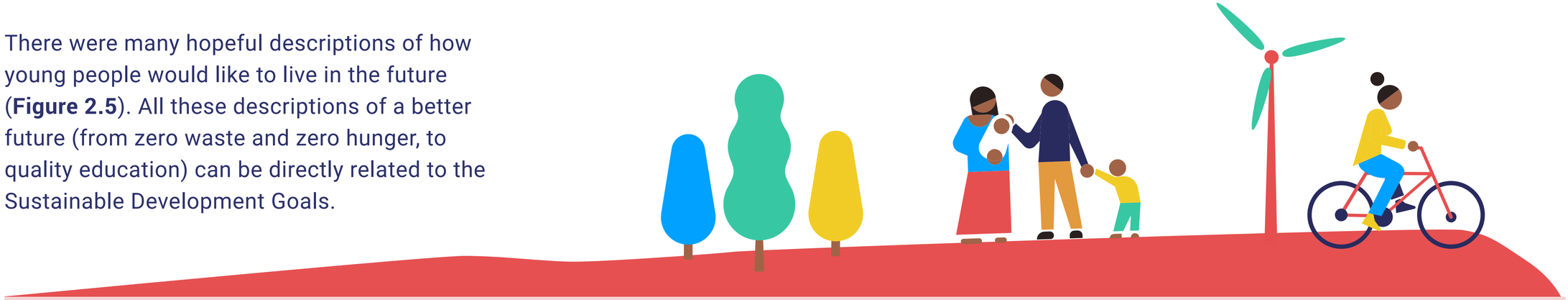
AFRICA

WEST ASIA

ASIA AND THE PACIFIC

Figure 2.4 Sustainable Development Goals prioritized for the future
Source: GEO-6 for Youth Survey

There were many hopeful descriptions of how young people would like to live in the future (**Figure 2.5**). All these descriptions of a better future (from zero waste and zero hunger, to quality education) can be directly related to the Sustainable Development Goals.



"A future where both women and men make constructive decisions towards climate action. I envision a future where our children will be well versed with agriculture, which I am apparently dealing with through practicing vegetable gardening, with children to be the hunger fighters of tomorrow. I envision education which is not basically books but rather how to be sustainable and live in harmony with mother nature."

Female // 24 years // Uganda

"The majority of people will strive to be as zero waste as possible and will know the impact of their actions; fuel, plastic, carbon, meat and other consumptions will go way down. Education will be pushing us beyond our limits in a way of innovative thinking for sustainable development. Politically unstable countries will receive unselfish help to make the countries worth staying in instead of mass migrations."

Female // 20 years // Slovenia

"I strongly believe if we want to build a sustainable future, with climate change constraints, I pragmatically choose zero hunger because it is difficult to ameliorate your immediate environment if you cannot satisfy the most natural need for an organism. We need to take climate action, we're against the clock. And finally, we need to understand that our most strategic way to ensure human life is to ensure other lifeforms, we depend on each other."

Male // 22 years // Mexico

Figure 2.5 Several descriptions of young people's desired futures Source: GEO-6 for Youth Survey.

2.4
A Look into the Future

Now that we have an idea about the futures the world's youth want, it's time to explore the possible futures presented in GEO-6.

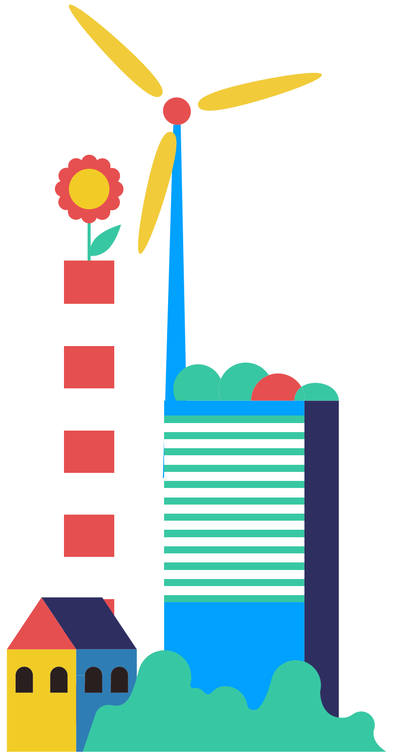
No one can predict the future. Nevertheless, scenarios are a useful tool for looking at very different futures and how they could become real under different circumstances that would either support or impede efforts to achieve sustainable development. For example, the success of these efforts might depend on technological innovations, governmental regulations and policies, or societal change. This chapter presents two scenarios, based on the analysis in Chapters 21 and 22 of GEO-6 (UNEP 2019a), with the help of our six imaginary characters (see "Reading Tools" in the General Introduction).

The first scenario extends our current way of living into the future, assuming there will be no significant changes in our societies or economies (see GEO-6, Chapter 21). This report will refer to that scenario as "the path we are on", although scientists and others also commonly refer to it as "business as usual" scenarios. If we remain on the path we are on, the SDGs will not be reached.

To avoid such a bleak future, it is important to look at how we could meet the environmental goals within the SDGs (that is, their "environmental dimensions"). We will therefore present a positive pathway to sustainability (see GEO-6, Chapter 22) called the "more sustainable scenario" or "the path we should take".

Even as we move towards the path we should take, environmental problems that already exist (such as climate change) will make it impossible to return to a natural environment that is pure and pristine. In the "more sustainable scenario" there will still be some serious environmental problems.

We will show how the main drivers of environmental problems described in Chapter 1 (population growth, economic development, urbanization, technology and climate change) will collectively impact the Earth System in the future. We will also look at the roles of the food, energy, and waste systems.



2.4.1
Air and climate in 2050

The path we are on

Hello everyone, this is Artan from Kiribati. The past three decades have been extremely difficult for my country and the rest of the planet. Back in 2020 we were using far more resources than the planet could replenish, and things have only become worse. Today, in 2050, we consume about 60 per cent more primary energy (UNEP 2019a). There are fewer people without access to modern energy, but we use fossil fuels to supply the majority of our energy needs. In addition, many developing countries still openly burn a significant amount of waste. This means we have more air pollution in many emerging countries, causing about 7 million people (equivalent to the total population of Hong Kong, Sierra Leone or Laos) to die prematurely each year (Stohl et al. 2015; Klimont et al. 2017). Poor air quality is affecting our economies by reducing global GDP by 1 per cent because we take more sick days, which increases health care costs and reduces the amount of food we can grow (Organisation for Economic Co-operation and Development [OECD] 2016). The wealthy continue to exacerbate environmental problems, as they purchase energy-intensive food such as meat and products like cars and electronics at alarming rates, when they should be reducing consumption.

However, the biggest problem we face is how quickly the climate is changing. Emissions of greenhouse gases (GHGs) have increased by 50 per cent (Riahi et al. 2017; International Energy Agency [IEA] 2018) and people in richer countries still emit the most GHGs. The planet is now almost 3°C warmer than it was before the Industrial Revolution, when large-scale combustion of fossil fuels began. Scientists expect it to be well over 4°C warmer by the end of the century (Intergovernmental Panel on Climate Change [IPCC] 2018). This means we are experiencing significant sea level rise, much more drought, extreme weather events, and greater human and economic losses.

At this point the climate is destabilizing, and scientists believe many of these changes cannot be reversed and will become worse regardless of any actions we take today. In my country much of our land has been lost to the sea. Many of my friends and family members have moved to other countries in the region, since living here through these changes has become extremely difficult. My childhood memories are of places that are now underwater. My children are likely to see their current home lost soon because of sea level rise.

Figure 2.6 Air and climate: the path we are on

The path we should take

Sarah here, reporting from a very green and clean London! It's been a very, very busy 30 years, but during that time, we've come together as a global community to ensure a better planet for all. After governments agreed in 2015 to limit global warming to 2°C (United Nations Framework Convention on Climate Change 2015),

GHG emissions continued to increase for five more years. While the lockdowns during the COVID-19 pandemic had curbed air pollution, it continued to rise, they continued to rise as soon as the lockdown periods were over. However, in 2019 and the early 2020s a series of scientific reports such as GEO- 6 (UNEP 2019a), the IPCC Special Report on 1.5° of Warming (IPCC 2018) and the IPBES Global Assessment on Biodiversity and Ecosystem Services (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services [IPBES] 2019), combined with several natural disasters, finally served as a wake-up call for people around the world. Moreover, with the objective of building back better from the COVID-19 crisis, the government adopted a recovery plan that focused on environmentally sustainable policies, including GHGs emission reduction. Citizens, young people in particular, pushed for transformative action by their governments. Consumers simultaneously demanded that companies rapidly reduce their emissions before climate change reached an irreversible tipping point in 2030.

Many people – including me – worried at the time whether GHG emissions could be reduced by 45 per cent by 2030 and reach net zero by 2050 (IPCC 2018), while also reducing inequality and improving human health outcomes globally as the population continued to grow. Rather than shying away from these challenges, though, the global community took advantage of the opportunity to build a brighter future. Enormous investments were made in decarbonizing the global economy with renewable energy. Technologies based on fossil fuel combustion, such as petrol-powered vehicles and natural gas heating and cooling, were replaced with alternatives (e.g. electric vehicles and heat pumps) that run on electricity produced from renewable sources. At the same time, ways were found to make all modern technologies more energy efficient. In my country policies were introduced to rapidly phase out the use of coal for power generation. In 2021, we experienced our first coal-free week since 1882. People did not think it was possible, but by 2025 we had entirely phased out coal! London made great efforts to reduce air pollution and ensure that its GHG emissions were aligned with the 2015 Paris Agreement by building a vast network of bike lanes, taxing cars entering

the city centre, and investing in energy efficiency measures for all its buildings. At the time the Paris Agreement was signed, cities were using a large share of the world's energy supply and were responsible for something like 70 per cent of global energy-related GHG emissions. London and other cities in the world have played an essential role in increasing energy efficiency and reducing these emissions.

Globally, much of the efforts to reduce GHG emissions were focused on the 90 investor- and government-owned businesses involved in the production of fossil fuels and cement that had emitted about two-thirds of historic carbon dioxide (CO_2) and methane emissions. National and local governments worked tirelessly to make sure those companies stopped profiting from pollution, while also making sure their employees were equipped with the new skills needed for environmentally regenerative jobs and were ready to move into them.

Many places around the globe created low-carbon food systems through innovation, local production, and decreased meat consumption. Energy utility companies also redesigned their energy systems to incorporate renewable energy sources in the energy mix. They made sure there was enough energy stored in batteries for times when the sun wasn't shining or the wind wasn't blowing enough. Utility companies made it easier for homeowners to save money by installing solar panels on their roofs. During the transition to renewable energy, policies were instituted to keep fossil fuels in the ground and a great deal of innovation went into developing more environmentally friendly alternatives to products like plastics and electronics that previously were energy-intensive to produce and required fossil fuel inputs. While we've significantly reduced waste through reducing, reusing and recycling processes, the remaining waste is often used to generate energy and heat for homes in clean power plants.

Since it was clear that all these investments in reducing GHG emissions would not be enough to stabilize the climate, investments were also made in planting trees and inventing low-cost technologies to capture existing carbon from the atmosphere and store it or create products from it. Efforts to reduce emissions came with co-benefits for human health, as concentrations of dangerous air pollutants have been drastically reduced and the number of premature deaths has fallen (UNEP 2019a).

However, with all these efforts the planet has still changed drastically. Climate change has already caused enormous harm, and it is likely that things will worsen before they get better. Today, in 2050, almost 40 per cent of the global population is exposed to severe heat at least once every five years; sea level rise is approaching half a metre, regularly causing floods in major cities globally; ecosystems are shifting geographically; crop yields are decreasing; coral reefs are almost entirely gone; and every year record-breaking extreme weather events displace millions of people (IPCC 2018). These are all logical consequences of many decades of unsustainable growth (mainly between the Industrial Revolution and the 2020s). However, this has not discouraged us from working to reverse climate change. We know that some real, positive effects can only be felt many years from now.

Figure 2.7 Air and climate: the path we should take

2.4.2
Land and biodiversity in 2050

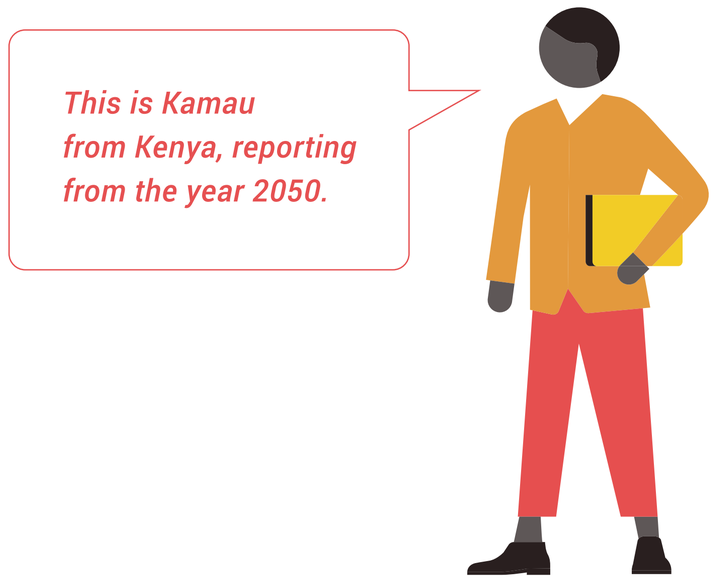
The path we are on

This is Kamau from Kenya, reporting from the year 2050. The current population needs more land, water and energy to sustain the economy, particularly for food production (UNEP 2019a). Furthermore, although the COVID-19 crisis in 2020 caused significant impacts to the economy and human health; humans still failed to understand the interactions between society and nature, and nothing really improved.

Human activities have not become more sustainable and, as a result, the planet's natural resources are severely depleted. For the most part, people have not changed to a more plant-based diet, so agricultural demand has increased by around 55 per cent (UNEP 2019a). On top of that, we see enormous amounts of food go to waste, while across the planet farmers are dealing with water shortages and contamination, soil degradation, and climate impacts such as changing seasonal weather patterns, heat waves, droughts and extreme weather events. The economic losses are huge, too. To increase yields, most farmers are using more fertilizers, which pollute the land, water and air even more. More than 3 billion people in the world are affected by degraded land (IPBES 2018a). Between 200 and 300 million people around the world are undernourished (UNEP 2019a).

In Kenya farmers are struggling to be profitable, as crops regularly fail and we often have food shortages. Globally the wealthy are still able to eat what they want, but many people I know in Sub-Saharan Africa are struggling to make a decent living. Food prices are kept incredibly low by the big agriculture industry (I wonder, why is Fair Trade consumption not the standard?!), I worry that inequality is still growing.

Additionally, unsustainable ecosystem management has increased vector borne diseases and infectious human diseases originating in wildlife, like COVID-19, Ebola and SARS, which are facilitated by human-animal contact.



We are also in the middle of the worst extinction crisis in the planet's history. In 2019 we found out that 1 million of the 8 million animal and plant species on Earth were threatened with extinction, mainly because of human actions – and now many of those species are gone forever (IPBES 2019). Demand for more food has led to over 400 million hectares of natural land, like forests and savannahs, being cleared (an area greater than India). The loss of forests and savannahs has significantly decreased the habitats of animals and plants. These areas were home to many species that are now lost.

The numbers are staggering, but we knew of these problems in 2020 and failed to act. The lack of action turned out to be a tremendous mistake for humanity, especially now with our unstable global food production systems. Who else besides insects would be able to pollinate our fruits, vegetables and flower fields? This is not a myth anymore. The forest behind my parents' home is smaller and more barren than it was in my childhood. Here and elsewhere around the planet, nature is much quieter than it was before.

Figure 2.8 Land biodiversity: the path we are on

The path we should take

Anjali here, reporting from India on a thriving planet full of life. Our entire relationship with the planet Earth has changed dramatically since 2020 – in a good way! Due to major social changes, our land is healthier and much of Earth's biodiversity is no longer threatened.

Guess what?! An approach recognizing that human health is connected to the health of animals, plants and our shared environment at all levels of decision-making was implemented. After the COVID-19 nightmare, countries started to pay much more attention to the value of all life, which was a smart choice, because it reduced the risk of diseases that originate in animals (zoonotic diseases).

Moving towards sustainable land use, and restoring biodiversity with 9 billion people on Earth, meant we had to significantly reduce consumption of meat, dairy and eggs and increase farm productivity in sustainable ways, while reducing food loss and waste and expanding protected areas. Many of these changes happened because of new government policies and innovation, but they were also pushed forward by people around the world taking individual actions to reduce their impact on the planet.

Hundreds of millions of people, often led by youth movements, initiated transformative changes in their diet – to both improve the sustainability of the food system and reduce food waste. Earlier in the century growing wealth in developing countries like Brazil, India and China was leading to increased meat consumption, but many of my friends and family members decided to become vegetarians or vegans whenever possible. Actions like this helped ensure that less cropland would be needed for livestock feed and grazing. An immense amount of agricultural land was being used for meat and dairy production. Globally we cut food waste in half, so that now 14 per cent less cropland is needed to produce our food (UNEP 2019a). The incredible amounts of food lost and wasted in the past, estimated at around one-third in 2011 (Food and Agriculture Organization of the United Nations [FAO] 2018;

FAO 2019), now seem so ridiculous, and the little that is "wasted" now is either composted or donated to those in food insecure situations.

Much of the land that would have been used for agriculture has been converted to natural areas. In creating this transformed world, special attention has been given to indigenous and poor people – who earlier in the century lived on 22 per cent of the land that supported 80 per cent of global biodiversity (World Bank 2008). Western countries, especially, have learned a lot from the way indigenous people live with nature instead of working against it. Governments have provided them with economic opportunities and incentives to protect their land, which has helped ensure their well-being as well as helping to preserve valuable ecosystems and biodiversity (UNEP 2019a). If only you could see all the services that nature provides us now!

All this has needed new and fair ways of treating our natural resources. For instance, by including all environmental and social costs in the price of consumer goods we finally pay their true price. We never forget that trees fight climate change and generate money at the same time: restoring a forest of 350 million hectares generates USD 9 billion. This is because healthy land provides lots of ecosystem services and removes GHGs from the atmosphere (UNEP 2019a).

For me, the largest success of the past several decades has been the recovery of species that were on the verge of extinction when I was growing up. While many species are still threatened, many more are thriving thanks to the recovery of their natural habitats from past human activities. Yesterday I saw on the news that India's Bengal tiger population is higher no[illegible] than in the past 150 years!

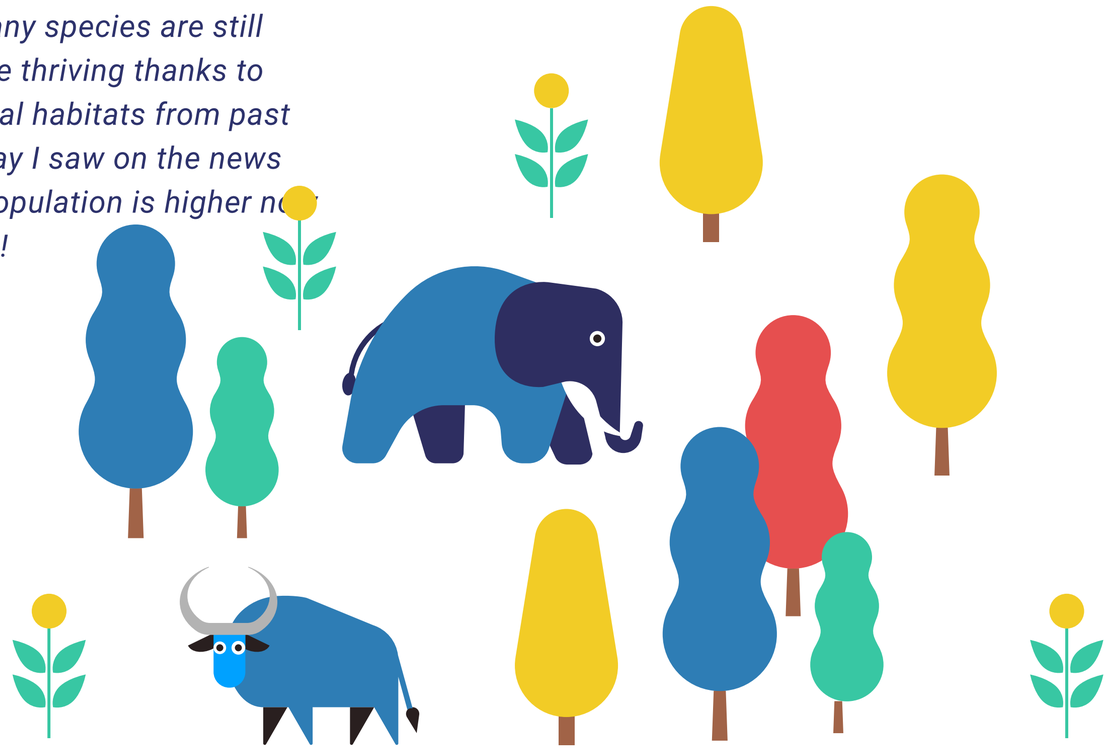


Figure 2.9 Land and biodiversity: the path we should take

2.4.3
Freshwater and oceans in 2050

The path we are on

This is Carlos calling in from Lake Poopó. Demand for fresh and clean water in the world has increased by 26 per cent during the last 30 years because of population growth and more industrial activities, as well as higher electricity and energy use in developing countries (Bijl et al. 2016; Wada et al. 2016; Satoh et al. 2017). In 2019 more than 2 billion people lived in countries with high water stress, but now over half the world population lives in water stressed areas (a total of more than 5.4 billion people) (UNEP 2019a).

Globally, increased food demand has led to the intensification of food production. That not only means we need more water. It also means we use more chemicals and fertilizers, like nitrogen and phosphorus, which find their way into nearly every water body and all the oceans across the globe. This chemical pollution is reducing water quality and creating dead zones (usually caused by eutrophication) in freshwater bodies and oceans (UNEP 2019a). Poor water quality has led to unsafe drinking water, sanitation and handwashing; it is responsible for 1.4 million deaths every year (UNEP 2019a), including hundreds of thousands of children, mainly due to diarrheal diseases (Fullman et al. 2017).

More than 400 million people still live without access to improved drinking water services and about 2 billion lack access to improved sanitation. Today water is a scarce resource in many places, leading to instability and social unrest all around the world. People are leaving their homes and settling in other countries to survive (Ratner 2018). I recently saw in the news that GDP in Central and East Asia is about 10 per cent less than what it should be because of water stress.

Oceans are also not in great shape (IPBES 2018). The high concentration of atmospheric CO_2 has resulted in increased ocean acidity, impacting their productivity. Global warming of over 2°C has resulted in the loss of over 99 per cent of all coral reefs (IPCC 2018). Fishing communities earn 10 per cent less than they used to because fisheries

are not sustainably managed (UNEP 2019a). Furthermore, microplastics and antibiotics pollution is increasingly deteriorating the health of marine animals, in many cases causing species and ecosystem collapse.

Then there is sea level rise: global warming has caused temperatures to increase rapidly and snow and ice to melt (back in 2019, more than 70 per cent of the planet's freshwater was still locked up in ice). Natural coastal protection zones like coral reefs are disappearing. The situation is chaotic in coastal communities. They are trying to protect themselves with seawalls and even leaving their homes to move inland. Imagine what it will be like when sea level rises by 1.2 metres by the end of the century (UNEP 2019a).

Did you know?

- **While 'the path we are on' is based on the best science available, 'tipping points' add large amounts of uncertainty to how the future will play out. Scientists have identified that global warming exceeding 2°C could trigger us into a "Hothouse Earth" pathway in which dangerous feedbacks lock-in catastrophic warming of 4-5 °C. A notable tipping point and feedback loop is the melting of the West Antarctic ice sheet - after a certain extent of warming, the entire ice sheet will start melting and it will not be able to recover, leading to several meters of sea level rise. Recent research has pointed out that these tipping points could be triggered even with 1 or 2 °C of warming, meaning that we may have already locked-in significant environmental change.**

YALE Environment 360

Figure 2.10 Freshwater and oceans: the path we are on

The path we should take

Hello, everyone. Anoud here, from a fertile Kuwait. In this bright new future, we have found ways to overcome the negative environmental effects of population growth on water resources. It required efforts by all to reduce water demand – from farmers working in the field to individual households, and from industries to governments.

Innovative farmers have found ways to increase water use efficiency ("more crop per drop") and to improve irrigation efficiency (less water loss). Households have reduced their waste and stopped purchasing single-use plastics and other pollutants that often ended up as marine pollution which damaged oceans and life underwater. Industries have reduced water consumption and invested a lot in water recycling. There are also around 10 times as many desalination plants as we had in 2011, which has created more water supply.

Starting in the early 2020s, governments promoted nature-based solutions as a way to sustainably address freshwater issues. I understand there are several ecosystem services that recover their functions following conservation efforts and investments. Given our heavy reliance on the sea for fish and other ecological services, we encouraged better stewardship of these "blue" resources. The now robust "Blue Economy" is sustainable. It views the marine environment as more than a means for economic growth. The Blue Economy also works to improve human well-being and social equity while reducing environmental risks, such as climate change, and other ecological losses. The remaining coral reefs are now protected by the creation of marine protected areas (MPAs) (Elliott et al. 2001; Jones, McGinlay and Dimitrakopoulos 2017). These areas are deliberately set aside for the conservation of ecosystems, which allows recovering, protecting and enhancing the biodiversity, productivity and resilience of the MPA and its surroundings. In addition, we were able to reduce ocean acidification by bringing down atmospheric CO_2 levels, which also limited ocean warming and reduced the runoff of nutrients like fertilizers (nitrogen and phosphorous) into the ocean (Billé et al. 2013).

This worked out because of our combined efforts to make the production of food (i.e. land and biodiversity systems) and energy (i.e. air and climate systems) more environmentally sustainable. For example, since most young people today eat mainly a plant-based diet and pay attention to reducing food waste, the amount of water used for agriculture has been reduced significantly. Everything in the natural world is so connected.

Did you know?

- Some of you may think that the 'path we should take' we describe are nice visions but at the same time utopian and not feasible. We admit that it takes tremendous efforts but would like to show concrete examples of existing initiatives that hold potential to shape the future in a prosperous, just and sustainable way. There is a database called 'Seeds of good Anthropocenes' that is full of positive signals for the future. For example the initiative "La Platjeta", based in Barcelona, Spain, that delivers fish baskets, fresh from the sea, to their clients. They reduce the existing pressure on overexploited populations like tuna and cod by targeting only seasonal species that are not yet popular on the market. Another benefit is that they know beforehand how much fish they need to deliver and therefore avoid waste. Finally, they organize various activities to reconnect people to marine life and to their cultural heritage. This sustainable business model opens up opportunities for a younger generation of sustainable fishers!

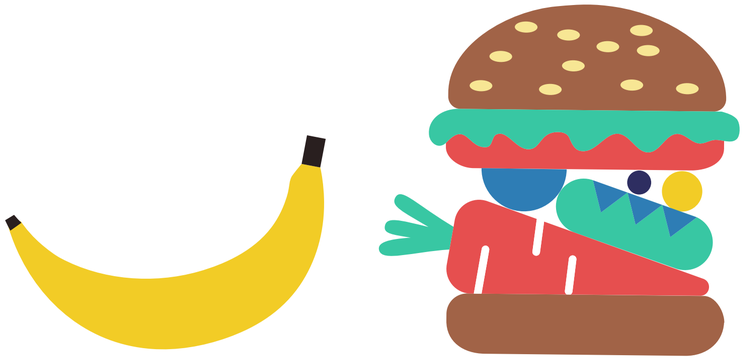


Figure 2.11 Freshwater and oceans: the path we should take

2.5
We need transformational change

The “path we should take” scenarios show ways to reach greater sustainability for air and climate, land and biodiversity, and freshwater and ocean systems. A major challenge in achieving greater sustainability will be tackling human health and environmental challenges in a comprehensive way that maximizes synergies. Today, for example, increasing food production often has many negative trade-offs, and our best solutions sometimes create more environmental problems. The real world will not always be as simple as the possible futures we can imagine.

For example, the need to increase food production because of population growth will require more freshwater, which affects our goal to reduce water stress. At the same time, water stress (or water scarcity) is becoming worse due to other demands, for example those from industry. To increase the amount of fresh drinking water, more desalination plants may be needed. But these plants require energy and can also acidify the ocean, thus negatively affecting marine life. In other words, reaching SDG 2 (Zero Hunger) and SDG 6 (Clean Water and Sanitation) at the same time is nearly impossible within the current system. This is also true for SDG 6, SDG 7 (Affordable and Clean Energy) and SDG 14 (Life Below Water) and many other combinations.

The COVID-19 crisis has once more showed the importance and interdependence of the SDGs. Our society needs to ensure healthy lives and promote wellbeing for all, at all ages (SDG 3). We have seen that inequality and injustice continue to dominate our current society, which shows the need to eradicate poverty in all its forms everywhere (SDG 1), to end hunger and achieve food security (SDG 2) and most of all, to reduce inequality within and among countries (SDG 10). Witnessing the impact of the social distancing measures that were put in place during the pandemic, it is clear that we need to ensure inclusive and quality education for all (SDG 4) that supports lifelong learning. The economic impacts of COVID-19 are clear and will greatly affect many people. The imposed lockdowns, community quarantine and the effect on enterprises and corporations prove that promoting inclusive and environmentally sustainable economic growth and decent work for all (SDG 8) are essential for building a resilient society. Lastly, the spread of this virus calls for making cities and settlements inclusive, safe, resilient and sustainable (SDG 11).

Although there are many scientific studies on the subject, it is still not clear how to ambitiously meet all the SDGs at once. A path to a completely sustainable world in which air, water, land, biodiversity and the climate are all healthy has not yet been discovered (UNEP 2019a). Many of the ways humans live and work (including our economies, infrastructure such as roads and buildings, education systems, and sometimes even our personal beliefs and values) currently work against a healthy environment instead of promoting it. This means we often improve one part of the environment while other parts continue to be degraded.

To achieve a sustainable future, we need to think differently about our economy and human well-being and better understand the good things that nature provides. We also need to consider how to achieve a socially and economically sustainable future that will lift a billion people out of poverty while, at the same time, improving human well-being, providing economic growth and protecting the health of citizens, especially the poorest and most vulnerable. To achieve all this, we need more than minor improvements in some sectors – we need a global transformation of human systems.

Despite the negative impacts of the pandemic, it also offers us a new perspective. A chance to take stock, pursue the advancement of environmentally sustainable development and to understand the need for transformational change.

Recovering from this pandemic will require comprehensive environmental responses, strategies and policies. According to UNEP, 4 SDGs are vital to a sustainable recovery. The pandemic has shifted our focus from the climate crisis, but its effects are more life-threating and long-term. The call for climate action (SDG 13) must continue and societies must rebuild the economy and society by prioritizing green jobs and technology. We must continue to sustain and protect life on land and below water (SDGs 15 and 14) to help us build back better and focus more on nature-based solutions. Our lifestyle choices and the investments of both our public and private sectors have resulted in the depletion of natural resources, led to an increase in greenhouse gases, biodiversity loss and the emergence of diseases and other health concerns. Promoting responsible consumption and production can help us make better choices that contribute to a resilient society.

But how do we transform systems? How do we change our current ways of doing and fix the things we have already destroyed or almost destroyed? To close the gap between where we are today (the path we are on) and where we want to be (the path we should take) will require a radical change in society, including new policies (for example, a systemic approach to food, energy and waste rather than isolated policies for fisheries or agriculture); a circular economy (from a linear focus on take, make, waste to a more circular approach of reduce, reuse, remanufacture regarding goods and products), gender equality (female empowerment allows improved environmental outcomes and is an essential part of any sustainable and just future); and an education system that teaches with a view to bringing about this new future, including new technologies and lifestyle changes – all implemented at scales and speeds never experienced before.
While achieving transformational change is not an easy task, there are five building blocks that

everyone can use to initiate transformations (**Figure 2.12**). These are broad movements that can lead us to a sustainable future, so the examples within the building blocks may overlap somewhat. All five building blocks are potential career pathways for young people. They provide examples of sustainability actions they can take every day.

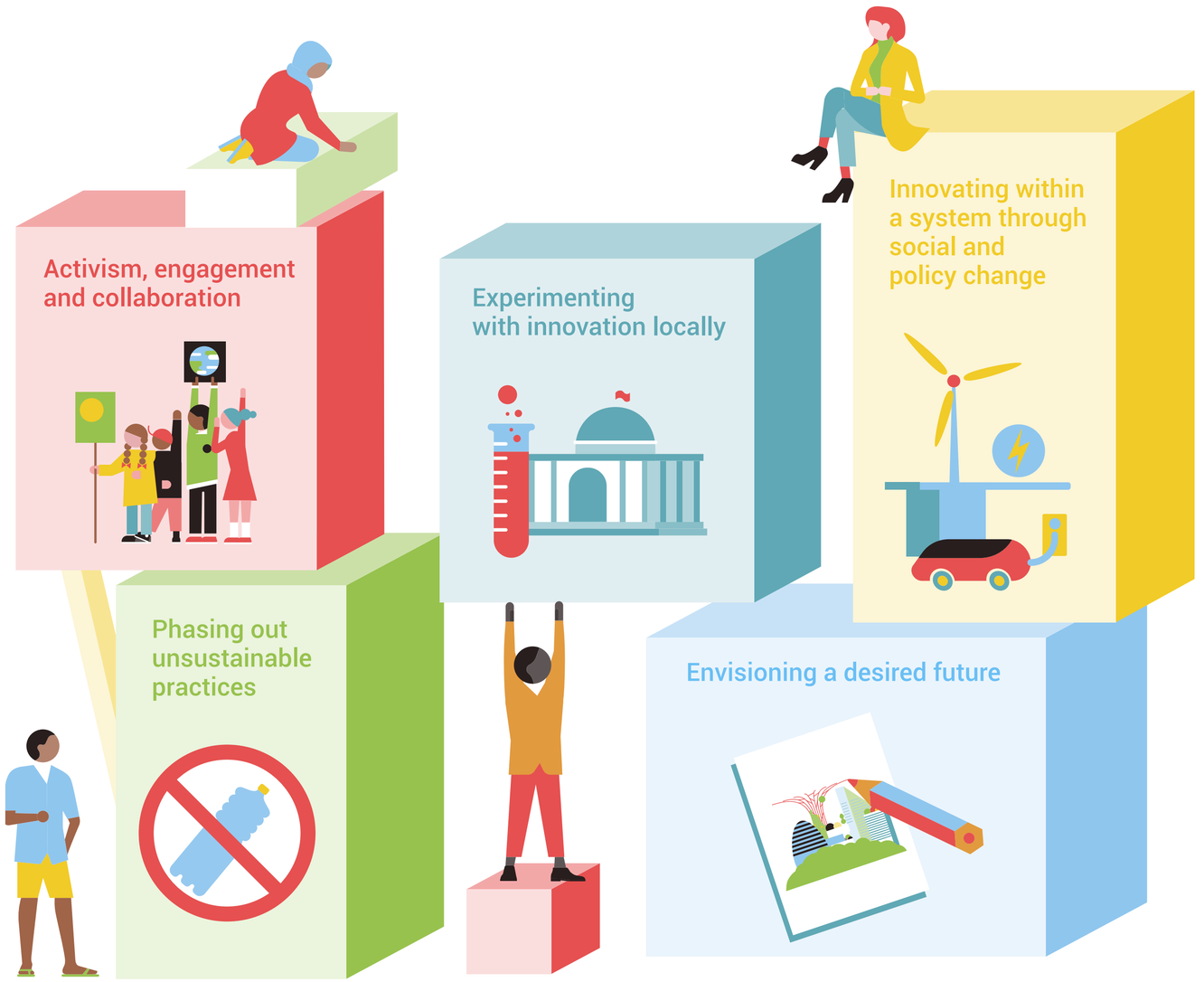


Figure 2.12 Building blocks for a sustainable future

Although transformative change may sound abstract, far away and almost utopian, it should be remembered that all transformations start from small innovations and everyday actions at the local level. If we manage to recognize them and support them, many small actions can cause markets to change at local, regional and global levels. We only need to believe in them, support them, share them and let them grow, so that they can reach the rest of society. In this way young people can be part of the change needed to achieve a sustainable future.

2.6 Conclusion

The daily lives of many of us have been comfortable and convenient because of advances in technology, for example, automobiles, smartphones, the Internet and various gadgets that allow us to feel we have almost everything within our reach. However, modern lifestyles have also put the planet under pressure through excessive consumerism and a lack of a sense of urgency to look after the environment. For example, continued use of plastics has polluted the planet. Growing demand for new technology and innovations has resulted in the depletion of natural resources. This impacts every one of us.

The future is difficult for us to imagine. The purpose of this chapter has been to provide a glimpse of different possible futures, as projected by the sixth Global Environment Outlook (GEO-6) (UNEP 2019a). The world's youth can contribute greatly to shaping a better, healthier future for humans and the planet.

There is increased concern about climate change, air pollution and chemical pollution and how these problems continue to threaten our health and the environment. Young people desire a future with better opportunities for quality education, personal engagement, and participation in climate action while living in a more sustainable world.

The world's youth are the future. Our choices and decisions will be the drivers of the changes needed in order to preserve our planet. Our contributions, as well as our leadership, are essential to build a more sustainable society. We can lead this transformational change.

Chapter 3 looks at some of the actions we can take.

Checkpoint 3

You may take this match and drop quiz in the interactive version.

Connecting the dots

To test your knowledge on the business-as-usual future scenarios faced by people across the globe, try matching the statements in the left column with the other half in the right column.

By 2050, agricultural demand for over 10 billion people will increase by ____ .	60%
About ____ of the known animal and plant species on Earth are threatened with extinction.	45%
In a business-as-usual scenario, ____ million people will be undernourished by 2050.	55%
By 2050, ____ of global population will live in high water stress areas.	1 million
To meet the needs of the current global population, we consume about ____ more primary energy	45%
Limiting global warming to 1.5° C would require global net human-caused emissions of carbon dioxide to fall about ____ from 2010 levels to 2030.	200-300

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3 From Empathy to Action

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3.1
Introduction

As shown in Chapter 2, we need transformational change to achieve the Sustainable Development Goals (SDGs) and bring about a sustainable future. The current global pandemic situation has reminded us of this. A shift in our economies is required. This shift can occur through market. It is not the only way.

Every time you buy something or use a product in a certain way, you affect a market. For example, the market for personal mobility is dominated by polluting passenger cars, sport utility vehicles (SUVs) and trucks that also consume lots of petrol (International Energy Agency [IEA] 2019). You have the power to change that market by using public transportation, bicycling or walking. You can also buy a more fuel-efficient conventional vehicle (maybe one that is used or reconditioned) or an electric vehicle that produces no tailpipe emissions.

This chapter focuses on the effects young people can have based on what they buy – or don't buy – every day. It also looks at other types of daily behaviour and important life choices. To become agents of change, we all need to equip ourselves with good information and strategies for moving towards a sustainable world individually and collectively.

Youth are going to suffer the most from the social and economic consequences of the COVID-19 pandemic in the coming years (Organisation for Economic Co-operation and Development [OECD] 2020a). Being an agent of transformational change, we need to play a role collectively to cope with these consequences, and to avoid future pandemics. Adopting circular economy practices can help achieve it.

> "I am a believer of the butterfly effect. A small positive vibration can change the entire cosmos."
>
> Amit Ray,
> Walking the Path of Compassion

In this chapter, we describe ways in which the world's youth can change markets and bring about transformational change. We begin by showing how to move from a linear economy to a circular one (section 3.2). In section 3.3, we present the voices of young people speaking about perceived challenges in achieving the "more sustainable scenario" described in Chapter 2. Transformative change can be achieved through individual actions (sections 3.4 and 3.5). There are examples of collective actions aimed at transformative change in section 3.6, followed by the conclusion in section 3.7.

3.2
From a Linear to a Circular Economy

A first step towards achieving sustainability is to begin looking at resources differently and learn to do more with less. Many of us were raised to use objects and then throw them away. That's what it has meant to be consumers. But why are so many of these

objects considered waste when they could be reused? By continuing to throw things away, we are putting the planet under enormous pressure. We need to start viewing our relationship with materials differently. We should consider where products came from, how they were made, and where they will eventually end up.

The way we use resources today is based on a "take, make, use, waste" model: this is a linear model. To achieve a sustainable future, we need to change this model to be more circular – extracting and wasting fewer resources by keeping these resources in use as long as possible. In other words, we should extend the life of materials. This is the basis of the circular economy, which restores and regenerates our environment by design (Ellen MacArthur Foundation 2017).

"The circular economy reduces our unhealthy and harmful dependency on scarce limited natural resources and provides economic, ecological and social benefits."

Employment in the Circular Economy:
A Baseline for Glasgow, 2018

To move from a linear way of consuming to a circular one, we need a combination of lifestyle changes, changes in the way we throw things away, and the exploration of new technologies **(Figure 3.1)**. This will not only reduce our need to take things out of the environment and then send them back as waste. It will also focus on reducing, reusing and repurposing. If we all work towards building a circular economy, we can change markets over time. Each of these changes is a challenge to the people and companies that rely on the linear economy. How can we, the world's youth, bring about transformative change? Just remember that every choice we make, every day, has consequences.

Figure 3.1 How circular and linear economies work. Source: Ellen MacArthur Foundation (2019).

3.3
Facing Challenges to Action: What are the perceived challenges in creating a sustainable world?

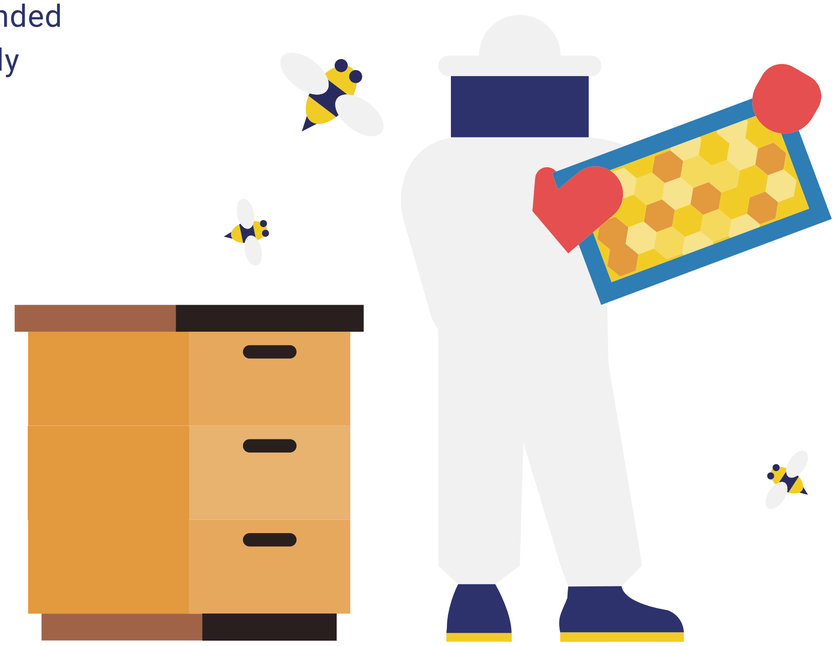
“A winner is a dreamer who never gives up.”

Nelson Mandela

Have you ever felt it was difficult to act?

The main challenges young people feel they face in taking action to achieve a sustainable world differ considerably. These challenges may be related to perceptions of the magnitude of environmental problems, leading to denial and apathy; or lack of sufficient information and data; or an inability to influence change (for example, feeling alone or powerless). Social and economic challenges, such as lack of funds can also affect our ability to act (Kollmuss and Agyeman 2002).

In the GEO-6 for Youth survey (see Annex 1) young people were asked: “What do you think are the challenges that you face or might face in the future while taking actions to improve the environmental conditions?” Identifying challenges is the first step towards finding solutions. Here we analyze some of the main challenges, identified by those who responded to the survey, to taking actions in their daily lives in order to improve the environment **(Figure 3.2)**.



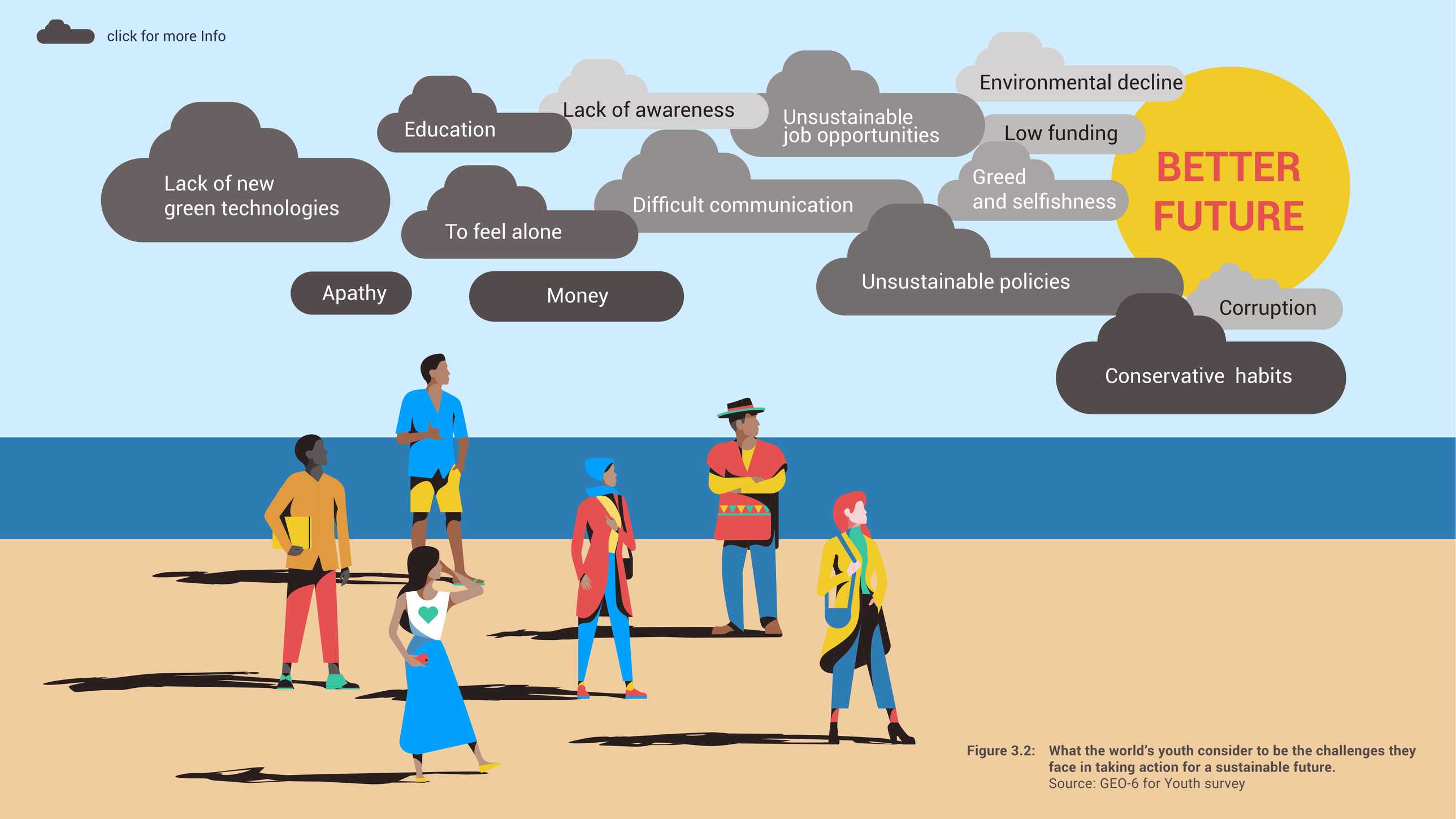


Figure 3.2: **What the world's youth consider to be the challenges they face in taking action for a sustainable future.**
Source: GEO-6 for Youth survey

We also asked young people whether they felt they could influence or change rules and policies concerning the environment in their countries; 45 per cent felt they definitely or probably could not influence rules or policies in their countries. **Figure 3.3** shows perceptions of challenges that would deter them from taking action.

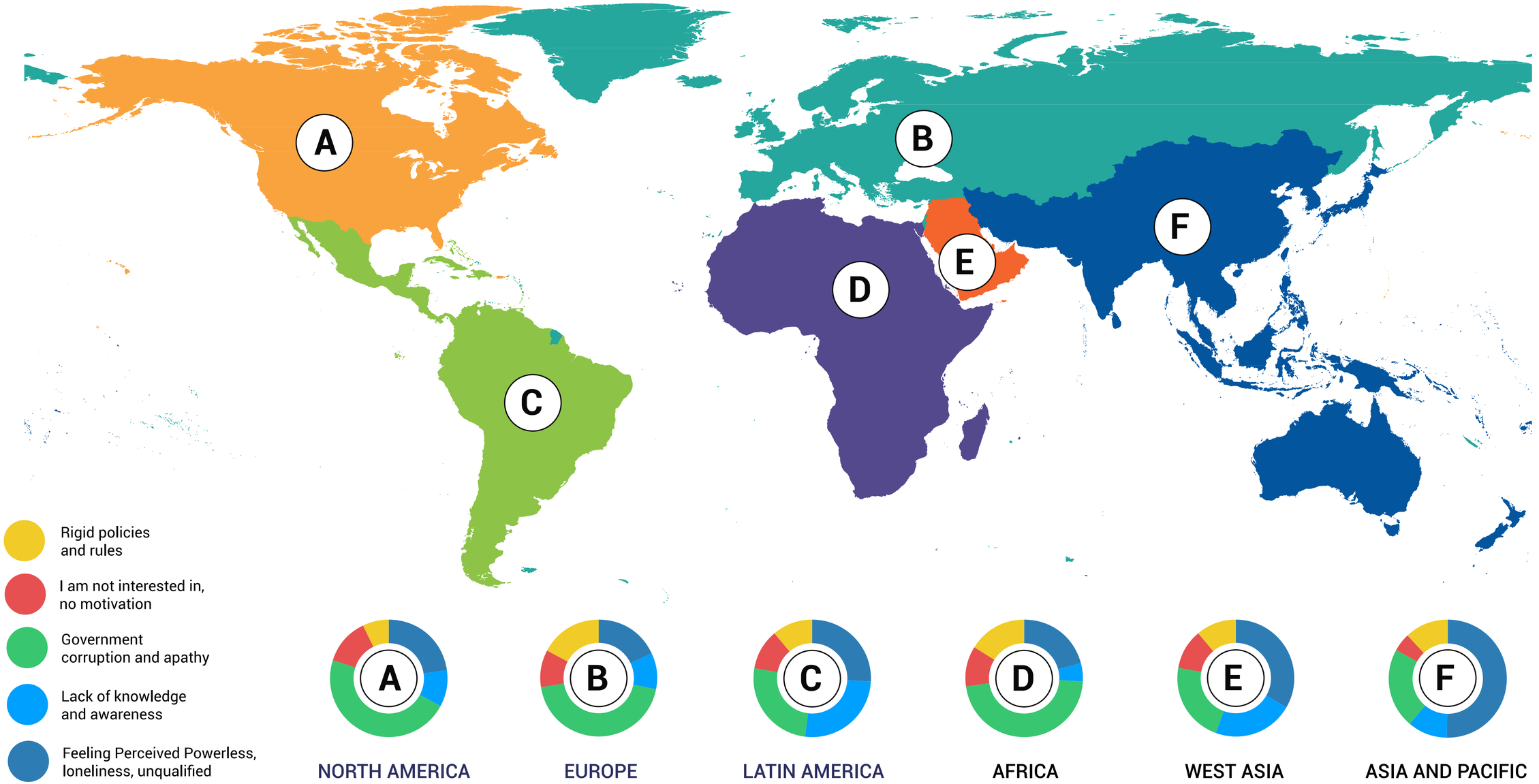


Figure 3.3 **The main obstacles young people felt were in their way with respect to changing existing government rules and policies on the environment.**
Source: Based on the GEO-6 for Youth survey.

Most of the respondents who answered “I definitely or probably cannot influence the government” indicated that their actions would probably be insignificant and that change could only be brought about by other, more powerful people. These young people felt they were too young to do anything and would rather delegate to others. A large number also blamed their governments and institutions for being indifferent to the environment and to people’s well-being, leading to skepticism about being able to influence environmental rules and policies.

Political, social, cultural and economic differences across regions are responsible for different perceptions. The survey results (**Figure 3.3**) show that the main perceived obstacles in North America, Europe and Africa were government corruption and apathy, while feeling powerless, lonely or unqualified was the main obstacle in the Asia and the Pacific region and in West Asia.

Are we, young people, really as powerless as many of us think? The following sections show what we can do to tackle these obstacles and help create a more sustainable world.

3.4
Change Starts with Us! Guidance for Individual Actions and Life Choices

“One voice can change a room, and if one voice can change a room, then it can change a city, and if it can change a city, it can change a state, and if it can change a state, it can change a nation, and if it can change a nation, it can change the world. Your voice can change the world.”

Barack Obama

3.4.1
Your daily life shapes the world

You may think that you alone cannot change the world. However, that's not true! What and how we eat, live, buy, travel and live are the bases of our society and economy. You are the customer businesses rely on, and you are the citizens your governments should be listening to!

The demand for new smartphones every time a new model is released (see Chapter 4, Box 4.1) creates massive electronic waste problems, while long-distance travel contributes to climate change. On the other hand, demand for sustainable food increases the share of organic food on the market and the number of vegetarian and vegan options in restaurants. The daily life of every one of us has a huge impact on the planet. This means changing our day-to-day actions to "sustainable actions" has the potential to create a sustainable future.

Young people are ready to take action

Many young people around the world understand the size of the environmental problems we face and are willing to take action to confront them. The GEO-6 for Youth survey asked what actions respondents were willing to take in order to improve the environment (air, freshwater, biodiversity, land and oceans) and to conserve biodiversity **(Figure 3.4)**. The actions they were willing to take included:

- **driving less and using bicycles, in order to improve air quality and create a more stable climate;**
- **using water efficiently by, for example, taking shorter showers, so we will have more and cleaner freshwater;**
- **using less plastic and reducing waste, to help protect the oceans and the life in them;**
- **using land sustainably and eating less meat, so there is enough land to provide food for everyone; and**
- **protecting natural habitats and planting trees to conserve biodiversity.**

Are you curious about how much impact you have on the planet in your daily life? Calculate your footprint here (Conservation International 2019) and see how many Earths we would need if everyone lived the way you do! It is also possible to look at the positive impact of your lifestyle: calculate your hand print here (Centre for Environment Education 2019).

Figure 3.4 **Actions the world's youth are willing to take to improve air, freshwater, land and oceans and conserve biodiversity** Source: Based on the GEO-6 for Youth survey.

Daily actions (”sustainability actions”) that can change markets and transform the economy to a more circular one are shown in **Figure 3.5**. See what you can do, how a new lifestyle could benefit you and the environment, and the type of system (food, energy or waste) your actions could impact (See **Figure 3.6**). Consumers have the power to send a clear message. What captures people’s attention is how your money is being spent!

“If I asked you to describe yourself as a human being, I don’t think you would consider that nature and you are the same thing. There is this term called the nature deficit disorder. This is really a disease for western societies because we spend too much time inside, we spend too much time not in the sun or not breathing fresh air, which is not natural and not normal.”

Melasine Martin
(James Cook University 2019)

hover for more Info

Environmental Benefit

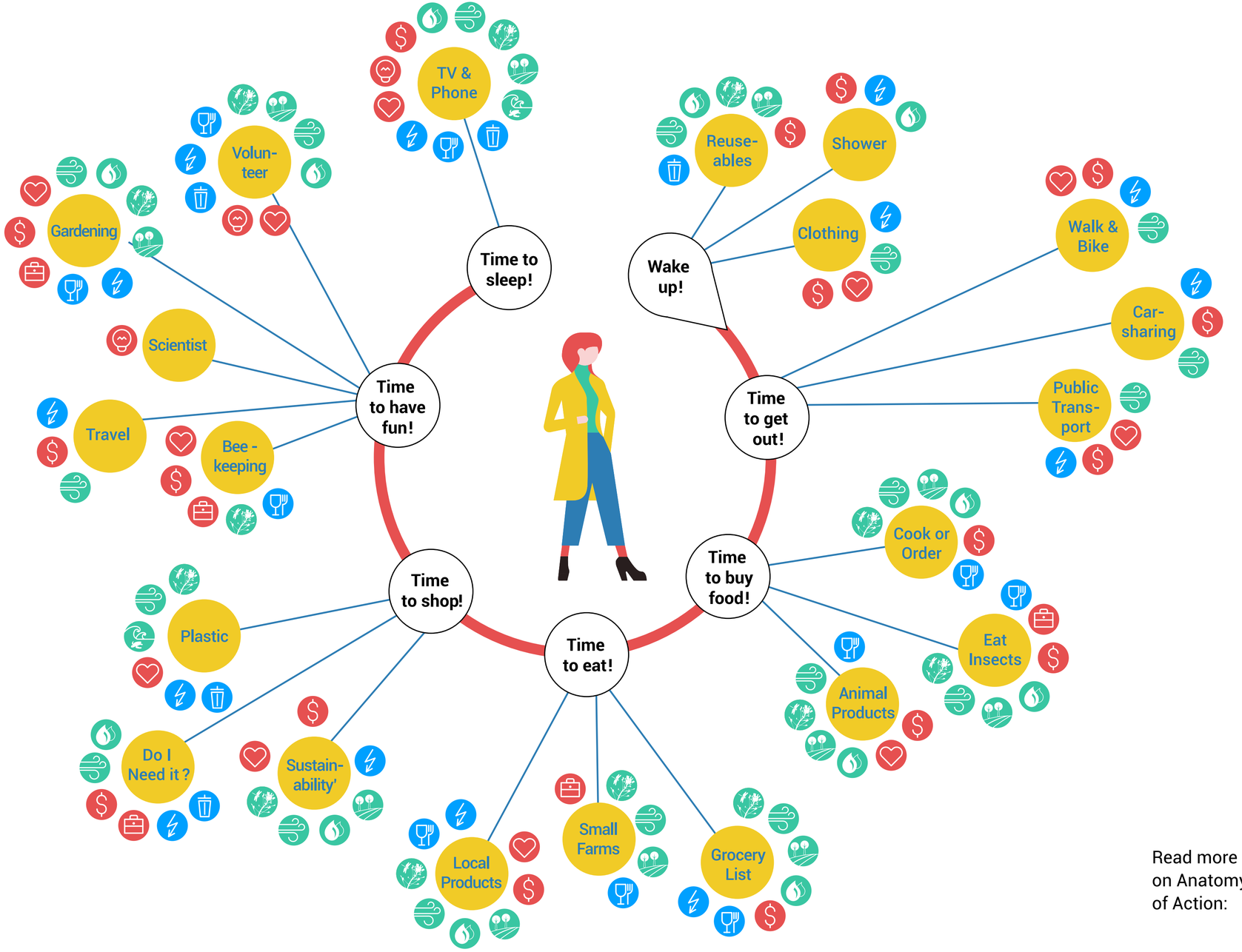
- Freshwater
- Air
- Biodiversity
- Land
- Ocean

Personal Benefit

- Money
- Health
- Green Jobs
- Knowledge

System Involved

- Food
- Energy
- Waste



Read more on Anatomy of Action:

anatomyofaction.org

Figure 3.5 A day in the life of a young person: types of actions that can be taken,

Figure 3.6 See what you can do and how your actions have an impact

Box 3.1
Ecolabels

An ecolabel promotes the circular economy by encouraging producers to generate less pollution and waste during the manufacturing process. It is important to show merchants that you are interested in buying ecolabelled products. To find out more about individual ecolabels, search the Internet. Ecolabel Index (click here) has information about 463 ecolabels in 199 countries and in 25 industry sectors.

"Success is the sum of small efforts, repeated day in and day out."

Robert Collier

"It is the little things citizens do. That is what will make the difference. My little thing is planting trees."

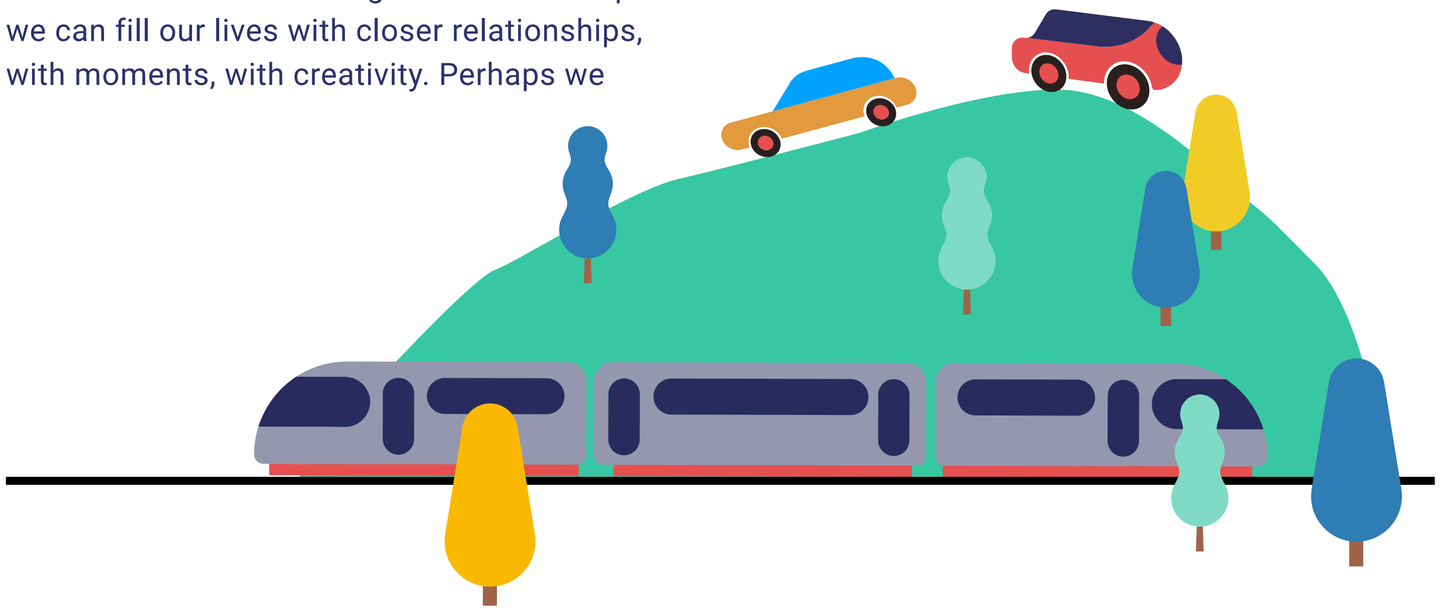
Wangari Maathai

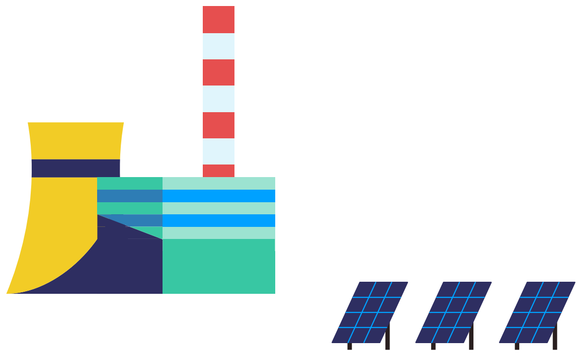
3.4.2
Life decisions for change

Everyday decisions are very important. However, we also make important life decisions that will have a large impact on the environment and markets, including where we live (location and type of residence) and the type of transportation we will normally use. We need to make sure these decisions are consistent with the principles of a circular economy and will help change key markets. Every life decision ultimately has a huge environmental impact that may be felt over many years (**Figure 3.5**). If informed purchases are based on the environmental impact of every step in the production and delivery of a product, we can avoid supporting businesses with high carbon emissions or products that contain toxins or are designed to be thrown away.

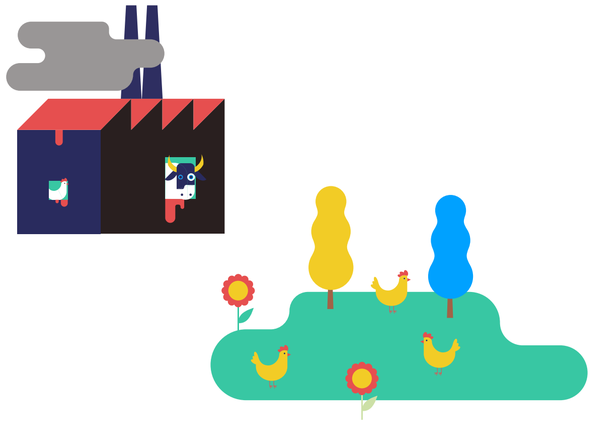
By supporting businesses that produce sustainable products, and by properly managing disposal or recycling of “end-of-life” products (think batteries and electronic products), investing in ethical companies that work on green projects, buying or building energy-positive homes and adopting slow travel (for example, travelling overland instead of by plane), we can help change our economies from linear to circular, transform markets, and eventually change the world.

“After COVID-19, nothing will be the same. But life can be better. We have had a moment to think and reflect. Perhaps we don’t need as much stuff as we thought we did. Perhaps we can fill our lives with closer relationships, with moments, with creativity. Perhaps we recognize what really counts in our lives: being safe and being free. When we overcome COVID-19, we should not risk what we have won. We should do what we can to stabilize our environment, our support system. We need to think about how we can restore nature by living life differently.” - Inger Andersen (TIME 2020)



Life choice	Environmental impact	Ways to reduce environmental impact
Where you live and how much energy your home consumes 	• Living far from your place of work or recreation can have considerable environmental impacts, depending on your means of transportation. Transportation-related CO_2 emissions contribute to climate change (Neves and Brand 2019). • Your home consumes energy, as well as money for space heating or cooling and for lighting and appliances. CO_2 emissions from energy consumption contribute to climate change (Renewable Energy Policy Network for the 21st Century 2019).	• Live near where you work or play, so you can use transportation options like bicycling and walking. If you need to live further away, consider buying a fuel-efficient used car or an electric car that that does not produce tailpipe emissions. • Replace all lightbulbs with light-emitting diodes (LEDs), purchase an energy-efficient refrigerator, make sure your home is well insulated and has high R-value windows. Install an electric heat pump or connect to a neighbourhood district heating or cooling system.

Life choice	Environmental impact	Ways to reduce environmental impact
How to get around and how to drive 	• Since 2010, SUVs have been the second largest contributor to the increase in global CO_2 emissions, after the power sector but ahead of heavy industry, trucks and aviation (International Energy Agency 2019). • Calculating the carbon footprint of new versus used vehicles is highly complex. It may be better for the environment to keep an older vehicle running and well-maintained than to buy a new one, particularly if it is relatively fuel-efficient. Extending the life of a vehicle you already own or buying another used one, being an informed driver and consumer (check out the Internet), and eventually disposing of an old vehicle responsibly can all lower your carbon footprint (Car Buyer Labs 2018).	• Purchase the most fuel-efficient and least polluting vehicle for your situation. Many smaller cars can seat four or five passengers, the same number as most SUVs. • Be a market leader and buy an electric vehicle. This will speed up adoption of these vehicles and the growth of battery charging infrastructure (Acaroglu 2019). • The metals, minerals and plastics in any kind of new vehicle require a lot of energy to extract and produce. If you extend the life of the vehicle you own, you avoid the emissions and environmental impacts associated with the production of new ones (National Geographic 2019c).

Life choice	Environmental impact	Ways to reduce environmental impact
Where you invest your money 	• Many profitable companies are still working on a linear economy model. They promote this model through, for example, advertising and political donations. This is leading to continued environmental degradation (Acaroglu 2019). • COVID-19 has caused a tremendous shock to our economies. The outlook is uncertain, but this calls for building back better. Continuing on the pre-COVID-19 path will lead us to the same unsustainable outcomes. • Major investment firms want to obtain the highest returns for clients and earn high commissions for themselves. They may not invest clients' money with a longer-term vision of achieving sustainability.	• Clients should invest their money (for example, for their children's education or for retirement) in ethically managed funds or in environment and sustainable development-oriented funds. Over time this will move the world away from a linear economy model. • Green investments can lead to a better recovery from the pandemic, as economies built on the foundations of environmental sustainability will change future trends (World Bank 2020). • If you have investments, be active in managing them. Guide the individual or company managing your money by indicating your preferences for ethical or environmental investing, even if the returns are a little lower.

You don't have to do everything at once! Try a few things at first and then add to them. Keep in mind that we are all seeking long-term transformational change, so you need to be able to continue taking these actions and making these choices over your lifetime. However, most of the changes will have co-benefits by saving money or by making your life healthier. Remember to share your actions with others, in order to scale them up so that they will lead to true market change. For example, conventional cotton bags only have a lower environmental impact than plastic ones if they are used enough times: around 7000 times in the case of a pure cotton bag! (Bisinella *et al.* 2018).

The 5 Rs (Refuse, Reduce, Reuse, Repurpose and Recycle, but especially the first two: Refuse and Reduce) should always be at the back of your mind. Soon your small actions can have a bigger influence around you. The following section presents stories about young influencers and leaders, as well as older influencers of the world's youth.

3.5 Spread the Actions Across Generations: How to Become an Influencer

You have the potential to influence not only other young people, but also children, your parents and broader society (Khamis, Ang and Welling 2017). You can spread your knowledge and passion across generations by knowing your rights, informing yourself about environmental issues, and speaking out using social media platforms and at local meetings and community events (AIESEC International 2016). By engaging in discussions with older generations, you increase their awareness about our common future.

Simple as can be

www.youtube.com/watch?v=4YZH-18-UJ0&feature=youtu.be

Many adults who have jobs that consume natural resources could potentially make an impact if they are sensitized to environmental challenges. Engaging in conversations with our families can help change some unsustainable consumption patterns and contribute to awareness-raising about climate change (Suki 2013). Dialogue helps to co-educate both young and older generations on environmental issues. The next 30 years (approximately one generation) are crucial for our future. We

therefore must build relationships among generations.

Young people should be able to seek support from older generations to promote educational experiences focused on environmental issues, create opportunities for youth, and act as mentors. For example, some schools and organizations have mentoring programmes.

“By talking with older people, young people, and local people, we get ideas and inspirations from them.”

Keiko Takahashi

Greta Thunberg addresses climate strikers at Civic Center Park in Denver.
Photo: Andy Bosselman, Streetsblog Denver

Greta Thunberg, a 16-year-old Swedish student, started the movement #FridaysForFuture. She wants politicians and decision-makers to be alarmed about climate change the same way they would be if their house was on fire. Greta was alone when she started to sit in front of the Swedish Parliament. Since the movement began, she has mobilized young people throughout the world (McFall-Johnsen 2019).

In 1992, a 12-year-old Canadian girl named Severn Cullis-Suzuki addressed the United Nations Conference on Environment and Development (the Rio Earth Summit). She spoke on behalf of the Environmental Children’s Organisation (Eco), a group of 12- and 13-year-olds, who had raised the money to travel to Rio de Janeiro. Today she says: “I knew exactly what I was doing. I was so focused on the message, and I recognize that in Greta. She knows exactly what she’s saying, and I totally recognize that experience because I experienced it as well” (Weston 2019).

Young people today have better access to environmental information and greater capacity to share information than older generations (Proctor and Kitchen 2015). Moreover, they can take the initiative and monitor the environment themselves as citizen scientists to better understand the changes happening around them (**see Annex 2**). We all have significant responsibilities for environmental protection. Today's young people, sometimes referred to as "millennials" – those born around 1988 onward (Hertsgaard 2011) – are likely to live a long time with the deteriorating environment left by previous generations.

The same is true of future generations. While their lives will be shaped by many factors, today's consumption patterns will play a huge role. Air pollution, decline of freshwater quality and availability, land and soil degradation and severe dust storms, marine debris, ocean acidification and loss of coral reefs, depletion of natural resources, loss of biological diversity, and worsening climate change are some of the problems we may leave them.

Keiko Takahashi –
Empowering people through education

youtube.com/watch?v=0Dw-KMosacg&feature=youtu.be

Keiko is an educator and researcher who works with local communities in Ikebukuro Tokyo, Japan. The curiosity of children and young people inspired her to start an environmental education project in 2006 when she was still a student. The project was transformed into "education for sustainable development (ESD)" over the years. Keiko believes that delivering knowledge is not enough. Learning by doing is the most important way to change behaviours. Only then is it possible to create change.

According to an analysis of influence patterns on Twitter, individuals can become influencers on a wide variety of topics even if they don't have expertise in a particular area (Cha *et al.* 2010). Celebrities can persuade millions of fans to change their behaviours (e.g. reduce their plastic consumption) (McCarthy and Sanchez 2019).

"We can't give in to despair, we have to go out and look for the hope we need to inspire us to act, and that hope begins with a conversation, today."

Katharine Hayhoe

My friends and I decided to separate waste at school and at home. This was noticed by the principal and the board of directors of the school, who supported our activity and started a zero-waste campaign. We used social media to generate awareness, which led more people in our town to set up separate bins for waste. Try using social media to generate awareness! #bustthewaste

Involving young people and children in planting a million mangroves

An initiative to plant a million mangroves, started by Bader Al Balushi in Oman, expanded to the regional level. Mr. Bader is known as the spiritual father of this initiative between generations. He has worked to involve young people and children, in order to continue to realize the importance of this type of ecosystem. Mangrove forests are important to coastal communities because of the ecosystem services they provide (Feller *et al.* 2017).

www.youtube.com/watch?v=Ln_40TkYWskwatch?v=Ln_40TkYWsk

3.5.1
The majority of young people think they can be influencers and leaders

The GEO-6 for Youth survey showed that 88 per cent of those responding believed they could encourage others to take action (**Figure 3.7**). They felt they could encourage others through communication, education, sustainable consumption, changing their personal lifestyles, being an agent of change through their careers, applying peer pressure, and collective action or partnerships (**Figure 3.8**).

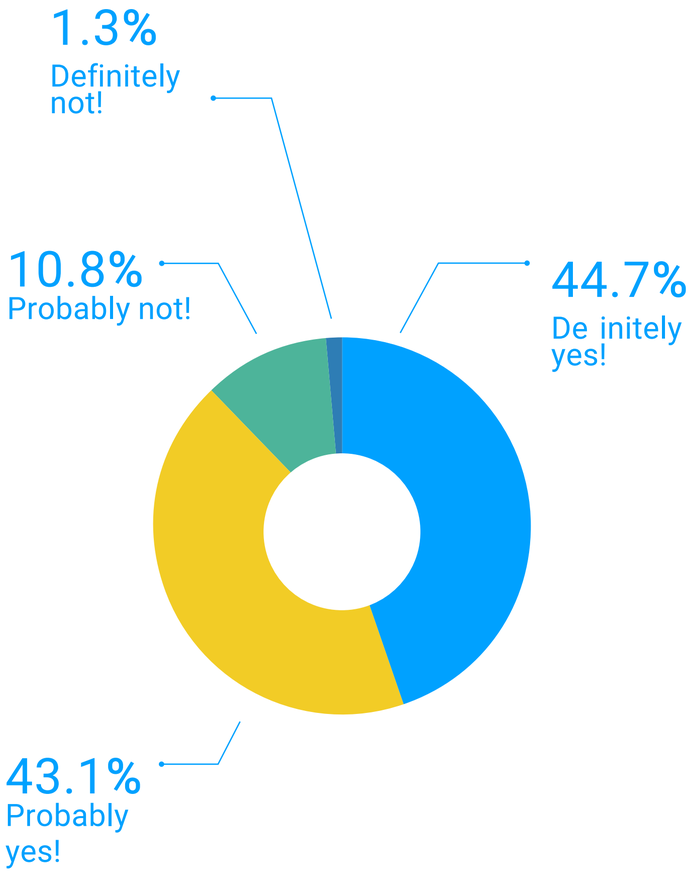


Figure 3.7 **Can young people influence those around them to take action? Young people's perceptions of their ability to influence others.**

Source: GEO-6 for Youth Survey

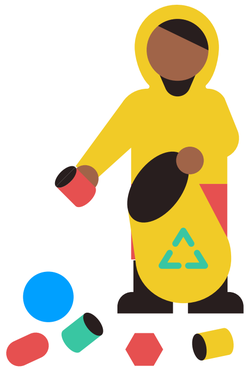
Proartso: artistic actions across generations

www.youtube.com/watch?v=EDR4wntiNCo&feature=youtu.be

Proartso (Social Artistic Promotion) demonstrates how art and creativity can contribute to saving the environment and strengthening social cohesion (Proartso 2019). This Spanish non-profit organization brings people of all ages together to focus on the results of excessive consumption patterns combined with overpopulation (for example, generation of large amounts of waste). By organizing professional and volunteer local beach and ocean cleaning sessions, Proartso creates art using the "yield" of the day.

personal lifestyles /
being an agent of change

through work



personal commitment

sustainable
consumption

collective action /
partnerships

communication

education

Figure 3.8 **How the world's youth feel they can encourage others to take action to improve the environment.**
Source: Based on the GEO-6 for Youth survey.

3.5.2
How can you become an influencer?

Social media is an ideal platform for inspiring your peers. Becoming an influencer can be easy. Start by finding your niche. Identify your interests and the environmental issues you want to address based on available information.

There is a story about an airplane pilot who announces in mid-flight: “I have good news and bad news. The good news is that we are ahead of schedule; the bad news is that I don’t know where we are heading.” No one wants to be in an airplane whose pilot does not know where they are going.

In this story the pilot can be thought of as the influencer. His or her technical knowledge of how the airplane functions should make it possible to fly the airplane to its destination. The pilot must choose the flight path from take-off to landing. Similarly, to exert influence on others you need to be clear about how your actions will impact or guide your followers. That is, you need to develop your context strategy. You can grow your network by attending events – online and offline – and making frequent visits to places where the type of people you want to know hang out. Become a good listener, ask questions, make your presence known, and follow up with those you connect with.

“How to become an influencer” – Lucia Musau

www.youtube.com/watch?v=Jhcmq-KiYrE&feature=youtu.be

Lucia Musau is a Luxury PR Consultant and an Award Winning Fashion/Lifestyle blogger from Nairobi, Kenya. Lucia was one of the first bloggers in Kenya. She is now an advocate for sustainable fashion and promotes clothes swap and recycled material in the textile industry. She is a creative thinker and an entrepreneur and the founder of African Elite Group Ltd, a boutique PR firm in Nairobi.

3.6
Build Back Better

As discussed in previous chapters, he ongoing COVID crisis has added more complexity to our current environmental problems. It is crucial that our recovery from the pandemic is resilient and durable. This pandemic has given us the time to reflect on our environmentally destructive practices, including the additional problems created by our drastic increase of waste. We must use these observations to build back better towards a more resilient world.

This crisis has shown us how global environmental emergencies such as climate change and biodiversity loss can cause devastating social and economic damages (OECD 2020b). While lockdowns were in place in different parts of the world, it seemed that shutting down the economy would be a solution to every environmental problem. However, even though it is true that GHGs emissions were reduced, air and water pollution decreased, animals were seen again in places where they had not been spotted for a long time, it seems that almost none of these improvements will have a long term impact (Le Quéré *et al.* 2020). If economic activity resumes as before, without any change towards a more sustainable path, these improvements will be quickly erased.

We have an impending global problem that has slowly been oncoming which is going to have more disastrous effects than the current crises. As Inger Andersen, Executive Director of UNEP, reminded us on World Environment Day 2020, “three planetary crises are impacting all life on earth as we know it. The climate change crisis, nature and biodiversity crisis and the pollution and waste crisis. These three crises, caused by our unsustainable consumption and production, are undermining the natural foundations of human existence. The devastating COVID-19 pandemic is obviously closely linked to these crises” (Andersen 2020). To recover from this crisis, we need to choose a more sustainable path, we need to “build back better”.

The concept of “building back better” was first used to refer to recovery from physical disasters, such as tsunamis or earth quakes (United Nations Office for Disaster Risk Reduction 2015). This term is now used to talk about a sustainable recovery from the COVID-19 crisis, one that not only focuses on the economic benefits but also social and environmental improvements to increase the well-being of humans and other species. Fundamental to COVID-19, recovery is also the One Health approach, a collaborative effort across multiple disciplines to achieve the optimal health of people, animals and the environment. (more on this can be found in Box 1.1 in Chapter 1).

To ensure a more sustainable and inclusive recovery, we should all work on building back better, together. Even though this applies differently depending on the country, this effort includes:

- **focusing on well-being and inclusiveness**
- **establishing long-term GHGs emission reduction goals**
- **strengthening resilience to climate change**
- **developing policies to reverse biodiversity loss and restore ecosystem services, including through nature-based solutions,**
- **increasing circular economy practices**
- **fostering innovation to trigger behavioural changes.**

We are now faced with a unique opportunity to rethink the systems, behaviours and principles that define our societies, and thus it is imperative that we engage in a critical self-reflection process that places the caring of our planet and the environment at its core. As the world recovers from the impact of a devastating pandemic, let it also start shifting away from these destructive patterns towards more environmentally sustainable practices.

The Secretary General of the United Nations, Antonio Guterres proposed six climate-related actions to shape the recovery, including the need to deliver new green jobs through a clean, green transition and ending fossil fuel subsidies, but also the need to work together as an international community to leave no one behind. The stimulus packages and economic measures planned by the governments to help with the recovery from the COVID-19 crisis need to invest in this green transition, be inclusive, pro-poor and gender responsive (Guterres 2020a; 2020b).

The only way to effectively achieve these goals, to “build back better”, is to work together. We, as youth, have an opportunity to raise our voice and showcase our innovative ideas, participate in climate discussions, change our lifestyles, the markets and the policies in place. We are already in the front lines of climate action and should now gain more space through collective action and activism. The actions and initiatives mentioned in this chapter can help you get an idea on how you can contribute to the “building back better” effort.

3.7
United We Stand!
How to Create Collective Action

“Teamwork is the ability to work together toward a common vision. The ability to direct individual accomplishments toward organizational objectives. It is the fuel that allows common people to attain uncommon results.”

Andrew Carnegie

Each of us has the power to change something – to think, act, create, and lead actions. Young people can become a strong collective force to protect the planet (Velasquez and LaRose 2015). When we act together, we are much more effective at finding solutions and avoiding the tragic overuse of natural resources. One voice can make a difference. If 1.2 billion voices come together, they can create a revolution.

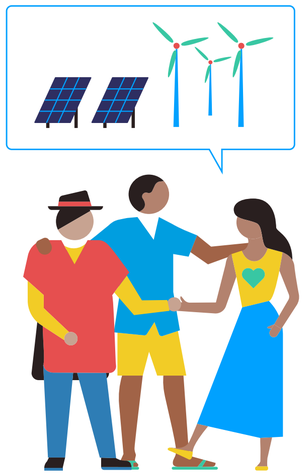
“I contacted the community leaders near my childhood camping site regarding the health of the environment around it. They were also concerned about the site and its environment, as camping activity generates business for local people. The local community is willing to contribute to other community-based activities such as workshops, cleaning events and nature walks. We are determined to change the campers’ lifestyles by our collective actions. #bringbackthegreen”

Shafiqah Adin from Sabah, Malaysia has worked as a volunteer for the Borneo Rhino Alliance, the Malaysian Nature Society, the Gibbon Protection Society Malaysia, and 1StopBorneo Wildlife. During her internship at the Borneo Rhino Alliance she started to assist the organization in her personal capacity. Afterwards, she began to volunteer for other nature/conservation-based organizations. Shafiqah's message to others is: "Please stop violating nature!"

3.7.1
It's your time to act!

Do you feel powerless to make real change happen? Do you assume the voice of one person will not have the power to move the world? What if hundreds or thousands of people use their voices for change? Acting together has the power to help create the future we want.
Are you interested in collective action, but don't know where to start? We have prepared steps for beginners (as well more experienced participants in collective action) to take part in initiatives that can influence governments and society.

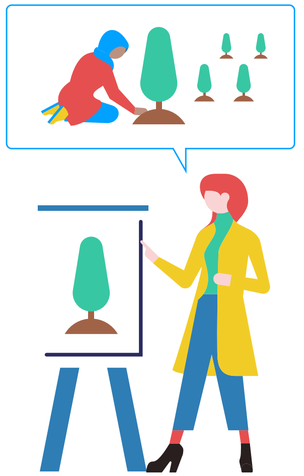
Level 1
Novice



Vote for candidates with sound environmental policies if you are eligible to do so. Taking part in elections is the formal way to express support for a candidate and his/her platform. Voting allows citizens to choose future leaders and influence government decisions (Green 2012). Elections can impact their quality of life. The youngest generation of voters needs to cast their votes to decide their future.

Participate in public events such as public forums, public consultation meetings and public debates to better understand concerns in your town, city, region, country or the world. You can use this opportunity to voice your own concerns and exchange ideas about solutions (Taft and Gordon 2013). Non-violent protests, demonstrations and strikes are also an impactful way to get your message across and meet like-minded people.

Level 2
Master



Take part in volunteer activities. Volunteering can help you develop interpersonal and social skills. It can also help you gain work experience and make contacts (Perry and Thomson 2015). For example, you could volunteer for non-governmental organizations, other local organizations or environmental education activities. **Participate in a training programme** to make sure you have adequate understanding and can be a real influence on public matters and think critically, with as many thinking tools as possible at your disposal. The components of a civic education include civic knowledge, civic skills (knowledge of political systems) and a civic disposition (Hatcher 2011).

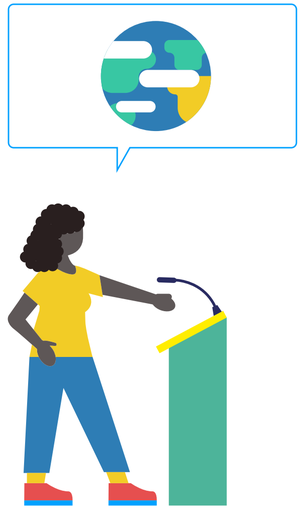
Join a political party with a strong environmental platform. Engaging in politics is a powerful way to express your views. It can also introduce you to politicians and others who are influential. Including young people in political parties leads to a stronger democracy by providing a platform for youth voices and reflecting their interests more widely (Taft and Gordon 2013). Joining a political party is a great way

to participate in political decision-making and propose concrete solutions to the environmental problems your community may be facing.

Meet with your local council member and member of parliament/house of representatives to discuss sustainability and ways to improve the environment.

Your country needs to be persuaded of the importance of having a **youth representative in its delegation to the UN General Assembly** (United Nations Department of Economic and Social Affairs 2019). Once such a position has been established, a selection process should be initiated.

Level 3
Legend



Run for office and be the initiator. You can take responsibility for initiating new actions at various levels, within your community or outside it.

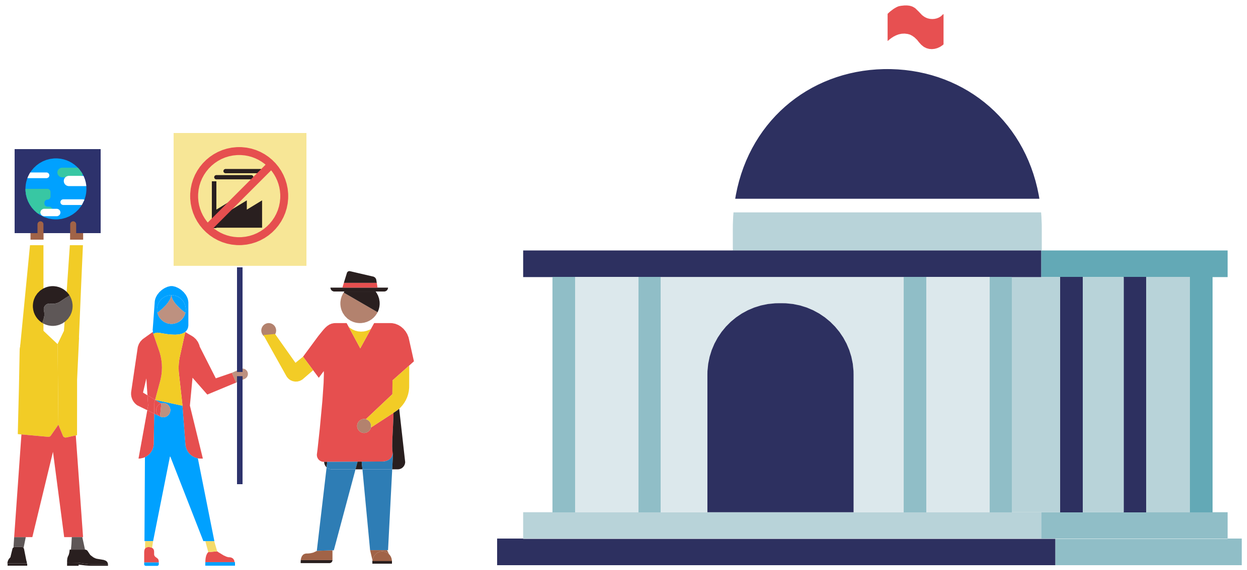
Implement campaigns to spread the message among your peers, encouraging them to be better informed about their rights while using communication tools such as social media, local radio, the press and special events effectively.

Launch capacity building programmes to share your expertise and multiply actions. Find out how Kelsey Juliana did this to address climate change.

Take the lead and design your own collective actions. Nina Gualinga of the Guardians of the Jungle, 24 years old, a member of the Kichwa community of Sarayaku, Ecuador, is an inspiring example.

3.7.2
If young people think they can influence rules and policies in their countries, what actions should they take?

If you think you can influence the adoption of better environmental policies, what actions should you take? We asked this question in the GEO-6 for Youth survey. **Figure 3.9** shows the results by region. The responses reflected political, cultural, social and economic conditions in each region. The majority of those in Europe and North America thought voting and lobbying were the best measures to influence policies and government actions, but most of those in Africa, Asia and the Pacific, West Asia and Latin America believed in raising awareness and education to help change policies. They also believed that taking environmental and group actions, such as following a sustainable lifestyle, would affect governmental policies.



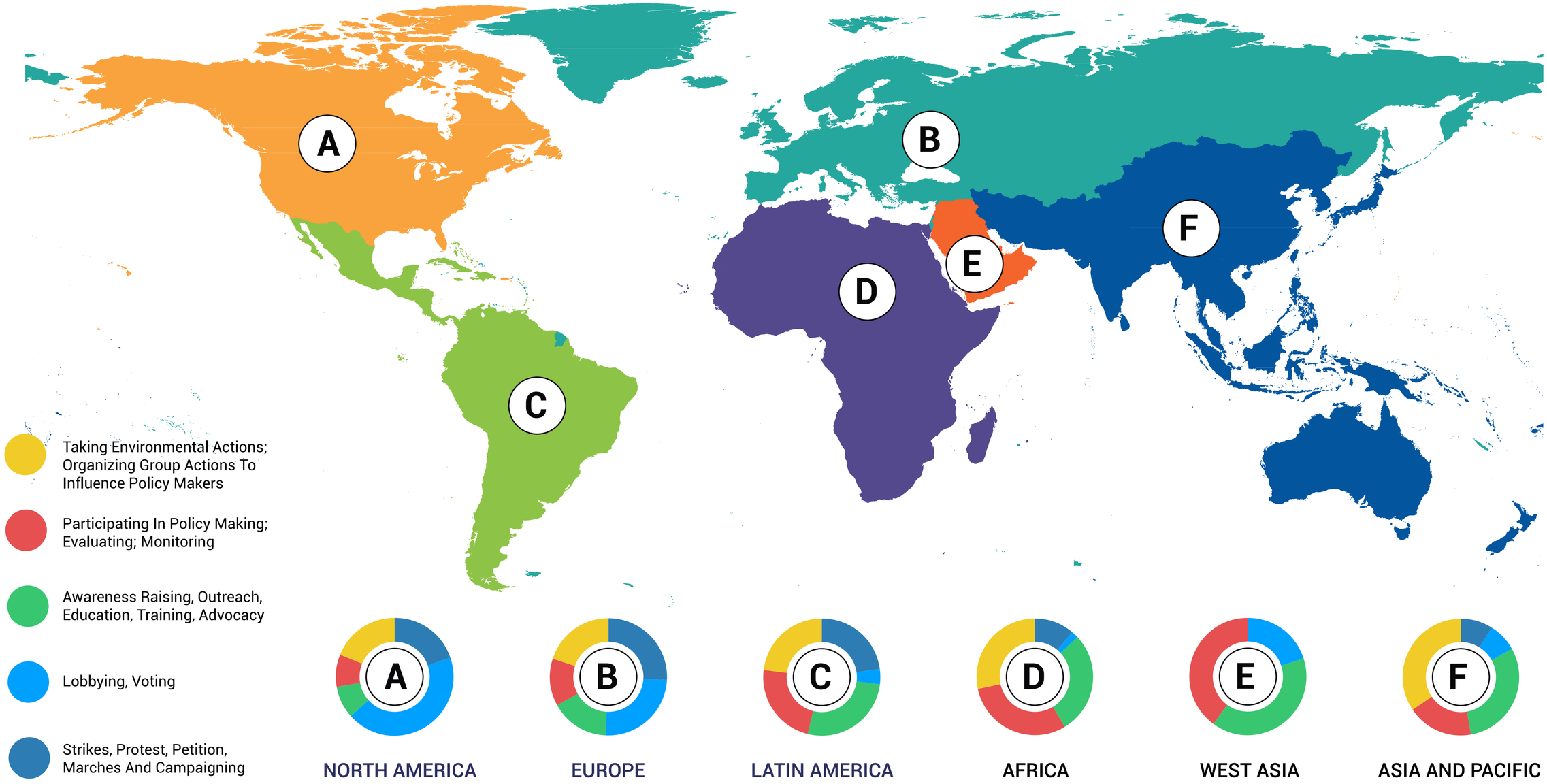


Figure 3.9 **Actions the world's youth are willing to take to influence the rules and policies of their countries, by region.**
Source: Based on the GEO-6 for Youth survey.

Young people have the power

The 1.2 billion young people in the world, who make up 16 per cent of the global population, are at the forefront of creating change (United Nations 2017; United Nations 2018). Governments, businesses and civic organizations need to partner with and engage these young people in order to solve local, national and global environmental problems.

Pocholo Espina - Green Entrepreneur

Pocholo is a young entrepreneur from the Philippines. He is taking climate action a step ahead by starting his own business to increase awareness and encourage action about sustainable living by providing reusable products. In 2016, he started with reusable straws, but today you can find a large variety of sustainable articles, including bags, cups, beauty products and even bikinis made of recycled fishing nets.

https://youtu.be/ovZSBG9EXD4

3.8 Conclusion

We have seen that young people can play an important role in creating a sustainable world, moving from empathy to action. Understanding the issues, taking individual actions and making lifestyle changes can be even more important and impactful if they are done collectively.
The world's youth have the power to address environmental challenges. Collectively, they can use their skills and knowledge to protect the environment through raising awareness and advocating for policies that move us towards green and sustainable economies. Historically, job creation has been aimed at improving human livelihoods. However, some economic activities have inadvertently damaged the environment.

The most crucial actions that can be taken by the world's youth today are to live in a sustainable way and call for transitions to a circular economy. When the work you do is environmentally friendly, it will eventually contribute to a circular economy – which, in turn, will promote a world that is sustainable.
Where pandemic crises have cost jobs and led to economic downfall globally, economic recovery led by circular economy principles can create a long term green transition and ultimately will bring the transformational change that we desire and should be determined to attain.

Your collective actions will determine the future of our planet: #live green, and #your future will be green! #work green includes implementing the green lifestyle in any job at any time.

The next chapter looks at new and emerging employment opportunities. It introduces the concept of green jobs in the context of the circular economy, and shows how almost any job or activity can become green (or greener).

Checkpoint 4

You may take this match and drop quiz in the interactive version.

Connecting the dots

To test your knowledge of environmental challenges faced by people across the globe, try matching the statements in the left column with the other half in the right column.

The first step to circular economy is	younger and older generations.
To know the challenge is	to generate less waste in manufacturing process.
Ecolabel encourages producers	acting collectively.
My small actions lead to	the first step towards its solution.
I have power to influence	to refuse.
It is possible to change rules and policies by	bigger benefits.

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4 Your Career, Our Future

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4.1
Your Career Choice Matters – Think Differently!

In light of the challenges we can see from the previous chapters, it is important to think about how your career path can also help create a more sustainable, healthy and safer world for all. While COVID-19 has altered careers and caused millions to lose their jobs, a shift towards a green economy could create millions of different new jobs globally by 2030 and inspire new career paths. Now more than ever, sound decisions about the education, skills and competencies you will need in the future could lead to a sustainable and fulfilling career.

One lesson this pandemic has emphasized is that one event can alter the world as we know it. We as youth should ride on such momentum to initiate the right actions that will shift job markets from traditional industries and business practices to circular systems and environmentally sound practices. By working together we can build a healthier, safer, greener world for ourselves, our children, and future generations.

Before the pandemic, fundamental positive changes were happening in food production, manufacturing, transportation, and energy production and use, and we should not reverse these gains! On the contrary, it is essential to take stock and to rebuild these sectors based on these positive changes, to achieve a more environmentally sustainable future.

As part of the recovery effort, governments and international organizations are addressing the impact of the pandemic on employment and it is clear that green recovery measures will have to take into account the issue of jobs. In the effort to “build back better”, new green jobs will be available in the sectors of energy, food, health and many more.

This chapter will give you a sense of how to design your career path to help create this more sustainable world. Section 4.2 of the chapter looks at the green jobs that are likely to be part of this future, how technologies are changing, and how a circular economy, as seen in Chapter 3, might change the types of jobs that are available. Section 4.3 shows how almost any job can become green (or greener). Section 4.4 sums up some of the ideas presented in this chapter and gives you some ideas for the future.

Did you know?

- **The number of young people (aged 15-24) in the global job market is expected to increase by 41.8 million between 2017 and 2030. Those from Africa, Asia and the Pacific will make up 77 per cent of the world´s youth labour force by 2030 (International Labour Organization [ILO] 2017).**

"Green jobs…reduce the consumption of energy and raw materials, limit greenhouse gas emissions, minimize waste and pollution, protect and restore ecosystems and enable enterprises and communities to adapt to climate change. In addition, green jobs have to be decent… Importantly, green jobs can enhance the transition to a green economy."

International Labour Organization [ILO] 2018a

4.2
Working Greener

4.2.1
Green Jobs and the Circular Economy

The way that resources and energy are used has changed greatly in the last 250 years, especially since the Second World War. The environment, and often human health, have been damaged on an unprecedented scale – even if for many years only a few people understood what was happening (Thompson 2019). Once, people depended mainly on the sun, wind, water and biomass (wood) for energy. This began to change with the large-scale use of coal, oil and gas for fuel, accompanied by new technologies. Technological advances since the beginning of the Industrial Revolution have had both positive and negative impacts. They have made high levels of global economic growth and job creation possible. Large quantities of products have been provided to a growing and increasingly demanding population.

However, manufacturing and the extraction of resources to sustain high production levels have generated massive pollution and waste. Today many scientists say we have entered the Anthropocene geological period, where humans have changed the face of the planet (Gabrielli 2015; Meyer 2019). Several "planetary boundaries" are at greater risk of being crossed, even more than would have seemed possible only a few years ago, leading to potentially irreversible environmental damage (Lenton *et al.* 2019) (see Chapter 1, Box 1.3).

It is now time for us to use resources in a more circular way (see Chapter 3, Section 3.2, "From a Linear to a Circular Economy"). A circular economy would make products for durable, reusable, or fully recyclable and help address environmental problems like air pollution, freshwater scarcity and pollution, soil and land degradation, biodiversity loss, human impacts on the oceans, and climate change (Ellen MacArthur Foundation and Material Economics 2019). We need to get creative and be more resourceful! This pandemic has shown we can be. Locked away in their homes, many people applied circular economy practices in their day

to day lives, to create more habitable spaces, to entertain themselves and start new businesses (e.g.: reusing, repurposing or recycling items they have long had). Green jobs can also help to bring about a circular economy. The International Labour Organization defines green jobs as "Decent jobs that help preserve and restore the environment… in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency" (ILO 2016).

Green jobs help:

- **improve energy and raw materials efficiency;**
- **limit greenhouse gas (GHG) emissions;**
- **minimize waste and pollution;**
- **protect and restore ecosystems;**
- **support adaptation to the effects of climate change."**

Green jobs lead to:

- **reducing consumption of energy and raw materials,**
- **enabling enterprises and communities to adapt to climate change**
- **achieving economic growth while fulfilling our needs.**

"… from the perspective of the world of work, achieving environmental sustainability is a question of social justice as women and the most vulnerable people in the world – migrant workers, youth, persons with disabilities, people in poverty, indigenous and tribal peoples and other vulnerable population groups, depending on the country and region – are particularly exposed to the risks and damages associated with environmental degradation, despite contributing to it the least."

ILO 2018a

The shift from a take-make-waste model to recycling, reuse, remanufacture, rental and longer durability of goods could create almost 6 million jobs by 2030. This would mean a shifting of jobs from the mining and manufacturing sectors to durable product design, waste management (recycling) and services (repair, rent) (ILO 2018a).

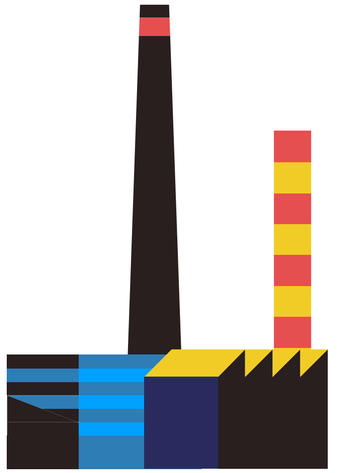


Table 4.1 shows industries that could be most affected by the transition to a circular economy. Those where jobs could be gained are in the left column, and those where they could be lost are in the right column. It is important to remember that job demand in the next ten years will be affected by a number of unknowns, like it is affected now by COVID-19 (European Strategy and Policy Analysis System 2019). These unknowns include things like:

- whether or not we will address climate change;
- how fast technological innovations are adopted, as the Fourth Industrial Revolution (Section 4.2.2) gets under way;
- uncertainty in geopolitics;
- how quickly we shift to green and circular economies (Doyle and Chestney 2018;Gregory 2019), and
- how we will address illegal wildlife trade and our relationship with nature in general.

Table 4.1 Industries that could be most affected by the transition to a circular economy

Industries set to experience the the highest job demand growth (absolute)		Industries set to experience the strongest job demand decline (absolute)	
Sector	Jobs (millions)	Sector	Jobs (millions)
Construction	6.5	Petroleum refinery	-1.6
Manufacture of electrical machinery and apparatus	2.5	Extraction of crude petroleum and services related to crude oil extraction, excluding surveying	-1.4
Mining of copper ores and concentrates	1.2	Production of electricity by coal	-0.8
Production of electricity by hydropower	0.8	Mining of coal and lignite, peat extraction	-0.7
Cultivation of vegetables, fruit, nuts	0.8	Private households with employed persons	-0.5
Production of electricity by solar photovoltaics	0.8	Manufacture of gas, distribution of gaseous fuels through mains	-0.3
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	0.7	Extraction of natural gas and services related to natural gas extraction, excluding surveying	-0.2

Source: ILO 2018a, p.44

“Further research is required to quantify all employment dimensions of green policies, not least with respect to… circular economy policies and the broad interactions with socioeconomic trends.”

OECD, 2017a

“Design sits prominently at the heart of the circular economy. It requires us to redesign everything: products, business models, cities, and the linear systems that have lasted for the past centuries.”

Ellen MacArthur Foundation 2017a

If we move to a circular economy, the need for design changes to products and industrial processes will mean new jobs are created (Ellen MacArthur Foundation and IDEO 2018). Circular design can increase the value and use of extracted resources and dramatically reduce environmental impacts. **Box 4.1** and **Box 4.2** show how unsustainable use of resources to produce smartphones and clothing can lead to environmental problems.

Box 4.1
The materials extracted to make smartphones

Over 7 billion smartphones were made between 2007 and 2017 (Jardim 2017). Around 1.46 billion were made in 2018 alone (Holst 2019a). There are over 3 billion smartphone users in the world. China, India and the United States have the largest number, at more than 100 million each. The number of people who use smartphones is expected to grow by several hundred million in the next few years, with developing and emerging economies growing the most (Holst 2019b; Poushter, Bishop and Chwe 2018).

Everything about a smartphone (production, use and disposal) has important impacts on the environment and human health. Smartphone production is very energy intensive, and its energy footprint is increasing (Jardim 2017). Smartphones contain critical raw materials, conflict minerals and many different hazardous (Gabbatis 2019; European Parliament 2017; Chen *et al.* 2018; Jha 2018). Getting rid of many different hazardous substances in smartphones would help protect consumers, as well as workers health and safety. It would enable safer recycling without perpetuating a “toxic cycle”. Consumers only know a little bit about the harsh conditions in which the mining, extraction and refining of materials used in smartphones takes place or the likely environmental impacts of these activities, including impacts on biodiversity in some locations (Business Today 2017; Kara 2018).

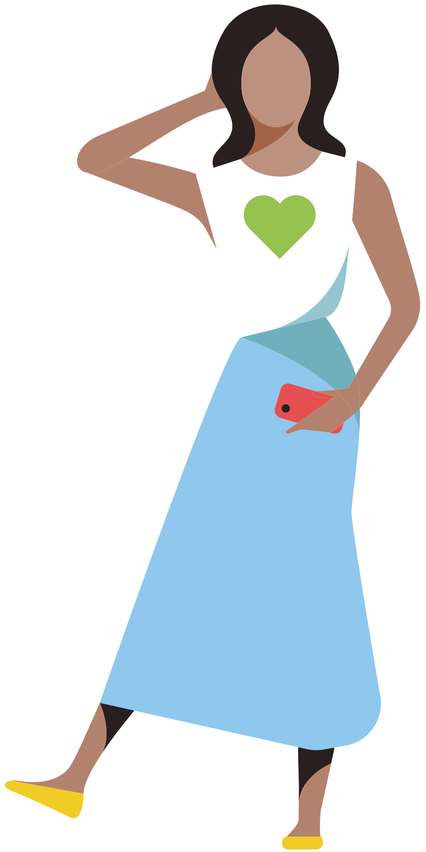


Figure 4.1 shows the materials found in one type of smartphone. What should we do with our damaged phone, assuming it can't be fixed? Should we throw it away? Or leave it in a drawer? What if you bought a "circular" or "green" phone, designed for disassembly at the end of its use and made with materials that could be safely reused in another phone or even in a different product? Modular "designed for environment" products are made so that, if they break, only the defective part has to be replaced or repaired. Sustainability can be built into the product life cycle of many things that we buy (Mutingi, Dube and Mbohwa 2017). Using a product over a longer period of time avoids resource use and waste and can allow companies to save money. In the case of smartphones (and other electronic products), countries would have to import much smaller amounts of the materials used to make them, and new jobs would be created for repairing, reusing, refurbishing and repurposing these products (European Economic and Social Committee 2019).

The smartphone industry is slowly changing (State of Green 2017a; Apple 2019). There are already examples of companies developing phones that are environmentally sustainable (HYLA Mobile Company 2019) and ethically produced (FairPhone 2019). You could be part of the movement that drives this change.

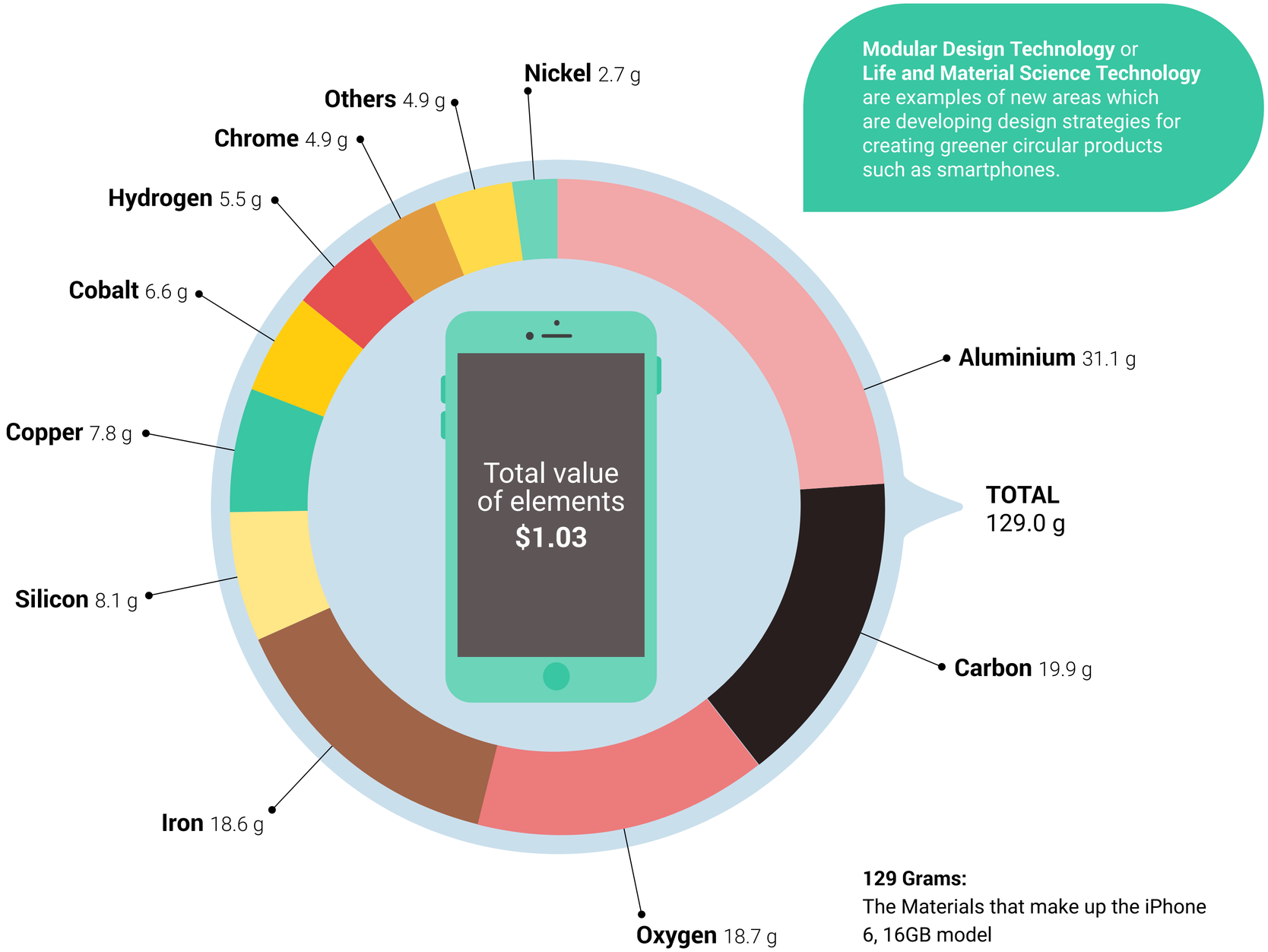


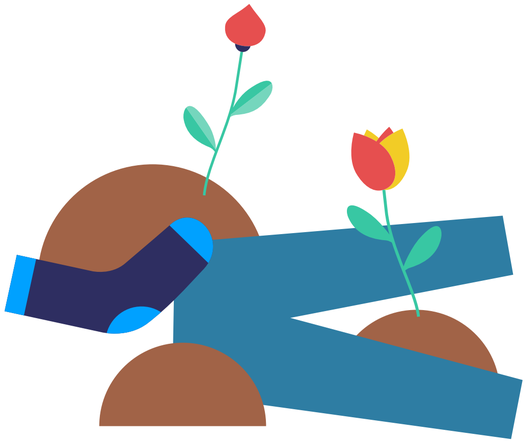
Figure 4.1 **Smartphone materials**
Credit: 911metallurgist in von Kessel (2017).

Box 4.2
The potential for a more circular fashion industry

The global market of fast fashion in 2018 was worth USD 35 billion, compared with USD 21 billion in 2008. It is expected to grow to USD 44 billion in 2028 (O'Connell 2019).

The fast fashion industry is very destructive for both the environment and natural resources (Reichart and Drew 2019; UNEP 2019b). About one out of every five t-shirts bought in 2019 will end up in a landfill within a year (Constable 2019). Fast fashion moves clothes quickly from production to consumption, often because consumers are looking for the latest styles. Because these clothes are made of fabric that tends to fall apart quickly, consumers buy more clothes more often (Still 2017).

Figure 4.2 shows how the fashion industry could become more circular, moving from a "cradle-to-grave" model (clothes are made, worn a few times and thrown away) to a "cradle-to-cradle" way of making them. For example, clothes could be made of fibres that can be composted or reused, worn many times, and – if they are not properly disposed of – reused and repaired to make more clothes or other items.



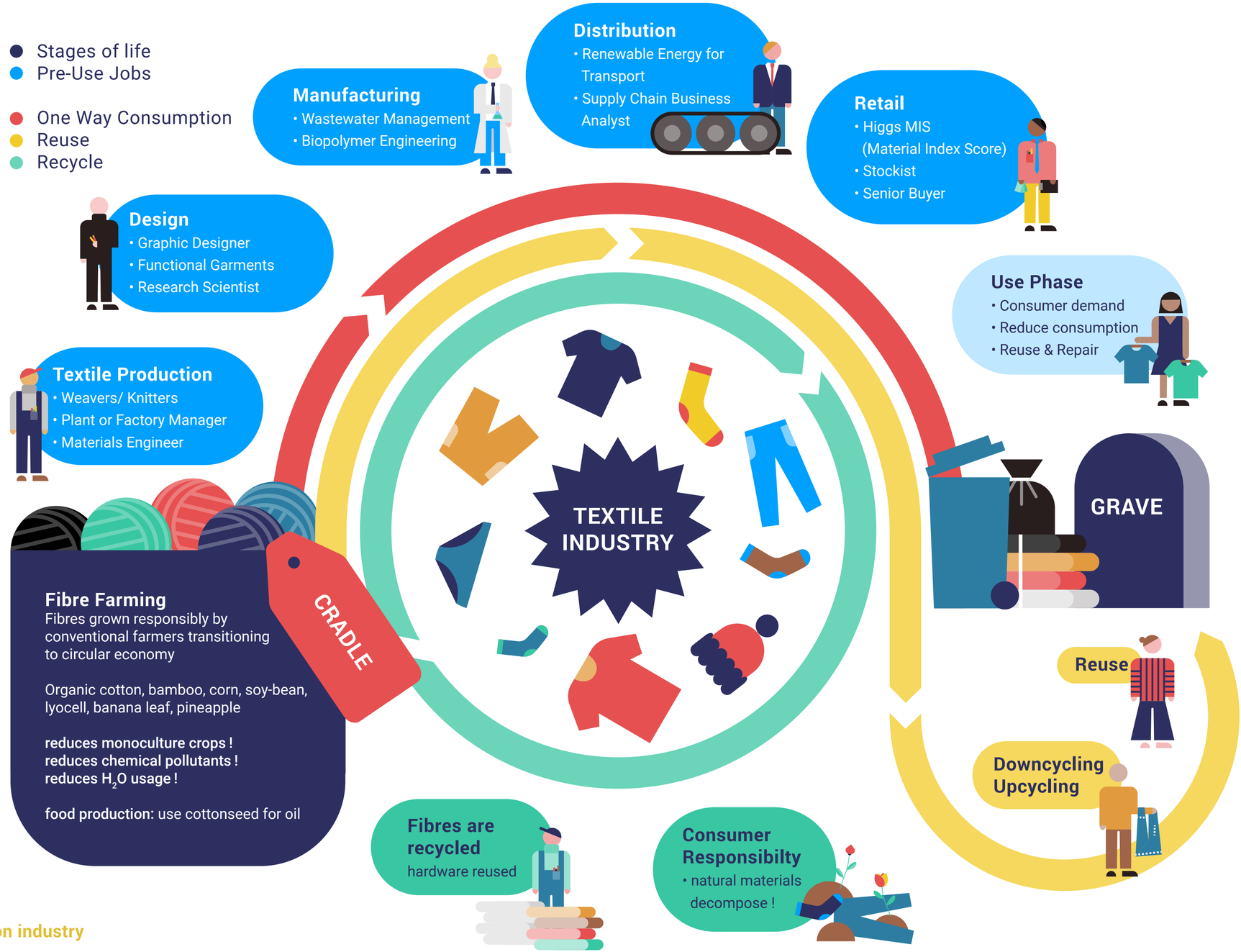


Figure 4.2 A circular fashion industry

Interestingly, some businesses that have suffered a devastating blow due to the global pandemic were primarily focused on unsustainable behavior, like fast fashion retail stores, hocking mass-produced, and unethically sourced materials goods. These businesses had to shut down their world factories, close their numerous brick-and-mortar store fronts, while world transport of these goods was almost brought to a complete stop! Looking forward, you can help change the way the fashion industry works, moving from a linear to circular model, by buying less and being smart about the materials you wear, or even by taking a green (or "sustainable" or "ethical") job in the fashion industry itself (Panna 2018). **Figure 4.2** shows the types of jobs that would be needed in a more circular fashion industry. For example, scientists and engineers would be needed to design new materials and build the factories where textiles are produced (and the industries where materials are disposed of or reused).

Renewable energy would be used to move goods along the design, production and distribution chain. Those who design clothes, weave and knit materials, and stock retail shops would need to sell sustainable items available in sustainable packaging.

"With current advances, digital technology has the power to support the transition to a circular economy by radically increasing virtualization, dematerialization, transparency, and feedback-driven intelligence."

Ellen MacArthur Foundation 2017c

The circular economy is slowly growing (Centre for European Policy Studies 2018). Seven key things (four core and three enabling ones) are needed for businesses, organizations and governments to focus on achieving circularity (UNEP 2019a) **(Figure 4.3)**. However, many types of activities can potentially contribute to a circular economy.

"It is too late for the world to grow now, and only clean up later. It is time to grow clean, to go green. The Sustainable Development Goals are clear in the desire to combine decent work for all with environmental sustainability."

ILO 2018a

hover for more info

And do not forget all the indirect circular jobs which are all those jobs that support the directly circular ones! For instance a teacher, courier, journalist, etc.

7 KEY ELEMENTS

ENABLING ELEMENTS

Collaborate for joint value creation: Networking
Work together throughout the supply chain, internally within organizations and with the public sectors to increase transparency and increase joint venture.

Design for the future
Account for the systems perspective during the design process, to use the right materials, to design for appropriate lifetimes and to design for extended future use.

Incorporating digital technology
Track and optimize resource use and strengthen connections between supply chain actors through digital, onlie platforms and technologies that provide insights.

CORE ELEMENTS

Prioritization of regenerative resources
Ensure renewable, reusable, non toxic resources are utilized as materials and energy in an efficient way.

Preservation and extension of what's already made
While resources are in use, maintain, repair and upgrade them to maximize their lifetime and give them a second life through take back strategies when applicable.

Use of waste as a resource
Utilize waste streams as a source of secondary resources and recover waste for reuse and recycling.

Rethinking of business models
Consider opportunities to create greater value and align incentives through business models that build on the interaction between products and services.

Figure 4.3 Key elements of a circular economy. Source: Adapted from UNEP (2019a).

4.2.2
Emerging green jobs: technology and education

The jobs of the future are taking shape today – even if we don't know yet what they will all be or how to prepare ourselves for all of them (Danger 2019; Elizondo 2019). Our digital world already needs a wide range of digital skills, and the COVID-19 pandemic has encouraged this trend. The Fourth Industrial Revolution is building on the digital revolution that began around the middle of the 1990s (Rideout 2017; Marr 2018; Xu et al. 2018). As this Fourth Industrial Revolution is applied worldwide, many people's jobs are changing (McKinsey and Company 2017a; Climate-KIC 2018). All of us will be affected by this technological revolution (International Institute for Environment and Development [IIED] 2017).

"…characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres"

(Schwab 2016).

"Forces of change are affecting three major dimensions of work: the work itself, who does the work, and where work is done."

Deloitte Insights 2019

Particularly, COVID-19 has accelerated the transition of "where work is done". Depending on the industry, some companies have not skipped a beat, fully leveraging technology to move their employees to a 100 per cent remote-work from home status and virtual meetings – avoiding unnecessary commutes and travel. Some employers are finding that not only were their employees more productive, they were well rested, and were spending more time with their family, with residual positive effects on mental health. The question remains, do we really need to go back to normal work places and travelling for multiple meetings once the pandemic has subsided? Could we find a middle ground that would be better for us all?

The world of work is also changing because of the gradual closing of the gender gap (ILO 2019a; WEF 2019). More women are now in jobs where they have been under-represented. (for example, in the fast-changing energy sector). These women can help companies reach a high level of innovation and find solutions that are inclusive

(IEA 2019a). But more progress still needs to be made on the percentage of women in some types of jobs, for example, their share in management and leadership positions could increase; and the pay gap could be reduced (McKinsey and Company 2018; Zahidi 2019; Institut national de la recherche agronomique [INRA] 2018a;). The chemical engineering industry has shown that inspirational teachers can help steer
young women towards quality jobs in that field (Business First Family 2019).

"… more has to be done to equip new generations, especially in developing countries, with the skills to succeed in tomorrow's reality. In this respect, increasing formal education attainment is necessary but not sufficient to provide young men and women graduating from every level of education with the type of skills demanded by the job market in the Fourth Industrial Revolution era."

World Economic Forum, 2019

The COVID-19 pandemic made clear that we need to ensure inclusive and quality education for all (SDG 4) that supports lifelong learning. This also needs to take into account the different types of access to technology and means of studying for different students, even during an emergency situation like a pandemic.

Moving to environmentally driven jobs such as those shown in **Figure 4.4**, young people need "green" knowledge, skills and competencies. UNEP, with the Youth and Education Alliance (YEA!) and the Higher Education Sustainability Initiative (HESI), is working with universities, governments, partners in youth movements, and the private sector to help bring digital skills to the workforce. It is calling on institutions of higher education to add sustainability teaching across all courses, and to give students more applied learning and ways to improve their skill sets. Skills mismatches have been identified as a major problem in moving to a green economy. To meet the qualifications of a green job, you will also need to know the environmental dimensions of the Sustainable Development Goals (SDGs) (see Chapter 2, Section 2.3.1).

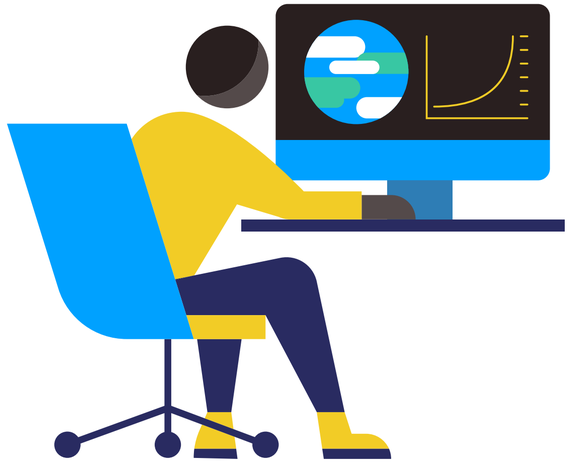
Decent Jobs for Youth is a United Nations initiative launched in 2016 that is focused on digital skills for youth; quality apprenticeships; green jobs for youth; youth in the rural economy; moving youth from the informal to the formal economy; youth in fragile situations; youth entrepreneurship; and self-employment (United Nations 2019a). This program is helping to achieve Sustainable Development Goal 8, Target 8.5 ("By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value").

“Skills training programmes provided by governmental, non-governmental and international organizations can be an important means of bridging skills gaps and providing youth with opportunities to acquire job-relevant knowledge. These include targeted vocational training programmes and, increasingly, training programmes aimed at providing youth with life skills centred around effective communication and negotiation, decision-making and problem solving, leadership, personal finance management, and critical thinking.”

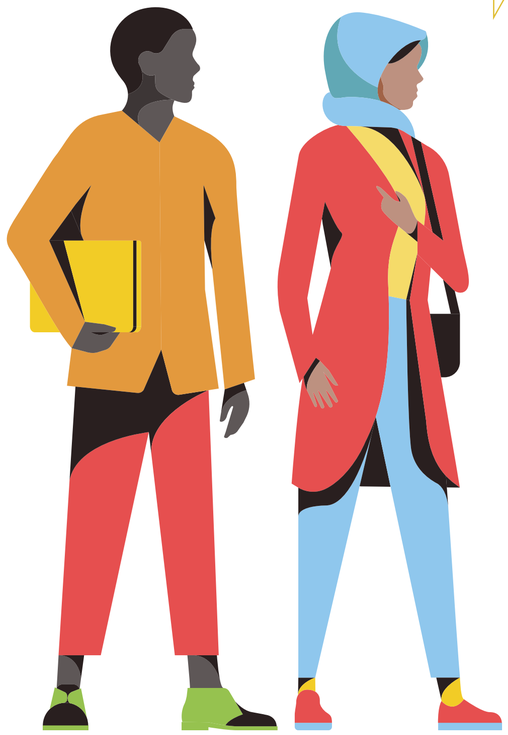
United Nations Department of Economic and Social Affairs [UN DESA] 2018

Did you know?

- With more than 135 million tons of debris to land ills every year, construction and demolition waste in the U.S. is the single largest waste source. (EPA 2003)
  The environmental consequences of construction and demolition waste are staggering.
- That Data Scientists in 2017 was as one of the toughest jobs to fill (Forbes 2017).
- Many times the film industry is criticized for the amount of wasted materials. Paramount Pictures (Noah 2014) had 100 per cent of their steel recycled and recouped by Allocco Metal Recycling. The total amount was estimated at 450,000lbs and the production made back approximately $45,000 (O´Brien 2014). Apparently, the myth that it costs more to “go green” in the filmmaking industry is not so.
- Application Software Developer is one of the hardest jobs to fill at present. There is a lot of demand for it! (Career Cast 2018)



A skilled workforce, including not only people who have scientific, engineering and management qualifications but also those who carry out traditional craft and technical jobs, is needed to support a green economy.



Complex problem solving skills

Basic skills: will include complex ones

Systems skills

Monitoring skills

Skills in education pathways

Environmentally friendly technologies and engineering skills

Operational and resource management skills

Agriculture skills

Green jobs will increase demand for science skills

Architects and planners skills

Figure 4.4 **Skills needed for future green jobs.** Source: Government of the United Kingdom 2011; Fedrigo-Fazio and ten Brink 2012; Consoli 2015; Vona *et al.* 2015; Maclean, Jagannathan and Panth 2018; Burger *et al.* 2019; Occupational Information Network (O*NET Online) 2019.

New information is always available on the Internet about topics such as sustainable development, the transition to a green or circular economy, and green job opportunities – from agroecology and agroforestry, to biodiversity conservation, to green roofs and urban agriculture, to reducing unnecessary consumption and waste and the expected impacts of the Fourth Industrial Revolution.

Many blogs, articles, reports, podcasts and videos are available, including:

- the UNEP, FAO, ILO, and other United Nations organizations and entities;
- other international organizations (e.g. OECD; The Forum Network);
- non-governmental organizations (NGOs) like the International Union for Conservation of Nature (IUCN), the World Economic Forum (WEF) and the World Wide Fund for Nature (WWF);
- websites of universities and scientific institutions (e.g. see INRA 2018b; Africa University 2019; Qatar University 2019; Ross and Kowarski 2019; U.S. News and World Report 2019; Woods Hole Oceanographic Institute 2019; University of California Television 2019).
- ministries and other governmental sources in countries; and
- YouTube, where there are videos on almost every topic you can think of, including green jobs.

Many websites describe green jobs and show you ways to find them. Some can direct you to employers or even show specific job vacancies. These include both commercial jobs and non-profits –including Conservation Careers, Environment Jobs, Environmental Career Opportunities, EnvironmentalScience.org, the Global Recruitment Company, Green America, Green Choices, GreenJobs and LinkedIn. Some others with international coverage (e.g. Guardian Jobs and New Scientist Jobs) not only show jobs in various categories, but also offer advice about job searches and interviewing. Even though some websites focus on specific countries, environment-oriented job sites are valuable sources of information. For example, Conservation Careers offers a free, downloadable guide for “conservation job-hunters and career-switchers” based on interviews with hundreds of professional conservationists around the world (Conservation Careers 2019). But be careful though, if you are interested in a job that you have found on a non-commercial site, such as from an international organization or an NGO, fake recruitment scams exist where applicants are asked to pay to be part of the application process (see warnings at Oxfam 2019 and United Nations 2019d).

Some countries are encouraging young people (and those who are older) to learn about environmental issues and to prepare for the green jobs market, including through vocational training (Maclean, Jagannathan and Panth 2017; Government of India 2019). In other countries, it can be difficult to find this type of information through the public education system (Trendov, Varas and Zeng 2019). Only around 68 per cent of the young people who took the GEO-6 for Youth survey (see Annex 1) had some knowledge of the green economy or green jobs. About 32 per cent knew nothing about green jobs, and did not have any information from their schools, governments

or from other sources to help them find them. If you are digitally literate (or "e-literate") and have access to the Internet, you can find out a lot about green jobs and other topics on your own.

Millions of young people in the world need to learn basic (and more advanced) digital skills or improve the ones they already have to compete in the job market (United Nations 2019b). In particular, progress needs to be made on the gender technology gap (Gama 2018; Adams 2019). Don't forget that employers value soft skills, which people of any age may have acquired at home, at school, or in previous jobs (Whitman 2019). Soft skills include adaptability, positive attitudes about yourself and others, the ability to work in a team, and good time management (Dupuy *et al.* 2018; Yate 2018; The Balance Careers 2019).

In addition, find out if you can obtain certification that might interest a potential employer, for example by completing a massive open online course (MOOC) (Bowden 2019; Open Learn 2019). Why not look into opportunities to work as an intern, an unpaid trainee or a volunteer?

In an ecologically focused society that avoids environmental degradation and reaches a level of prosperity associated with protecting and improving key ecosystems, the benefits of a green economy will include high-quality green careers (China Council for International Cooperation on Environment and Development 2019).

"Nearly every top-ten list of future important work skills… favours uniquely human abilities, often referred to as "soft skills." These are hard-to-codify abilities, traits and mind-sets like empathy, social and emotional intelligence, judgement, design mind-set, sense-making, collaboration and communication. They require both training and practice – otherwise known as experience. In this environment, constant upskilling of workers will be the new normal. Abilities related to the 5 Cs of soft skills – critical thinking, creativity, curiosity, change management and collaboration – will be prized more than ever."

Whitman 2019

“Technology-related and non-cognitive soft skills are becoming increasingly more important in tandem, and there are significant opportunities for innovative and creative multi-stakeholder partnerships of governments, industry employers, education providers and others to experiment and invest in new types of education and training provision that will be most useful to individuals.”

World Economic Forum, 2018

https://youtu.be/tEy1KvGkV6I

https://youtu.be/yDRX2iJNBwA

https://youtu.be/YO3iXAF8BVE

https://youtu.be/WEBDJsucPvQ

https://youtu.be/hNl3BKCSlpo

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4.3
Can Any Job Be Green(er)?

“The shift to a low-carbon economy implies structural changes across sectors and occupations as new ‘green’ occupations arise or grow in demand. However, ‘greening’ of existing ones is what is mostly required. This translates into new skill sets that necessitate curriculum updates or even new qualifications across education and training levels. These new ‘green skills’ can range from very technical and job-specific skills to ‘softer’ ones, such as responsible use of resources, which can be relevant across occupations, levels of hierarchy and sectors. While the ‘greening’ of the economy creates skill needs, particularly in specific sectors such as energy and resource efficiency, construction or manufacturing, moving towards a circular economy creates ‘green’ skill needs across the board.”

European Centre for the Development of Vocational Training (Cedefop), 2019

To reach the goal of creating an environmentally sustainable world, every job will eventually need to be green or at least greener. To help decide whether your chosen career path is heading in this direction, you could look at three main things: intentions, approach and environmental outcome. Imagine that a passionate wildlife biologist (intention) uses solar-powered technology (approach) to study and protect endangered species (environmental outcome). Based on this intent, process and outcome, they definitely have a green job. The environmental outcome is probably the most important factor in determining whether a job is or could become green. Some jobs will never be green (e.g. if they are involved in the production of fossil fuels or neonicotinoid pesticides), but many other jobs can be green or at least “greener”. A recent report in six European countries found that, across these countries, not many jobs were considered green as such. Greening of the economy and of today’s jobs so far mainly means that new green skills are being used within existing jobs (Cedefop 2019).

For millions of workers and companies, the green jobs future will become a reality. As this technological revolution …

> "… gains traction and speed, how the world works and lives are being redesigned, re-engineered, and reinvented" while the "line between the digital and physical is blurring."
>
> Renjen 2018.

Some people fear that we will become "robotized" in this transformation (Schwab 2016). Others are convinced that the Fourth Industrial Revolution and the greening of jobs can be positive, achieving both innovation and progress (Michalski *et al.* 2017). Over the next decade the number of workers who work in the linear economy is expected to decline – in some cases by a lot – because of technological change and the greening of the world economy (Table 4.1). It is difficult to know how many existing jobs will be improved (in terms of both job quality and productivity) thanks to new technology, how many will become greener (which may also include new technology), and how many will disappear altogether (ILO 2018a; WEF 2018).

Figure 4.5 shows how transferable certain skills are across different fields and the possibilities to make many jobs greener. The outer ring shows nine traditional career paths. The nine wedges show examples of jobs in each of these career paths. The five inner circles show different job sectors. The green parts of the figure are grouped into four categories: infrastructure; tangible; intangible; and nature (American Geological Sciences Institute 2019; Occupational Information Network [O*NET Online] 2019).

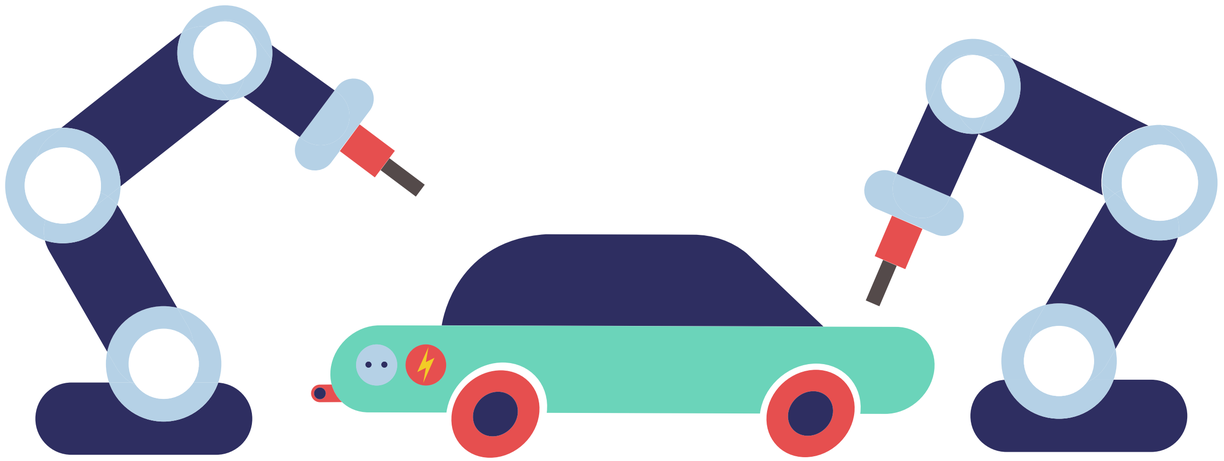


Figure 4.5 **Nine traditional fields (outer ring) and five job sectors (inner rings), with green segments grouped into four categories: infrastructure; tangible; intangible; and nature**
Source: American Geosciences Insitute (2019). Adapted from

4.3.1
From conventional to green conventional jobs

Whether you have already found a green job (e.g. see those in National Geographic 2019) or are in a job, workplace or business that could be made greener (Hays 2019; Mind Tools Videos 2019; Ward 2019), you can help with the transition to a green and circular economy. Most conventional careers – including those in music, law, education and many others – can be "greened" (Publicover *et al.* 2019; Smith 2017; Environmental Science 2019).

Can lawyers be green?

Over the last 50 years, lawyers have helped create new environmental laws that have shaped today's society. These laws need to be monitored to make sure they are making the environment better. Lawyers can also help shape and change these laws if they aren't achieving the environmental goal. Human rights lawyers can also help those affected by environmental disasters that are forcing them to migrate and are wasting natural resources. Lawyers can also help create patents for new innovations that promote environmental sustainability. But they need to be careful not to stifle innovation through the granting of patents that limit competition across companies.

Lawyers prosecuting environmental crimes investigate those who may be responsible for environmental damage. Environmental justice – that's green, right? Sure, as long as legal professionals also consider accountability and consistent governance. By doing this they can avoid sending mixed messages to the community because of inconsistent application of the law. For more information about governance systems and environmental management, read UNEP Environmental Rule of Law report (UNEP 2019c).

Can educators and other storytellers be green?

By traditional teaching, working as journalists or designing audiovisual content, educators help create the stories of what they are inspired to share. One thing they have in common is the art of storytelling. They can play an important role in raising awareness and knowledge of environmental issues and teaching young people to think differently.

As we move to a circular economy, education and training needs will evolve along with the jobs that define those needs. Teachers (storytellers) will be an important part of preparing the future workforce by planting the seeds of critical thinking at an early age to prepare young people for this change.

Green Teacher is a non-profit organization dedicated to helping educators, both inside and outside schools, to promote environmental awareness in young people aged 6 to 19. Another organization, Climate Tracker, has inspired, trained and mentored over 8,000 young climate journalists from around the world.

Sea Legacy uses the power of visual storytelling to show solutions for protecting marine species and habitats and promote sustainable fisheries. Its experience in conservation, photography and communications, combined with social technologies, is helping to build a healthy future for our oceans. Through its media networks this organization has inspired over 2 billion people to turn apathy into action! Check out this online video and join in #TurningTheTide.

Can musicians be green?

Music is unique since it has the power to transcend language barriers or boundaries on a map. The power of music is innately synced with how humans express emotions. But how can we harness music with a green spirit in our heart?

Alex Paullin calls himself a “musical conservationist”. In 2015 he started his journey to build “Conservation Music”. His mission is “to build a global network of musicians and youth volunteers to deliver environmental education through the catalytic power of music”. The catalytic power of Conservation Music’s philosophy is based on neuroscientific research which shows that music activates more regions of the brain than language does. Conservation Music wants to reach this mission with a vision “in which the memorable, emotional, and unifying power of music contributes to the balance between humankind, nature and society”.

Shady Rabab, an Egyptian musician and designer, has been turning waste into treasure: musical instruments. “My dream is to bring together children working as garbage collectors and teach them how to make their own musical instruments from trash and play music as a band. The project will empower children through the innovative use of waste, while using art and music as a medium to nurture relationships between communities, families and children”.

4.3.2
Transforming challenges into opportunities

In Chapter 1, the key environmental challenges for young people were discussed under three themes: the food, energy and waste systems. In Chapter 3 again, we looked at these themes and how these environmental challenges can be tackled with individual actions. In this section we will look at these themes again, but with a focus on how these environmental challenges can become opportunities.

Food: even simple solutions can lead to big impacts

"The agricultural labour force is ageing globally, yet rural youth unemployment is also a growing concern... Agriculture is a growing sector in need of talent. It is key to addressing the world's biggest challenges. And it is a sector full of innovation and opportunity."

Farming First 2013

" Farming has an image problem in large parts of Africa. For many people there, it's synonymous with poverty. So, it's hardly surprising parents don't want their children to end up working the land. Things may be starting to change, though. A growing number of African millennials are working to dispel the notion that all educated young people should aspire to professional desk jobs. The understanding that agriculture is key to the continent's long-term

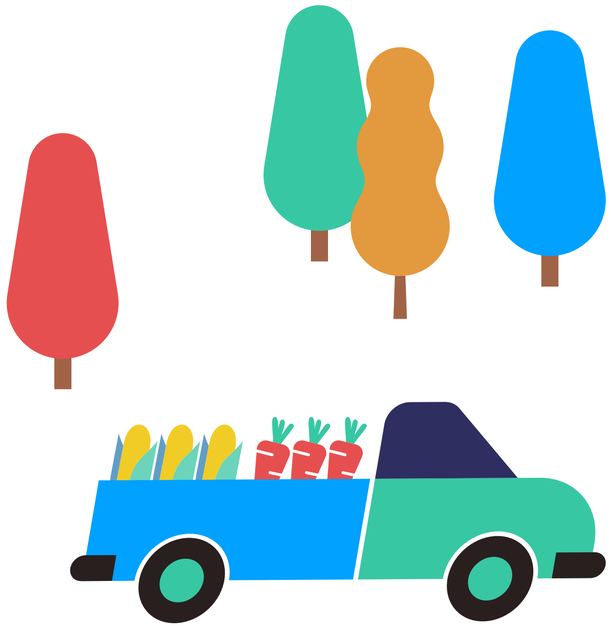
economic viability and growth is prompting an increasing number of African university graduates to choose careers in farming."

Broom 2019

"Young people make up roughly one-fifth of the population of developing and emerging economies, but in many parts of the world the farming sector lacks generational renewal. The young find it hard to engage in agriculture – despite its largely untapped reservoir of employment opportunities – and the drudgery and poor remuneration associated with family farming turns them off. Also, they face major barriers with regard to access to the resources, services and financing mechanisms necessary for farming activity. This is creating a growing trend towards urbanization, with more young people moving away from rural areas in search of new opportunities."

FAO, 2019a

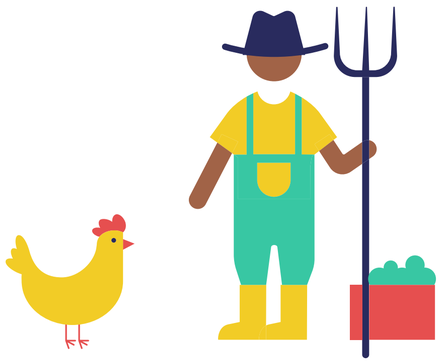
Producing food through agriculture is on the front line in the struggle to reach sustainable development and respond to climate change (Searchinger *et al.* 2018; Searchinger *et al.* 2019).



“Currently, 1.2 billion jobs rely directly on the effective management and sustainability of a healthy environment, in particular jobs in farming, fishing and forestry dependent on natural processes such as air and water purification, soil renewal and fertilization, pollination, pest control, the moderation of extreme temperatures, and protection against storms, floods and strong winds. Environmental degradation threatens these ecosystem services and the jobs that depend on them.”

(ILO2018a).

This fight cannot be won without the help of young people (Nyasimi and Kosgey 2017; Freeman and Mungai 2018). The agricultural workforce is getting older while, in many parts of the world, youth in rural areas (especially young men) are turning their backs on farming and are choosing to be more mobile or to make their life in cities (Uraguchi and Alandu 2017; Schulz 2019). At the same time around the world, millions of youth are unemployed (United Nations Department of Economic and Social Affairs [UN DESA] 2019). In our fast-changing world, and under the right circumstances, farming, fisheries and aquaculture (and other types of rural jobs could provide green jobs which are satisfying in themselves and can help to feed the planet in an environmentally sustainably way) (Gay 2017; Mukhebi 2017; Bezahler 2019; ILO 2018c; International Fund for Agricultural Development [IFAD] 2019).



> “Agriculture today is about so much more than a farmer simply planting a seed, rearing a cow or catching a fish. It takes a whole ecosystem and a host of actors to work together to produce the food we need for a population of more than seven billion people.”
>
> Farming First

Digital technology is giving us new opportunities in agriculture and rural employment, but there are still problems with Internet or broadband access in some parts of developed and developing countries (Radoš 2019; World Bank 2019). In Africa, barriers to using information and communication technologies (ICTs) in agriculture were in three main areas: infrastructure (45 per cent); availability of culturally appropriate and relevant resources (22 per cent); and knowing where to find resources, technical literacy, and cost (11 per cent each) (Freeman 2019). Farming is also becoming more sophisticated (De Clercq, Vats and Biel 2018; Rotz *et al.* 2019) because of the use of smartphones, remote sensing (satellite images), robotics and artificial intelligence (Michels *et al.* 2019; Byrum 2017; Alexander 2018; Tibbetts 2018; Allen 2019). Big changes are expected in the agrifood system over the next decade, coming mainly from digital technology and other innovations, along with changes in what types of food consumers want; the effects of online shopping; and climate change, among other factors (Trendov, Varas and Zeng 2019). Young people often understand new ideas more quickly than older ones and are ready to introduce or experiment with these new ideas. When youth are digitally literate and have good access to the Internet, they can help bridge traditional (old) farming practices and new ways of doing things. But sharing knowledge across generations in a thoughtful way is crucial (FAO 2019a; Foote 2019).

When you work in the food system (farmer, packaging, trading, transport), deciding how you can make a positive change is in your hands! Some simple actions can result in big changes, on the farm itself as well as in food distribution (**Box 4.3**). Different ways of preparing farmland help control weeds, making it possible to reduce or avoid chemical herbicide use, and can also improve crop yield (Oshunsanya 2013). Changing planting dates can also lead to higher yields (Wolf, Outtara and Supit 2015). Environmentally friendly farming means using less water, fertilizers and pesticides (agricultural inputs). Irrigating crops is responsible for 70 per cent of global water use. By scheduling irrigation in a smart way, we can save huge amounts of water (Sun and Ren 2014). Because of poor irrigation techniques, very large amounts of water (“virtual water”) are contained in the food we eat (**Box 4.5**). Farming has to become more “land-efficient” (that is, we need to produce more food on the existing farmland we have) and more “water-efficient”.

Every plot of land used for farming has its own set of challenges. There are no “one size fits all” solutions (Riensche and Jakhar 2019). However, good ideas are coming from every part of the world about how to meet the “triple challenges” that face agriculture (OECD 2019): improving the quantity and quality of food produced; reducing food waste, and making farming more environmentally sustainable. We now have ways to reduce the environmental impacts of farming while taking steps to reduce greenhouse gas emissions and adapt to a changing climate (e.g. Farming First 2019b; UNFCCC 2019). A new FAO report, Youth in Motion for Climate Action!, describes youth-focused and youth-led ways that farming can deal with the impacts of a changing climate (FAO 2019b).

Box 4.3
Ben Simon: Imperfect Produce

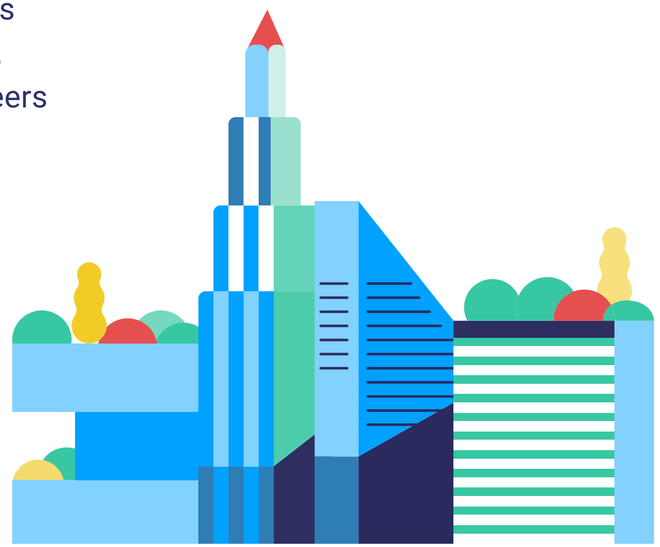
Every year 20 per cent of fruits and vegetables grown in the United States don’t leave the farm because of the way they look. These ‘appearance issues’ do not affect their quality, taste or nutritional value. This is linear economy thinking. To close the loop and move towards a circular economy, we need to create ways to use “would-be-waste”.

Ben Simon, CEO and co-founder of Imperfect Produce, has found a new way to get affordable, healthy food into the hands of everyone. Since 2015 he has recovered over 40 million pounds of ‘ugly’ produce, donating over 2 million pounds to a food bank and non-profit partners, and offering 10,000 low-income households weekly reduced-cost produce boxes. Imperfect Produce buys “ugly” discards from farmers and sells them at a 30-50 per cent discount, reducing food waste and bringing affordable food to customers.

Before Imperfect Produce, Simon co-founded the Food Recovery Network (FRN) in 2011 when, as a university student, he saw how much food was wasted in dining halls. Today the FRN works in 230 colleges/universities and has recovered and donated more than 3 million pounds of food. Simon saw a problem, addressed it, and turned it into his own green career.

Box 4.4
Urban agriculture: it's not just about food, but also about job creation

Farming in cities has an important role to play in helping to create a better urban environment and in providing fresh, nutritious food for city dwellers. It also brings new jobs to cities. Converting balconies, roofs, courtyards or abandoned urban spaces into urban gardens means that jobs are created for urban farmers, architects, landscape designers, engineers and builders (Sprecht *et al.* 2014; Baratta 2019; Molga 2019).



Box 4.5
How much water do we eat?

If you eat meat, remember that you are also "eating" the water used to grow the crops which were fed to the animal the meat comes from (Mekonnen, and Hoekstra 2010; Harvard T.H. Chan School of Public Health 2019a). What if you don't want to eat meat, but you still need protein? Many studies show how plant-based proteins can be as good as animal-based proteins (e.g. Harvard T.H. Chan School of Public Health 2019b). Some people already can see a meatless food industry, either producing plant-based products, laboratory-grown meat, sustainable seafood substitutes or insect protein (Reuters Plus 2018; CB Insights 2019).

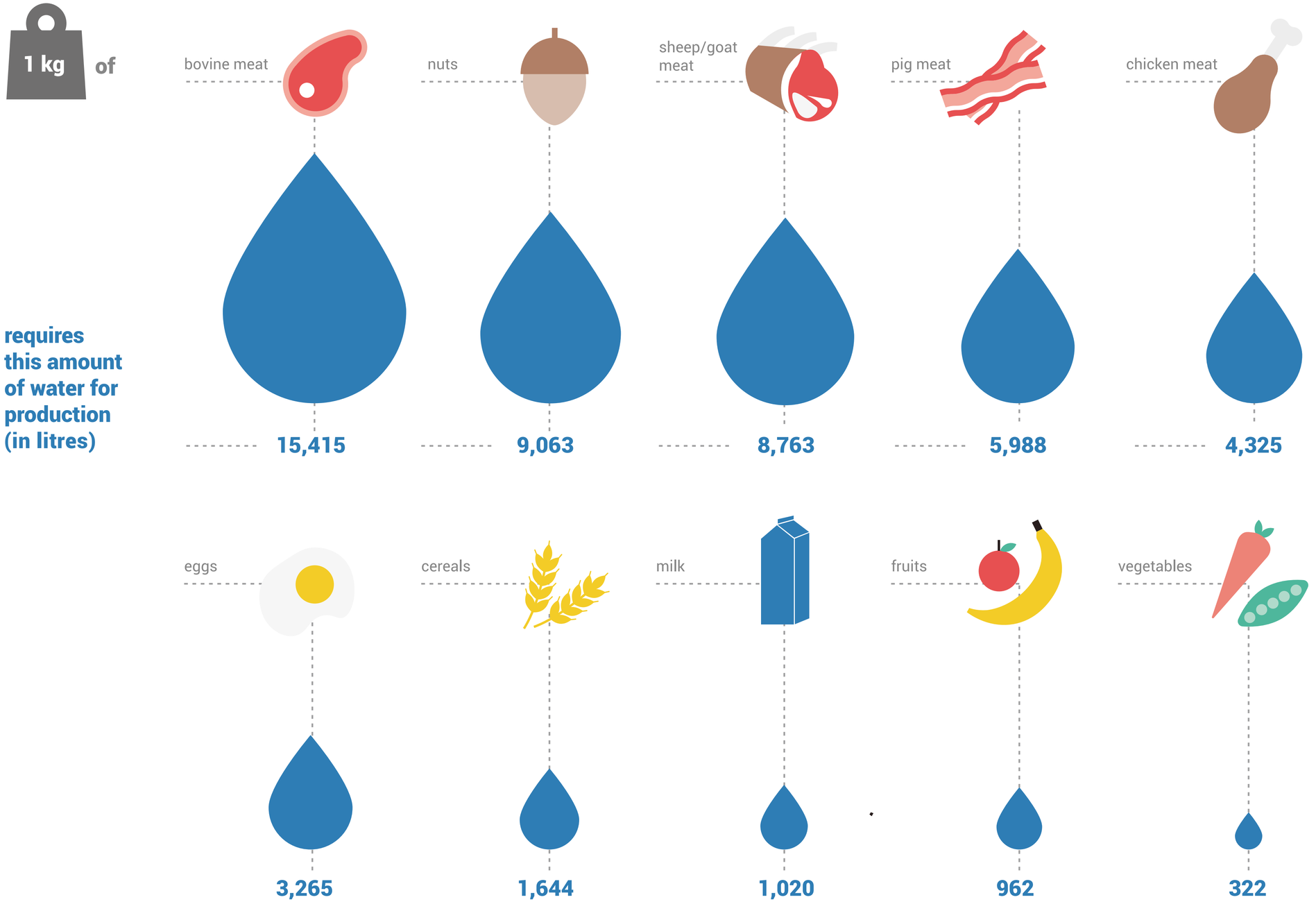


Figure 4.6

Litres of water needed to produce one kilogram of each type of food.
Source: Adapted from Mekonnen and Hoekstra (2010) and Armstrong (2017).

Box 4.6
Insects are our allies

Insects “hold the food chain together” (Addison 2015). Without them, the planet’s food supply would be much more limited. Because many insects are pollinators (see Chapter 1, Box 1.5), crops would suffer if they didn’t exist. We would have very little fresh fruit and vegetables to eat, and products like silk and honey would disappear.

The last two decades have seen a large decline in populations of bees and other pollinators (Carrington 2018; Vanderplanck *et al.* 2019).

Young people and others could think about becoming beekeepers, possibly starting in their own gardens on rooftops and balconies. To find out more about taking care of bees and marketing honey, have a look at these videos.

youtube.com/watch?v=eA9_UBPd_OA

In the United States, an online tool called Beescape allows users to share information about different flowering plants, the amount of toxins from applied insecticides, and where nesting habitat for wild bees can be found in the landscape near selected locations.

https://www.youtube.com/watch?v=gyFPD8mjpZE

Small drones can be used to pollinate plants artificially, but their use is not yet widespread (Boffey 2018; Knight 2019).

Waste: tomorrow's resource

In a linear ("take-make-waste") economy, waste can be grouped in a number of different ways. Household waste, for example, can be grouped into five types: liquid, solid, organic, recyclable, and hazardous (4 Waste Removals 2016). Even if these different types of waste can be disposed of in different ways, we should not be focusing on waste disposal (which often means bringing it to a landfill). Instead, we need to be aware of the resources used to make each item and the fact it is being turned into waste. In a circular economy, waste becomes a raw material for another process. Using resources efficiently across the whole life cycle of a product, from extraction, processing of raw materials, manufacturing and distribution to final disposal, will be very important for reaching sustainable development and a green and circular economy. The "Mind Your Step" resource footprint report (Friends of the Earth 2015) found that land and water use could be reduced a lot by taking into account in the way that different products are made. This research showed that producing a typical pair of leather boots and an average smartphone used 25,000 litres and nearly 13,000 litres of water each (**Figure 4.6** and **Figure 4.7**). Because of the large quantity of things produced globally each year, there are some very important jobs in the fields of circular design (see Section 4.2.1") and waste management.

While repurposing and recycling are two ways to reuse things that might otherwise be thrown out, our goal should be stop the need to reuse things altogether. In the meantime, one example of successful reuse is the Trashpresso machine, a "portable recycling plant" (Nuñez 2018). In addition, some young entrepreneurs in Indonesia have turned "waste into a business". Several waste recycling initiatives by smart entrepreneurs are also described in **Box 4.7**.

Cutting food waste and loss (**Box 4.8**) will also help increase the amount of food for people to eat without using more resources. It will also reduce the need for new land to grow more food and reduce the amount of "virtual water" used in farming – a trifecta of positive results!

Did you know?

- Your leather boots need between about 14,500 litres and 25,000 litres of water to produce, while your t-shirts need some 3,900 litres each.

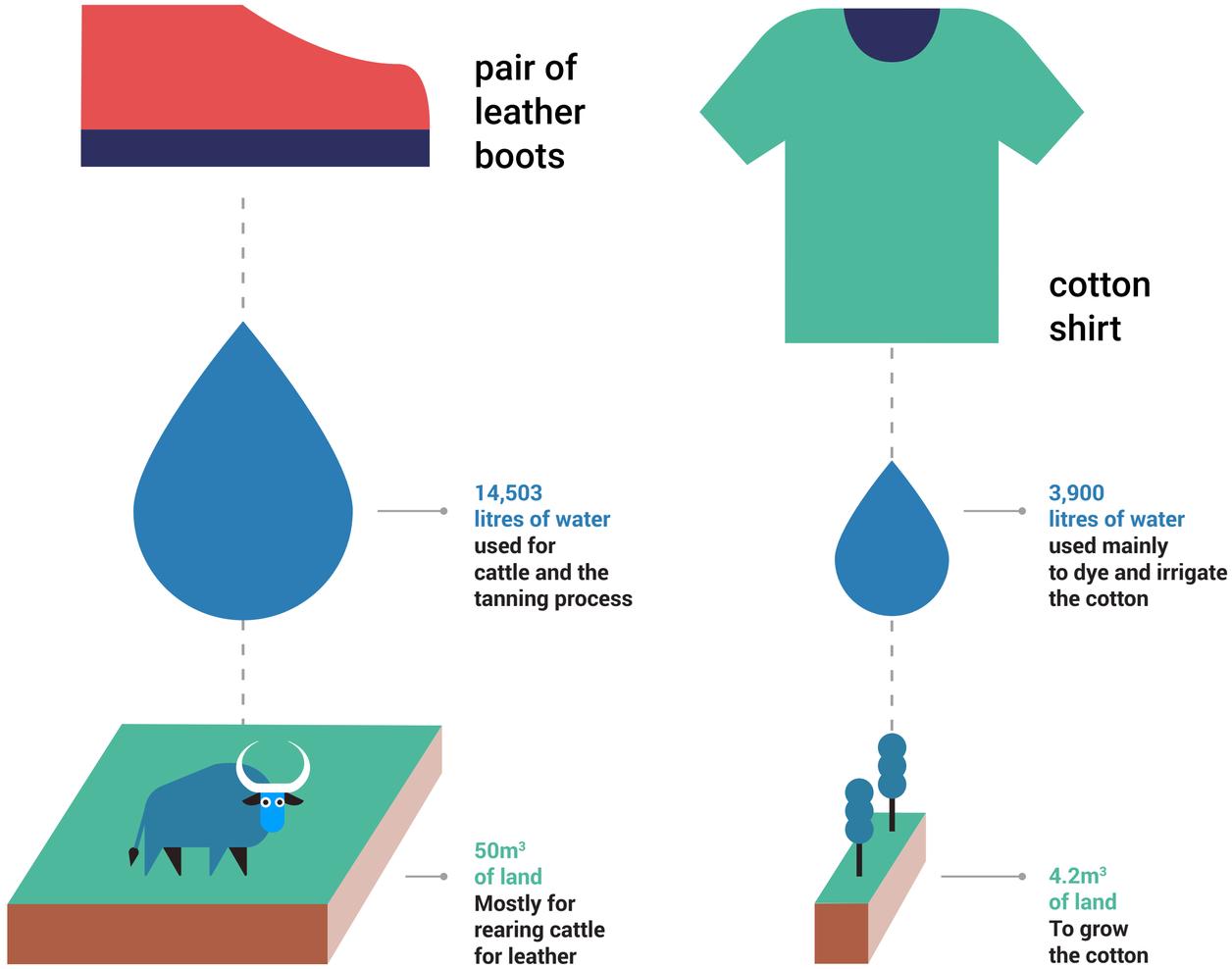


Figure 4.7
Water consumption to produce leather boots and t-shirts
Source: Adapted from Bawden (2015) and Friends of the Earth (2015).

Did you know?

- 50 million tons of e-waste are produced every year around the world. It is worth over 62 billion USD (ILO 2019b).

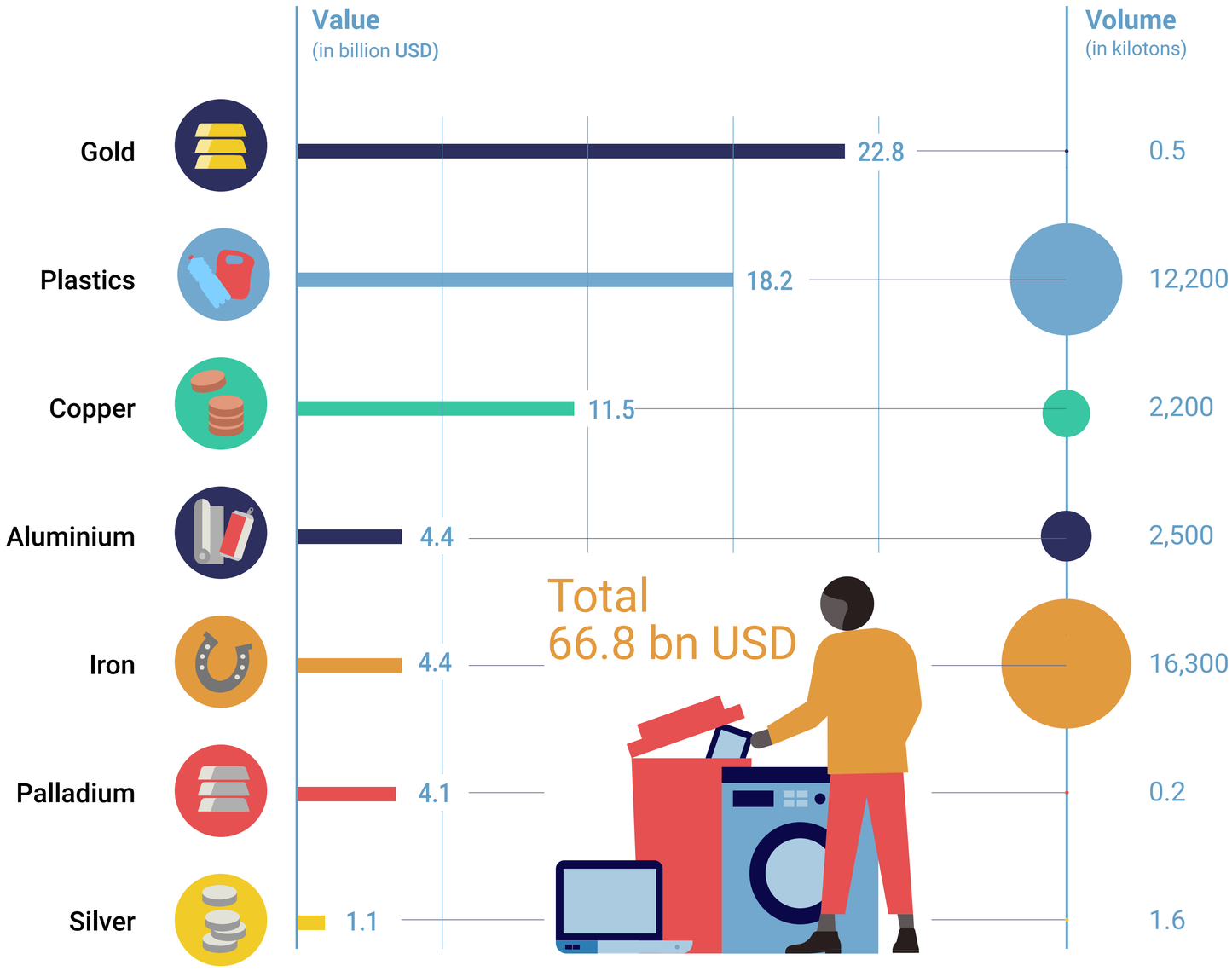


Figure 4.8
Mining e-waste
Potential value and volume of raw materials in e-waste worldwide 2016
Source: Adapted from Baldé *et al.* (2017) and Loesche (2017).

Box 4.7
Some inspiring waste recycling initiatives

Bilikiss Adebiyi Abiola - WeCyclers
WeCyclers, based in Lagos, Nigeria was founded by Bilikiss, a young Nigerian woman. WeCyclers waste collectors use bicycles to collect waste from households. In return for their waste, households are awarded points that can be exchanged for goods while also contributing to solving the city's waste problem.

Tom Szaky - TerraCycle
At the age of 20, Tom established a small company that collects and recycles waste. Now his company is in more than 20 countries and engages more than 80 million people.

Sifiso Ngobese - Unconventional Media Solutions
Inspired by a woman who collected waste to feed three children, Sifiso started this company in Johannesburg, South Africa. Unconventional Media Solutions provides jobs for informal waste collectors that give them an additional source of income.

Box 4.8
Where is food wasted and lost?

Food waste and loss are a challenge for global food security (MacArthur 2019). You can start thinking about possible solutions, innovations and new technologies that could help reduce or even eliminate food waste and loss at different stages (see Chapter 3, Section 3.4.1) You could have the next great business (or agribusiness) idea!

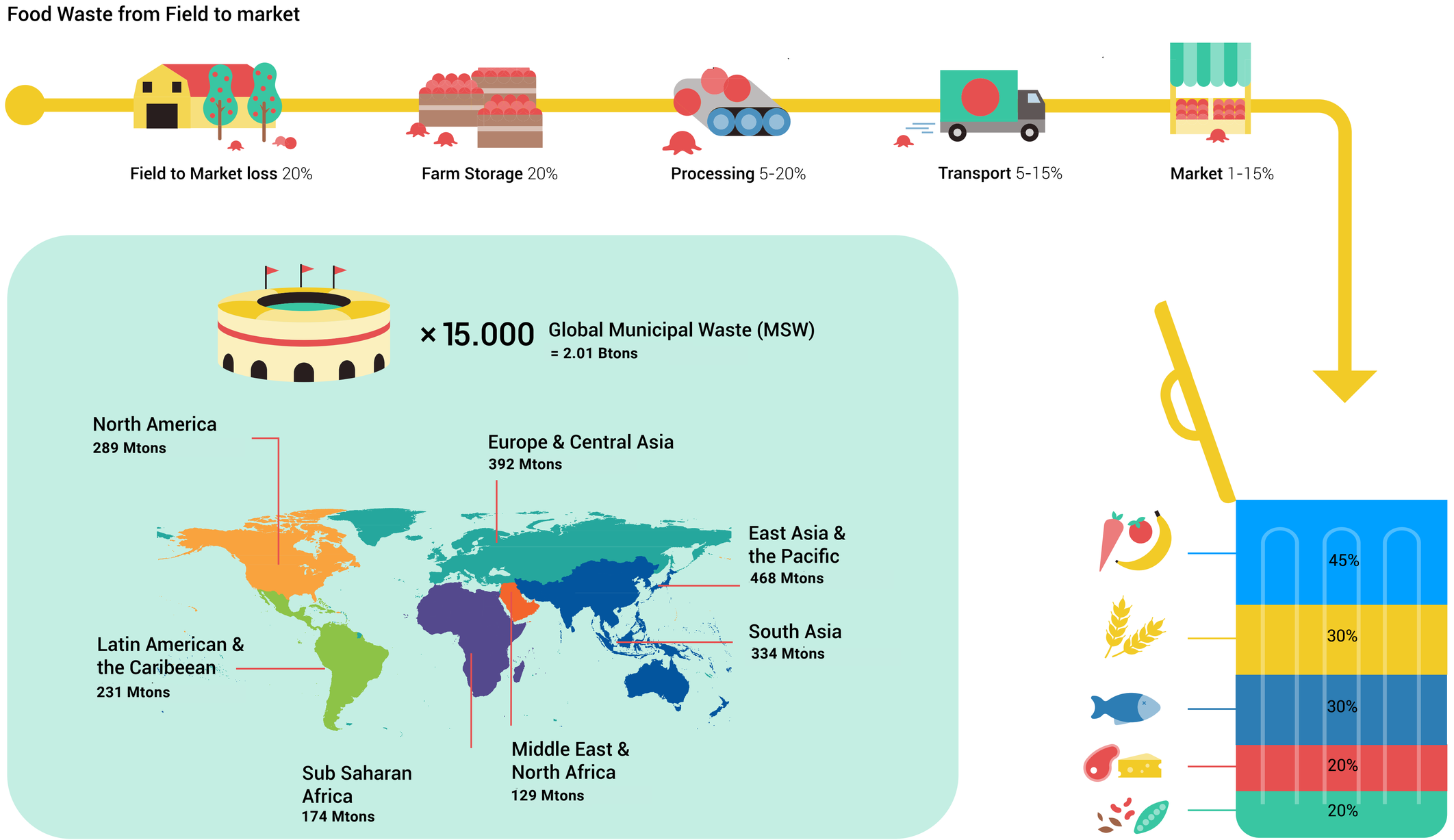
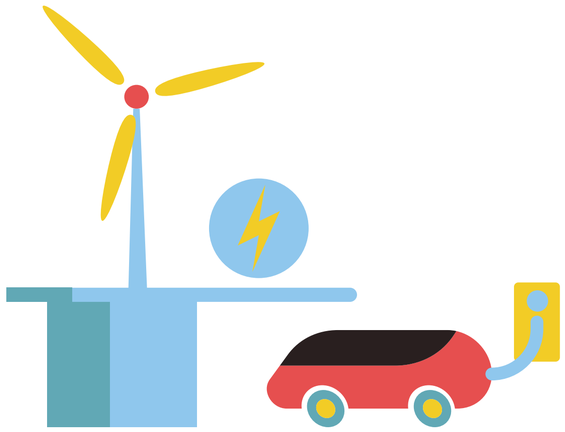


Figure 4.9 **Where food is wasted and lost.** Source: FAO (2019c); Hoornweg and Bhada-Tata (2012);Gill (2018); Yara (2018), ReFED (2019).

Energy: fuel for life

"Measures taken in the production and use of energy to job losses of around 6 million as well as the creation of some 24 million jobs.



The net increase of approximately 18 million jobs across the world will be the result of the adoption of sustainable practices, including changes in the energy mix, the projected growth in the use of electric vehicles, and increases in energy efficiency in existing and future buildings."

ILO 2018a

The energy choices we make today will have a long economic and environmental lifetime. The global energy sector is changing, but the way energy is produced and consumed still creates a lot of environmental damage (BP 2019; IEA 2019b). Making the energy system (like the food and waste systems) more circular can help protect our air quality and stabilize our climate, reduce land degradation and biodiversity loss, and also protect our oceans and freshwater resources (see the Introduction to Chapter 1).

"Employment opportunities are a key consideration in planning for low-carbon economic growth. Many governments have prioritized renewable energy development, firstly to reduce emissions and meet international climate goals, but also in pursuit of broader socio-economic benefits."

International Renewable Energy Agency [IRENA] 2019a

To really cut global GHG emissions now and avoid going above above 1.5°C average temperature increase, we have to be way more energy-efficient, leave fossil fuels in the ground, switch to electric vehicles faster, and use renewable energy. There are plenty of ways for countries to reduce their dependence on fossil fuels (UNEP 2019d). The renewable energy industry is growing fast, and the cost of renewable energy is falling more rapidly than was predicted even a few years ago. Renewables are now the second largest source of electricity globally after fossil fuels. According to the International Energy Agency (IEA 2019c), the share of renewables in power generation globally is expected to grow from 26 per cent today to 30 per cent by 2024, but this is still not fast enough. Solar voltaic (PV) will be 60 per cent of this increase. Installing solar PV systems on homes, commercial buildings and industrial facilities will probably take off over the next five years, with the number of solar rooftop systems on homes set to more than double to some 100 million by 2024.

Did you know?

- **The solar photovoltaic (PV) industry is the largest renewable energy employer, with one-third of all jobs and increasing off-grid solar sales translating into expanded energy access and increased economic activities in previously isolated communities.**
- **In 2018, biofuel jobs were up by 6 per cent to 2.1 million. Areas like Brazil, Colombia and Southeast Asia had labour-intensive supply chains to provide biomass for fuel production, while operations in the United States and the European Union were much more mechanized.**
- **Hydropower has the largest installed energy capacity of all renewables. It currently employs 2.1 million people directly, three-quarters of whom are in operations and maintenance.**
- **Women in the renewable energy sector perform 32 per cent of science, technology, engineering and mathematics (STEM) jobs, non-STEM technical jobs, and administrative jobs, compared with 22 per cent in the oil and gas industry.**

Source: IRENA 2019a; IRENA 2019b.

"23 countries have decoupled economic growth from GHG emissions as a result of the increased use of renewable energy, carbon pricing, green product subsidies and green jobs, among other policies. Environmental sustainability can be achieved alongside the advancement of decent work."

ILO 2018a

A sustainable energy future needs new thinking. We need young minds who can help to meet the challenge of increasing world energy demand (greater than 50 per cent by 2050) while ending the use of fossil fuels.

Remember also that energy is not used in the same way by everybody everywhere. This In Plain Sight online video uses night-time satellite imagery to “show places with bright lights and no people and places with people and no lights”.

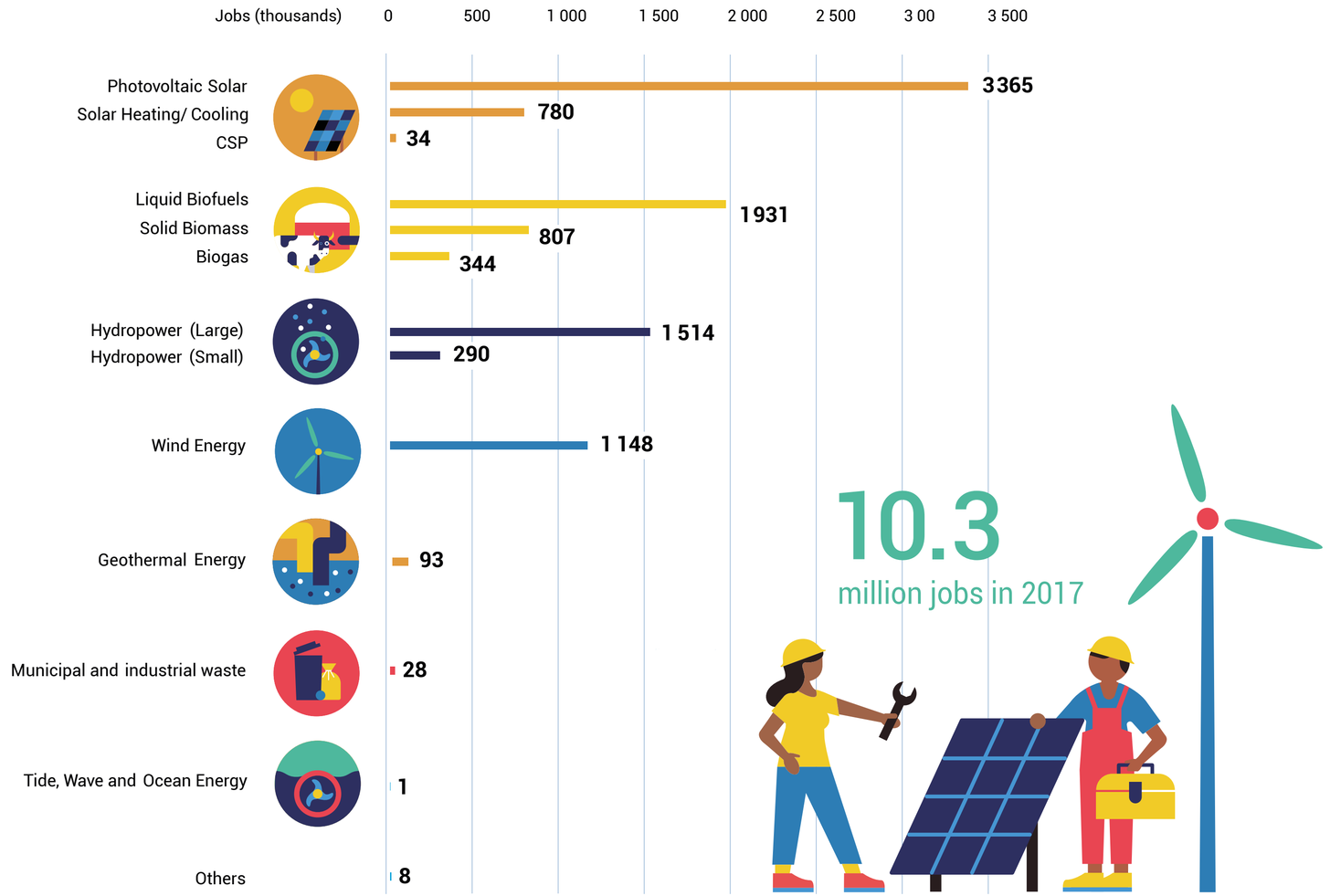


Figure 4.10 Jobs in the global renewable energy sector in 2017
Source: IRENA (2018).

Did you know?

- **The global renewable energy sector provided jobs for 10.3 million people in 2017 and 11 million in 2018 (IRENA 2019b).**

Figure 4.11 **Renewable energy sources (wind, solar PV, hydropower, bioenergy and geothermal) and technologies (heat pump and energy storage)** Source: SlideModel (2019).

4.3.3

Young people as green entrepreneurs – be your own boss!

The Information Age is also the Age of Entrepreneurship, or …

…“the human age, where talent becomes the key differentiator for organizations and countries alike”.

(Prising 2016).

Today there are ways to introduce innovative ideas at every stage of a business. Whether you are designing or launching a new energy-efficient device, exploring ways to join the sharing economy (BSR 2016; Gower 2018), upcycling (Petro 2019) or “going virtual” (Larsen and Makarios 2018), you can start and run a

business more easily than ever before. Why not have multiple jobs, often in the comfort of your own home, while connecting with people all over the world? (John 2019). This is exactly what happened to many of us during the pandemic. Online labour markets (Pelletier and Thomas 2018) and the growth of the sharing economy can mean more flexible hours, with less full-time jobs and more freelancers and entrepreneurs. COVID-19 has forced many to re-invent themselves and launch their own projects from home.

Many possibilities are opening up to connect people with similar minds and passions to brainstorm business ideas that could have a well thought out, positive impact for the environment. Social entrepreneurship could be a new way to share your views and bring change to society (UN DESA 2019b). Once the passion within you and others is kindled, you can create new green jobs. For inspiration, look at the examples on the map in **Figure 4.12**. Like Khalid (See **Figure 4.13**), for example, you can find or create your own green job – or make your job greener! Look at the short career of Boyan Slat from the Netherlands. In 2011, when Boyan was 16, he came up with an idea for getting plastic debris out of the ocean. Two years later he founded an NGO, The Ocean Cleanup. Problems with Boyan's system were worked out during the first and second missions, and a third mission in 2019 showed that his idea works (Boffey 2019).

Young women may face gender-based barriers if they are dreaming of becoming their own boss. For women entrepreneurs, traditional gender roles and cultural and social attitudes can still prevent them from finding their way. Historically, women entrepreneurs have had trouble finding start-up financing and capital and have been more reliant on funding themselves. A large body of research points to gender-based differences in lending by banks, such as higher collateral requirements and interest rates, regardless of the sector and business size (Halabisky 2017; Government of the United Kingdom 2019a).

"Encouraging young people to consider entrepreneurship at an early stage is vital. Unfortunately, entrenched stereotypes about gender roles from childhood can have a lasting influence on the career choices men and women make, including the likelihood of going on to start a business."

(Government of the United Kingdom 2019a).

Figure 4.13 below is an example of how youth are developing projects across the world. By clicking on the dot, one can see what the project is in each region and the SDG goal it seeks to address.

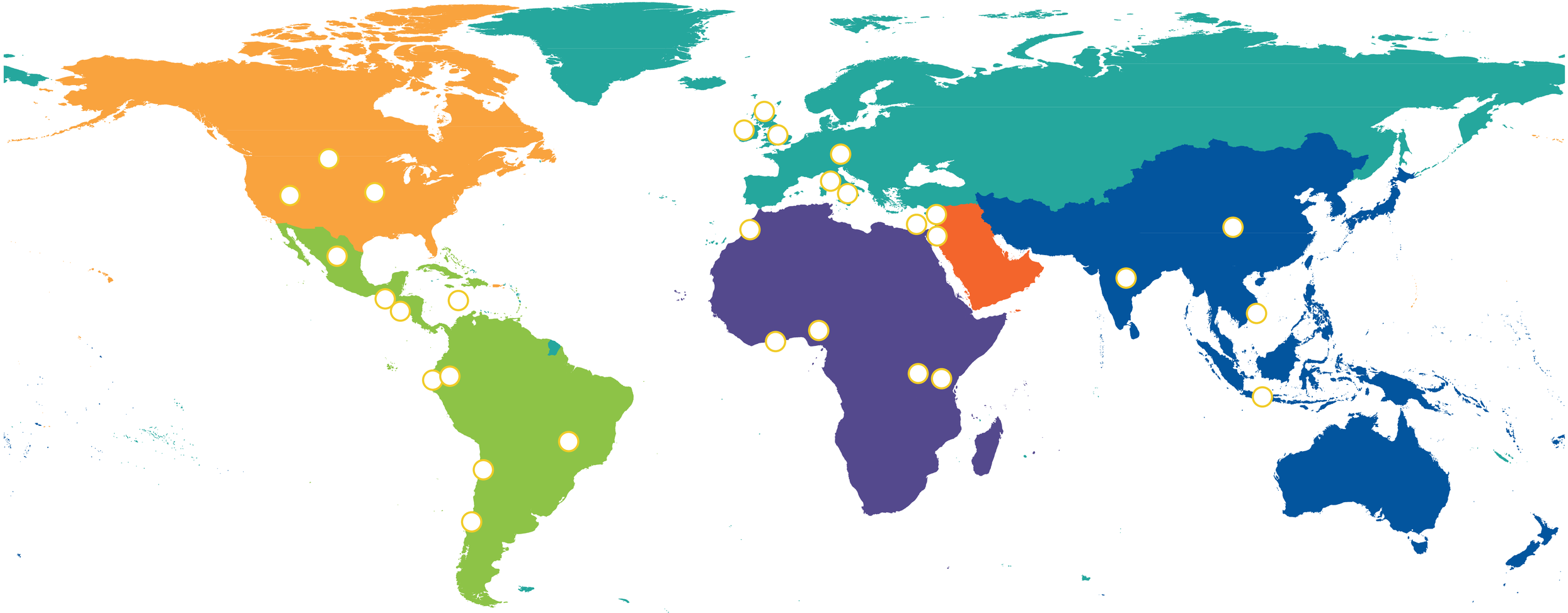


Figure 4.12 Green youth entrepreneur projects around the world

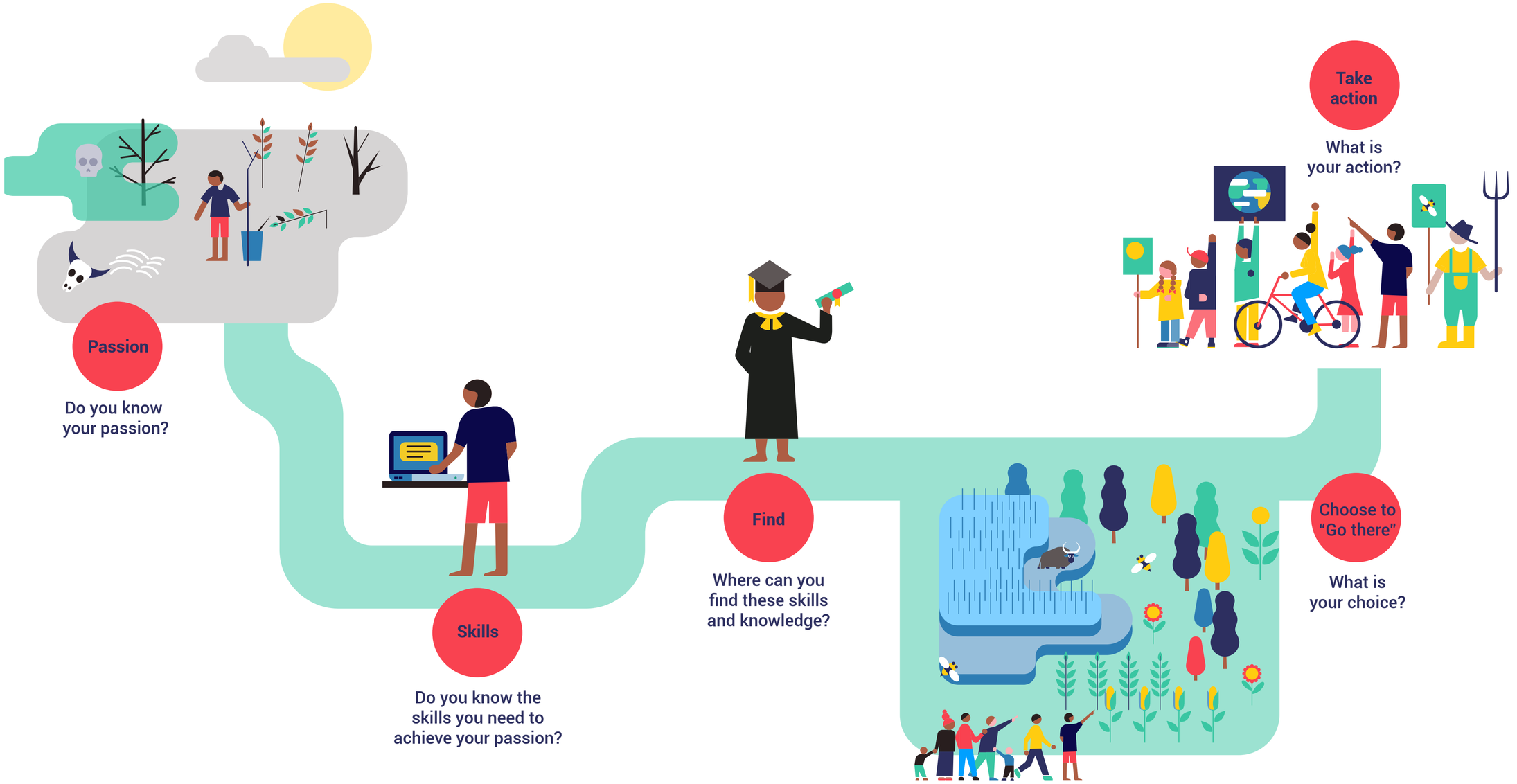


Figure 4.13 How can you find or create a green job? There are five questions (the 5Q of green jobs) that can help young people answer that question.

4.4 Conclusion

Creating job opportunities for young people while taking action to reach our environmental and social goals is absolutely needed to achieve the SDGs. Youth unemployment or underemployment, and the need for decent work (especially in the case of rural youth) are a global challenge will grow over the next decade. At the same time, environmental problems and climate change are serious threats to the future of jobs and could make existing inequalities worse.

Moving from a linear to a circular economy will create new types of jobs. Before we reach that point, though, we have to take a number of important steps in the direction of transformative change. Moving towards eco-innovation and using green technologies with supportive and improved education (including vocational training) will be crucial. Unequal access to quality education and Internet has proved to be a defining and limiting factor during the COVID-19 pandemic.

Without the right skills and resources, we won't be able to transition to green jobs. Young people need access to good information sources and to anticipate their need for new knowledge, skills and competencies in this green jobs marketplace. We do not know what these new jobs of the future will look like, but the evolving nature of green job skills provides an exciting opportunity for youth to adjust their current skills to suit the future jobs market.

Moving from a linear economy to a circular one can provide the world's youth with ways to innovate, inspire, and solve our toughest environmental problems. Many of you will make career choices in the coming years. Hopefully they will be in the areas of sustainable resource use, product life cycle design, waste management, and others mentioned in this chapter. For a green career, you will need to find out about:

- **jobs and entrepreneurial opportunities that already exist or are coming with this new green and circular economy;**
- **jobs and entrepreneurial opportunities that could exist in a green or circular economy, but do not exist now;**
- **the education, skills and competencies you need to take advantage of these new jobs; and**
- **which schools will help you get the education, skills and competencies that you need.**

Given the speed with which this change needs to happen and the risks and uncertainties we face, it is impossible to predict all the problems we will need to solve in the future. We can hope for a new type of circular economy in the future, prioritize social well-being and innovation-led development and the different ways to reach the SDGs to help us reach a healthy planet and healthy people within a generation. Your green(er) career choices will have a big impact on that future as well as the one of your family, but also the future of our world.

Checkpoint 5

You may take this match and drop quiz in the interactive version.

Connecting the dots
To test your knowledge of environmental challenges faced by people across the globe, try matching the statements in the left column with the other half in the right column.

Our career choices will have an impact on	persistent environmental problems and will open new opportunities.
Green jobs are	understand the connections between the environment and our consumption patterns.
The building of a circular economy will help address	the future of the earth.
Sustainability-aware teachers can help youth	decent jobs that contribute to preserve or restore the environment.
Careers are likely to emerge in four key areas	sourcing of new types of raw materials, life-cycle product design, sustainable consumption patterns and waste reduction to close the loss loops and increase profit margins in the new circular economy.
New jobs require	new skills, training and education.

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The way forward

The GEO-6 for Youth report has explored the pressing environmental issues highlighted in the GEO-6 main report. The key challenges identified were on the environmental and health impacts of food, energy and waste systems that need the immediate attention of today's Youth. We, as today's Youth, have the potential, the valor and the strength to convert these challenges into opportunities by working on innovative and environmentally sustainable solutions. The urgency of this task demands cooperation and collaboration to support our actions and sustainable thinking. As we strive to educate, network and collaborate, we can ensure that our actions are directed towards this common vision. We cannot afford to lose the only place we call home.

The generations before us have contributed substantially to today's environmental damage. The industrial revolution provided those generations with the opportunity to improve their livelihoods, social well-being and the economy. However the impact of this revolution (and the subsequent emphasis on financial growth) on planetary health and people is being realized gradually. We are now, more than ever, aware of the detrimental impact this has had on the environment and people's health and the potential disasters that might happen if we continue on this path.

This threat has become even clearer during the COVID-19 pandemic, which has disrupted many aspects of people's lives in an unprecedented way. It has emphasized the need to re-examine our interactions with nature and the environment. Our generation is being heavily affected by employment insecurity, disruption to education, mental health issues and limitations to individual freedom due to the pandemic. However, it may be important not to lose sight of youth's power to be agents of change during these challenging times.

We as Youth, are currently humanity's largest and most diverse generation. Generations before us did not have the capacity to interconnect, transfer and expand knowledge in the way we do. This allows us to play a central role in this transition toward sustainable development. We have the advantage of youth, our immense numbers and above all the benefits of technology and social media that are advancing rapidly. We can achieve our goals in this fast-paced world by using the tools available to us. Our decisions and actions during this transformational period could change and shape the world into a more sustainable future.

In this future, we will need to anchor our economic development and social well-being on environmental sustainability. We will need to explore the potential of new circular economy models in addressing the shortfalls of the current economic model. Change does not come easily, especially for those people and systems that have become used to the (old) unsustainable way of doing things. As a new generation, we can discover and create a future that revolves around improved social cohesion through environmental sustainability and sustainable lifestyles.
We have the potential to create an

environmentally sustainable world beginning with our own individual actions and choices. When these are scaled up by other Youth, we could start seeing the impact. Every action is valuable. Small or large, simple or complex, individual or collective. We have to join hands with those who are already thriving, and with those who are still striving, so that no one is left behind. Collectively we can work to change policies and anchor them to sustainable development, spearhead the adoption of environmental and sustainability education as well as monitor our environment so that we are able to keep track of the changes that are happening to mother nature. We have to fuel our creativity with the necessary skills and innovation to spread the light. The challenges presented in this report provide us with the opportunity to map out our actions to ensure that we will have a healthy planet with healthy people while preserving the planet's resources for future generations. Their future depends on the decisions and actions that Youth will commit to undertake from today onward!

As today's Youth, we owe it to ourselves and to the generations yet to come to undertake this mission with the urgency it demands. The Earth is one big system and whatever you do at one end, has an impact on the other. This generation is more connected than ever before. Let's continue using our strengths while accepting our differences, reducing our boundaries and becoming citizens of the world that work towards a brighter, more environmentally sustainable future.

GEO-6
FOR YOUTH

Annexes

Annex 1. Survey Methodologies

1. Data Collection

An online questionnaire was developed to understand the youth perception of environmental issues, sustainability, desired futures, green jobs and environmental actions. The questionnaire targeted young people between 18 and 25 years of age throughout the world. A series of questions were developed by the authors of each chapter in the GEO-6 for Youth. These questions were compiled, tested, and translated into ten languages: Arabic, Chinese, Dutch, English, French, Italian, Korean, Persian, Russian and Spanish. The questionnaire was converted to an online survey using Qualtrics. It was disseminated through emails and posted on websites and social media between 17 December 2018 and 16 April 2019.

The primary purpose of the questionnaire was to obtain actual insights and information from young people across the globe. The survey was not designed for research, but was developed by the respective chapter authors to get a better understanding of the different perspectives and visions of youth. The results were not intended to give a full representation of young people's perspectives and visions, but to connect and integrate important concepts about the environment and sustainability.

2. Questionnaire

An online questionnaire was developed to understand the youth perception of environmental issues, sustainability, desired futures, green jobs and environmental actions. The questionnaire targeted young people between 18 and 25 years of age throughout the world. A series of questions were developed by the authors of each chapter in the GEO-6 for Youth. These questions were compiled, tested, and translated into ten languages: Arabic, Chinese, Dutch, English, French, Italian, Korean, Persian, Russian and Spanish. The questionnaire was converted to an online survey using Qualtrics. It was disseminated through emails and posted on websites and social media between 17 December 2018 and 16 April 2019.

Sixth Global Environment Outlook (GEO-6) for Youth Survey

Thank you for participating in one of the most comprehensive global surveys involving youth (18-25 years) from all around the world!

With this survey we want to find out what you want your desired future to look like; how likely you think this future will become in reality; which jobs you envision and what actions you can take yourself to make the future planet more sustainable. The outcome of this survey will be included in an e-book published by UNEP's Global Environment Outlook (GEO-6) for Youth.

- Completing this questionnaire will take up to 15-20 minutes.
- The outcomes will be treated with a high level of confidentiality and processed anonymously (except if the respondent states otherwise).
- Participation is entirely voluntary, and you may choose to discontinue the survey at any point.
- There is no risk involved with filling in this survey.
- This survey closes on 16 April 2019.

About GEO-6 for Youth

GEO-6 for Youth is a project set up by and for youth – we aim to translate high-level, scientific messages on the state of the environment into something that is useful and more exciting for you(th). Among others, we will take a look into the year 2030 to explore what our future will look like (with and without radical action). You, as part of the global youth community, now have the opportunity to describe your own future and work towards it!

Contact

If you have any questions or comments, please contact unenvironment-science-geohead@un.org

Q1 What is your age?

☐ 18 ☐ 19 ☐ 20 ☐ 21 ☐ 22
☐ 23 ☐ 24 ☐ 25

Q2 What is your self-identified gender?

Q3 What is your nationality?

Q4 What is the highest level of school you have completed or the highest degree you have received?

- ☐ Less than high school degree
- ☐ High school graduate
- ☐ Secondary vocational education
- ☐ Associate degree in college
- ☐ Bachelor's degree in college
- ☐ Master's degree
- ☐ Doctoral degree
- ☐ Other

Q5 Which environmental issues (max. 3) do you expect to impact you most in the next 10-20 years?

- ☐ Biodiversity loss (i.e. species extinction)
- ☐ Land use change (e.g. forests/wetlands converted to cropland)
- ☐ Air pollution (i.e. particulate concentration in the atmosphere)
- ☐ Ozone depletion (i.e. changes in ozone layer)
- ☐ Climate change (i.e. long-term change of weather patterns)
- ☐ Freshwater withdrawal (i.e. consumptive blue water use)
- ☐ Ocean acidification (i.e. through dissolved carbon dioxide)
- ☐ Chemical pollution (e.g. plastics, nuclear waste, heavy metals, emissions)
- ☐ Nitrogen and phosphorus loading (i.e. inflow of phosphorus to ocean and freshwater systems)

Q6 Do you know about the Sustainable Development Goals (SDGs)?

- ☐ Definitely yes
- ☐ Probably yes
- ☐ Probably not
- ☐ Definitely not

Q7 Now imagine that you are able to take a look into your future life in 2030. What do you envision when thinking about your desired future?
Please pick 3 Sustainable Development Goals that illustrate your desired future

- ☐ Goal 1: No poverty
- ☐ Goal 2: Zero hunger
- ☐ Goal 3: Good health and well-being
- ☐ Goal 4: Quality education
- ☐ Goal 5: Gender equality
- ☐ Goal 6: Clean water and sanitation
- ☐ Goal 7: Affordable and clean energy
- ☐ Goal 8: Decent work and economic growth
- ☐ Goal 9: Industry, innovation and infrastructure
- ☐ Goal 10: Reduced inequalities
- ☐ Goal 11: Sustainable cities and communities
- ☐ Goal 12: Responsible consumption and production
- ☐ Goal 13: Climate action
- ☐ Goal 14: Life below water
- ☐ Goal 15: Life on land
- ☐ Goal 16: Peace, justice and strong institutions
- ☐ Goal 17: Partnerships for the goals

Q8 Please describe your desired future briefly (max. 3 sentences)

_____

_____

Q9 Do you believe that it is likely or unlikely that <choice Q7> will be achieved by 2030?

☐ Very likely
☐ Likely
☐ Unlikely
☐ Very unlikely
☐ I don't know

Q10 Which jobs (employment opportunities) can you think of that could help to achieve a sustainable world? Please suggest a few.

☐ Job example 1 _____

_____

☐ Job example 2 _____

_____

☐ Job example 3 _____

_____

Q11 In which sector do you want your future job to be?

☐ Education
☐ Industry
☐ Finance
☐ Agriculture
☐ Government
☐ Research and Innovation
☐ Other _____

_____

Q12 "Green jobs are decent jobs that contribute to preserve or restore the environment, be they in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency." (International Labour Organization).

According to this definition, do you think that there will be a change in the number of green jobs in the future?

☐ Probably increase
☐ Probably decrease
☐ Probably remain the same

Q13 Have you heard of green jobs available in your country?

☐ Definitely yes
☐ Probably yes
☐ Probably not
☐ Definitely not

Q14.1 You indicated that you probably have not heard about green jobs. What do you think is the reason for that?

☐ Lack of information from educational institutions
☐ Lack of information from the government
☐ No knowledge of where to find them
☐ Other _____

_____

Q14.2 You indicated that you definitely have not heard about green jobs. What do you think is the reason for that?

☐ Lack of information from educational institutions
☐ Lack of information from the government
☐ No knowledge of where to find them
☐ Other _____

_____

Q15 Are the green jobs in your country accessible to all?

- ☐ Definitely yes
- ☐ Probably yes
- ☐ Probably not
- ☐ Definitely not
- ☐ I don't know

Q16.1 You indicated probably not accessible. What do you think is the reason for that?

- ☐ Lack of training or information in previous education
- ☐ Gender discrimination
- ☐ Lack of work experience
- ☐ No knowledge of where to find them
- ☐ Other _____
  _____

Q16.2 You indicated definitely not accessible. What do you think is the reason for that?

- ☐ Lack of training or information in previous education
- ☐ Gender discrimination
- ☐ Lack of work experience
- ☐ No knowledge of where to find them
- ☐ Other _____
  _____

Q17 Please rank the following institutions in terms of who you think can make the greatest positive impact on the environment.

Drag and arrange the option with most impact on top and that with the least impact at the bottom.

- ☐ National government
- ☐ Local government
- ☐ Non-governmental organizations (i.e. United Nations, Save the Children, etc.)
- ☐ Private sector (i.e. businesses, foundations, etc.)
- ☐ Community organizations (i.e. faith-based groups, local non-profits, etc.)

Q18 In your opinion, how could education systems be modified in order to raise awareness on environmental issues and better prepare youth to achieve a sustainable future?

_____
_____

Q19 What would you start doing realistically in the near future to help improve the environment in your neighbourhood, community or city? Please explain your answer with reference to (at least one of) the following environmental systems:

- ☐ For air: _____
  _____
- ☐ For freshwater: _____
  _____
- ☐ For biodiversity: _____
  _____
- ☐ For land: _____
  _____
- ☐ For oceans: _____
  _____

Q20 Do you think you can encourage your peers and others around you to take actions to improve the environment? If yes, then how?

- ☐ Definitely yes, by _____
  _____
- ☐ Probably yes, by _____
  _____

☐ Probably not, because _____
_____

☐ Definitely not, because _____
_____

Q21 What do you think are the challenges that you face or might face in the future while taking actions to improve the environmental conditions?

_____
_____

Q22 Do you think you can influence or change the existing government rules and/or policies on the environment in your country? If yes, then what actions would you take?

☐ Definitely yes, namely by _____
_____
_

☐ Probably yes, namely by _____
_____

☐ Probably not, because _____
_____

☐ Definitely not, because _____
_____

Q23 In the Global Environment Outlook for Youth e-book, we will highlight the desired future of young individuals (including photo), as well as (youth) initiatives that promote sustainability. Please indicate if you are interested in being featured (you will be contacted for an interview in case you are selected).

☐ Yes

☐ No, thank you.

Q24.1 You indicated that you would like to be included in the Global Environment Outlook for Youth. What is your desired future that you would like to share and/or the initiative(s) in which you are involved with?

_____
_____

Q24.2 What is your email?

_____
_____

3. Overview of Respondents

There were a total of 1,929 respondents, of which 1,475 answered at least one question. Responses were received from individuals between the ages of 18 to 25. 25-year-olds were the largest age group, constituting 12 per cent of the respondents. 75 per cent of the responses in languages other than English were translated into English prior to analysis. 307 responses were not translated due to limited time and resources, as well as unforeseen circumstances in the database.

5 per cent of the respondents were from Africa, 39 per cent from Asia and the Pacific, 14 per cent from Europe, 5 per cent from Latin America and the Caribbean, 8 per cent from North America, and 3 per cent from West Asia. 26 per cent did not mention their country. 42 per cent of respondents were female and 32 per cent were male. 1 per cent of the respondents did not mention their gender or indicated “other”, while 25 per cent did not respond to this question.

30 per cent of the respondents had a secondary vocational degree, high school degree or less; 30 per cent had a college or university undergraduate degree; and 10 per cent had a master’s or doctoral degree. 29 per cent responded “other” or did not respond to this question.

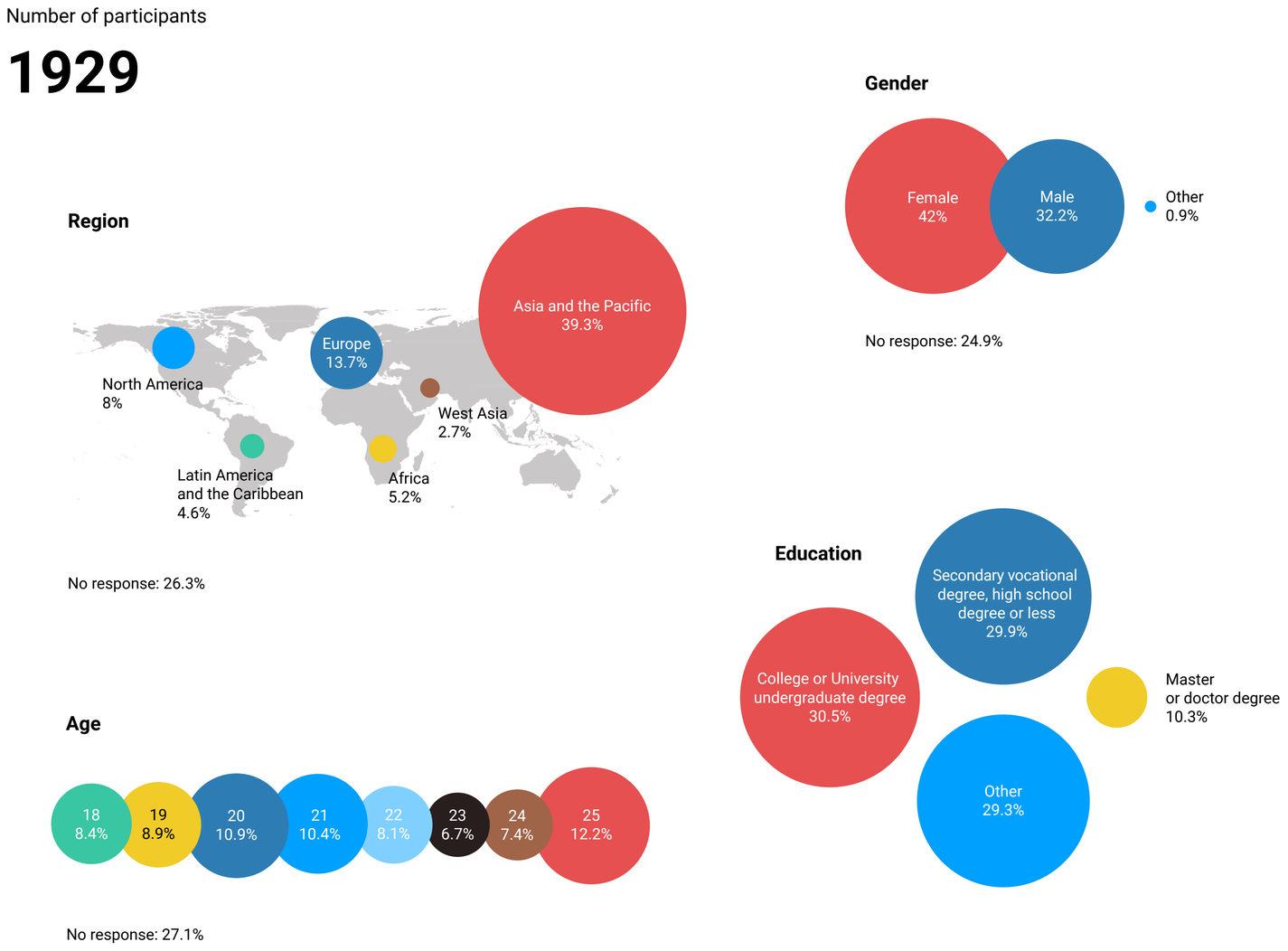

Figure 1 Overview of respondents of the GEO-6 for Youth survey (n = 1,929)

4. Analysis

The responses to each question were quantified (Table 1). An appropriate method was chosen for the analysis of each question.

Table 1: GEO-6 for Youth survey and responses

Chapter	Section or Figure	Question number	Number of responses included in the analysis
2	Figure 2.4	5	1 029
	Figure 2.5	7	981
3	Figure 3.2	21	512
	Figure 3.4	19	917
	Figure 3.7	20	693
	Figure 3.9	22	562
4	Section 4.2.2	13	856
	Section 4.2.2	14.2	276 out 856

5. Chapter 2

The questions in Chapter 2 were designed to understand youth's perceptions about environmental issues that will impact them most (Question 5), their understanding of the Sustainable Development Goals (SDGs) (Questions 6, 7 and 8) and how the SDGs will affect their desired futures. To further understand their insights about the SDGs, Questions 5 and 8 were created as open-ended questions so that respondents could further elaborate on their answers.

The data sets were first checked for consistency and missing information. Country names were checked for possible duplication, and official names were matched with their common country names. Then countries were classified into the following regions: (1) Africa, (2) Asia and the Pacific, (3) West Asia, (4) Pan-European Region, (5) North America and (6) Latin America and the Caribbean.

For Questions 5, 6 and 7, the sum and percentages for all responses were calculated to obtain global trends. Subtotals of the responses were also computed by region and their corresponding percentages. The regional results were compared and checked to further understand the potential differences in the responses based on geographical location. Results were visualized using different types of charts.

For Question 8, a qualitative analysis was conducted on what youth envisions as a desired future. A selection was made based on the following criteria: one per region; creativity; and permission by the respondent to be in the e-book. In total, five desired futures were selected and shown in separate illustration boxes.

6. Chapter 3

To analyse the short-term actions youth is willing to take for the environment (Q19), a word frequency analysis was conducted by environmental systems: air, freshwater, oceans, biodiversity, land and oceans. First a list of frequently appearing phrases was extracted from the answers to Question 19 in each category, on the basis of which the list of actions was refined. This analysis was developed by adopting the text mining in R, utilizing the text mining framework provided by the tm package. The answers were analysed to quantify the occurrence of each action in the refined list. The five most frequently cited actions for each environmental system were extracted and visualized.

To determine whether young people felt they could encourage peers and others around them, responses to Question 20 were analysed in two steps. First the percentage of each response was calculated; then, based on the fact that the majority of respondents (88 per cent) believed they could have an influence, the responses were further analysed. In the second step, where young people shared their thoughts on how they could have an influence, cross-tabulating and filtering analysis was performed. Suggestions were filtered and word frequency was checked.

Question 21 focused on the challenges faced by young people. All data were analysed to summarize their feeling about the challenges they face or might face in the future. At the end of this analysis, 14 different categories were identified. For each challenge, an answer among the different responses of the survey was chosen to describe broadly the common feeling of young people.

Question 22 was intended to test respondents' perceptions of their ability to change current policies and rules in their countries towards sustainability. The question consisted of selections (definitely/probably "yes" or "no") and descriptions of reasons for the selections. For each selection, the percentage of those responding "yes" or "no" was calculated. Concerning the corresponding reasons in the open-ended part, a qualitative analysis was used. The reasons for "no" were organized into five categories which indicated the perceived challenges, and these were disaggregated by regions. The same process was used for "yes" responses in regard to perceptions of measures that might be effective towards changing the rules and policies.

7. Chapter 4

The questions for Chapter 4 focused on green jobs. Their aim was to understand youth's knowledge of the concept. To determine which sectors were selected for a future job, the responses were computed. Additional information from respondents who indicated "other" was checked to identify sectors not listed in the choices, but which were of interest to these young people. For Question 13, the sum and percentage of the responses were calculated to determine awareness of green jobs. Question 14.2 was a follow-up question for Question 13, particularly for the responses "definitely not" and "probably not." From these answers, the sum and percentages of the corresponding reasons were used to verify the respective rankings. The questionnaire results provide a basic understanding of what young people look for in a career and the desired sectors. The questions on accessibility and awareness of green jobs were aggregated to give a global scope and were not further analysed.

Annex 2: Engaging youth in environmental monitoring

Citizen science is the practice of engaging and involving volunteers in science and research. It entails the collection and analysis of data relating to the natural world by members of the general public. Citizen science commonly involves data collection, but it can also involve initiating questions, designing projects, disseminating results and interpreting data (Blaney et al. 2016).

The level of engagement, skills and knowledge needed by volunteers in order to participate in citizen science projects varies, depending on the scope of the research. Some projects require basic data collection knowledge, which in turn requires minimal or no training of volunteers (UNEP 2019a) . Youth can be engaged in Citizen Science at any of the levels illustrated in Figure 1.

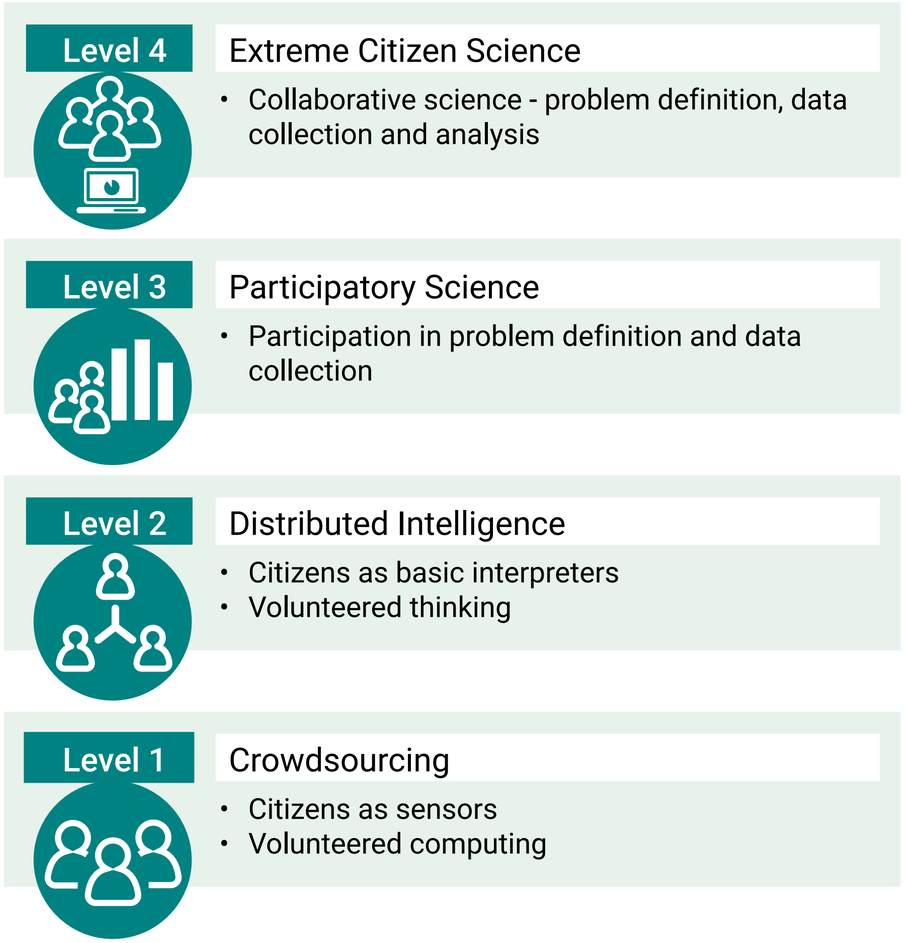

Figure 1 Levels of citizen science, by increasing depth of participation
Source: GEO-6, p. 600

New technologies for use in citizen science have become accessible and affordable in recent years. Smart sensors, mobile phones, Internet access, cloud computing and the capability of creating a simple desktop or mobile app-based data entry system, whose data is geo-located, is revolutionizing the process of initiating citizen science projects while ensuring data accuracy at minimal costs (UNEP 2019a).

Coupling of citizen science with new emergent technologies, and the possibility of involving the world's youth, due to their geographic spread, offers unprecedented opportunities to collect and analyse environmental data and to inform the public about environmental issues (UNEP 2019a).

Young people can become involved in citizen science in a variety of ways. As a start, they can access a number of different websites. Websites such as www.scistarter.org can provide anyone with the opportunity to become a volunteer and contribute to thousands of ongoing projects and communities of citizen scientists around the world. For those wishing to learn more, or to become involved in citizen science, Table 1 provides information on data access and volunteering opportunities. Volunteers can in due time progress to designing and undertaking their own citizen science projects, based on the environmental monitoring requirements and using guidelines such as those highlighted in GEO-6 (United Nations Environment Programme [UNEP], p. 601).

According to the UNEP *Measuring Progress* report (UNEP 2019b), of the 93 environment-related SDGs indicators there are 20 (22 per cent) for which good progress has been made during the last 15 years. If this progress continues, it is likely that the targets of these SDGs will be met. However, for the other 78 per cent of the environment-related SDG indicators, either there are not sufficient data to assess progress (62 per cent) or it is unlikely that the target will be met without upscaling action (16 per cent). According to that report, either there are either no data or no progress towards the 12 SDG targets related to the state of the environment (UNEP 2019b, p. 7)

Citizen science presents numerous benefits for youth by creating job opportunities in designing systems for data collection and analysis, based on new emerging technologies; increasing their scientific literacy and engagement; and understanding of the environmental issues in their area or region (UNEP 2019a). Enhanced collection of data by young people will greatly contribute to bridging gaps in environmental data, so that we can better monitor the changes our environment. If we understand what is happening in our environment, we will be in a better place to champion changes in policies and in our way of life.

Table 1 A selection of citizen-science projects and websites

Programme	Region	Description	Website
UNEP Environment Live	Global	UN open access platform of global, regional and national environmental data	https://environmentlive.unep.org
SciStarter	Global	Aggregates information, video and blogs about citizen-science projects	www.scistarter.com
Data Observation Network for Earth	Global	Provides a framework to access data from multiple data sources (including citizen science data)	www.dataone.org
CitSci.org	Global	Provides tools for citizen scientists to guide them on the entire research process such as: process of initiating research projects, managing the process of data collection, and analysis	www.citsci.org
iSpot	Global	Website aimed at helping anyone identify anything in nature by connecting citizen scientists with experts in species identification	www.ispotnature.org
eBird	Global	Online database of bird observations with real-time data about bird distribution and abundance	www.ebird.org
GLOBE	Global	International science and education programme that provides students and the public worldwide with the opportunity to participate in data collection and the scientific process, and to contribute meaningfully to our understanding of the Earth System and the global environment.	www.globe.gov

Source: GEO-6, p. 602.

References

Blaney, R.J.P., Philippe, A.C.V., Pocock, M.J.O. and Jones, G.D. (2016). *Citizen science and Environmental Monitoring: Towards a Methodology for Evaluating Opportunities, Costs and Benefits.* Wiltshire: UK Environmental Observation Framework. http://www.ukeof.org.uk/resources/citizenscience-resources/Costbenefitcitizenscience.pdf.

United Nations Environment Programme (2019a). *Global Environment Outlook – GEO-6: Healthy Planet, Healthy People.* Elkins, P., Gupta, J. and Boileau, P. (eds.). Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108627146.

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GEO-6 for Youth: Abbreviations and Acronyms

5 Rs	Refuse, Reduce, Reuse, Repurpose and Recycle
CBD	Convention on Biological Diversity
Cedefop	European Centre for the Development of Vocational Training
CEO	Chief Executive Officer
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2 eq	Carbon dioxide equivalent
CSA	Community Supported Agriculture
ECO	Environmental Children' Organization
ESD	Education for sustainable development
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization of the United Nations
FRN	Food Recovery Network
GBR	Great Barrier Reef
GDP	Gross domestic product
GEO-6	Sixth Global Environment Outlook (2019)
GESAMP	Joint Group of Experts on Scientific Aspects of Marine Environmental Protection
GHG	Greenhouse gas(es)
GNH	Gross National Happiness (Index)
Gt	Gigatonne
HESI	Higher Education Sustainability Initiative
ICTs	Information and communication technologies
IDB	Inter-American Development Bank
IEA	International Energy Agency
Ifad	International Fund for Agricultural Development
IIED	International Institute for Environment and Development
ILO	International Labour Organization
INRA	Institut national de la recherche agronomique (National Institute for Agricultural Research, France)
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
ISWA	International Solid Waste Association
IUCN	International Union for Conservation
LDN	Land Degradation Neutrality
LED	Light-emitting diode
MOOC	Massive open online course
MPA	Marine protected area
N_2O	Nitrous oxide
NGO	Non-governmental organization
NO	Nitric oxide
NOAA	United States National Oceanic and Atmospheric Administration
OECD	Organization for Economic Co-operation and Development

PV	Photovoltaic
SDGs	Sustainable Development Goals
SO_2	Sulphur dioxide
SO_3	Sulphur trioxide
STEM	Science, technology, engineering and mathematics
SUVs	Sport utility vehicles
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UN DESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
USD	United States Dollars
USGS	United States Geological Survey
VOCs	Volatile organic compounds
WEF	World Economic Forum
WHO	World Health Organization
WWAP	United Nations World Water Assessment Programme
WWF	World Wide Fund for Nature
YEA!	Youth and Education Alliance

Glossary

Acidification
A change in natural chemical balance caused by an increase in the concentration of acidic elements. Also see ocean acidification.

Acid rain
Precipitation (e.g. rain, snow, fog, hail) with acidic components that falls to the ground from the atmosphere.

Adaptation
There are two main responses to climate change: mitigation and adaptation. Adaptation seeks to lower the risks presented by the effects of climate change.

Aerosols
Aerosols are minute solid or liquid particles suspended in the atmosphere. They have an important influence on the planet's climate system.

Agricultural inputs
These can be inputs consumed by crops (e.g. seeds, crop protection and water) or capital inputs, ranging from nylon netting and stakes, to ploughs, tractors and other equipment.

Agrifood
Related to commercial production of food by farming.

Agroecology
Ecological approach to agriculture that views agricultural areas as ecosystems.

Agroforestry
Growing trees and shrubs around or among crops, or on pastureland.

Algae
Members of a group of predominantly aquatic organisms capable of photosynthesis. Algae have important ecological roles as producers of oxygen and as the food base for almost all aquatic life.

Ambient air pollution
Air pollution in outdoor environments. Poor ambient air quality occurs when pollutants reach high enough concentrations to affect human health and/or the environment.

Anthropocene
Term used to designate a new geologic epoch (following the most recent one, the Holocene) characterized by significant changes in Earth's atmosphere, biosphere and hydrosphere due primarily to human activities.

Anthropogenic
Originating in human activity.

Aquifer
An underground layer of water-bearing rock.

Artificial intelligence
Intelligence demonstrated by machines.

Biochemical
Relating to chemical processes and substances that occur within living organisms.

Biodiversity
The variety of life on Earth.

Biomass
Organic material above and below ground and in water, both living and dead.

Biosphere
The part of Earth and its atmosphere in which living organisms exist, or that is capable of supporting life.

Black carbon
Carbon formed through incomplete combustion of fossil fuels, biofuels and biomass. It warms the planet by absorbing sunlight and re-emitting heat to the atmosphere, and by reducing albedo (the ability to reflect sunlight) when deposited on snow and ice.

Bleaching
When water is too warm, corals will expel the algae living in their tissues, causing the coral to turn completely white. When a coral bleaches, it is not dead. Corals can survive a bleaching event, but they are then under more stress and subject to mortality.

Blue economy
There is no one definition, but "blue economy" generally refers to sustainable use of ocean resources for economic growth, improved livelihoods and ocean ecosystem health.

Business as usual
A scenario for future patterns of activity that assumes there will be no significant change in people's attitudes and priorities, and no major changes in technology, economics, or policies.

Carbon dioxide
A naturally occurring gas that is a by-product of burning fossil fuels and biomass, and of land use change and other human activities.

Carbon dioxide equivalent
Unit of measurement that indicates the global warming potential of greenhouse gases.

Circular design
Refers to the creation of products and services that no longer have a life cycle with a beginning, middle and end.

Circular economy
An approach to industrial processes and economic activity that would enable the resources used to maintain their highest value for as long as possible.

Citizen science
Collection and analysis of data relating to the natural world by members of the general public, typically as part of a collaborative project with professional scientists.

Citizen scientist
A member of the general public who collects and analyses data relating to the natural world, typically as part of a collaborative project with professional scientists.

Climate change
The UN Framework Convention on Climate Change defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere, and which is in addition to natural climate variability observed over comparable time periods."

Conflict minerals
Minerals mined in conditions of armed conflict and human rights abuses, which are sold or traded by armed groups.

Contaminant
A polluting or poisonous substance.

Coronavirus disease 2019
Illness caused by a novel coronavirus, 'severe acute respiratory syndrome coronavirus 2' (SARS-CoV-2), which was first identified amid an outbreak of respiratory illness cases in East Asia. The outbreak was first reported to WHO on 31 December 2019. On 30 January 2020,

WHO declared the COVID-19 outbreak a global health emergency and the following March a global pandemic, WHO's first such designation since declaring H1N1 influenza a pandemic in 2009.

Critical raw materials
Raw materials that are economically and strategically important for key sectors in certain countries.

Decent jobs
Productive jobs in conditions of freedom, equity, security and human dignity.

Desalination plants
Plants where salt and impurities are removed from seawater.

Desertification
Land degradation in arid, semi-arid and dry sub-humid areas. The causes include climatic variations and human activities.

Digital technologies
Technologies that convert information into a digital (computer-readable) format.

Digitalization
The integration of digital technologies into everyday life.

Earth System
A complex social-environmental system of interacting physical, chemical, biological and social components and processes that determine the state and evolution of the planet and life on it.

Eco-innovation
Innovation resulting in significant progress towards sustainable development.

Ecological
Relating to or concerned with the relation of living organisms to one another and to their physical surroundings.

Ecosystem
A dynamic complex of plant, animal and microorganism communities and their non-living environment, interacting as a functional unit.

Ecosystem services
The benefits humans obtain from the natural environment and from properly functioning ecosystems. They include provisioning services, such as food and water; regulating services, such as flood and disease control; cultural services, such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling that maintain the conditions for life on Earth.

El Niño
An oceanic event that has a great impact on the wind, sea surface temperature and precipitation patterns in the tropical Pacific Ocean. Its climatic effects are experienced throughout the Pacific region and in many other parts of the world.

Empathy
The ability to understand and share the feelings of others.

Endangered species
Species that face a very high risk of extinction in the wild.

Energy footprint
An environmental footprint whose calculation is focused on energy consumption.

Environmental footprint
The effect that a person, organization, activity, etc. has on the environment, such as the amount of natural resources used and the amount of harmful emissions.

Ethical
Related to moral principles.

Eutrophication
Process through which freshwater or marine systems become overloaded with nutrients, leading to increases in plant growth and changes in ecosystem structure and function. Also see hypoxia.

E-waste
Electrical and electronic equipment that is no longer considered to be of value and has been disposed of.

Extinction
The dying out of a species.

Fast fashion
Inexpensive clothing produced rapidly by mass-market retailers to respond to the latest trends.

Fertilizers
Chemical or biological nutrients added to soil or land to increase its fertility.

Food chain
A series of organisms, each of which is dependent on the next as a source of food. A food chain can also mean the series of processes by which food is grown or produced, sold and eventually consumed.

Forced displacement
Refers to the situations of people who leave or flee their homes due to conflict, violence, persecution and human rights violations.

Fossil fuels
Coal, natural gas and petroleum products formed from decayed animals and plants that died millions of years ago.

Fourth Industrial Revolution
A fundamental change in the way people live, work and relate to one another, made possible by technological advances that are merging the physical, the digital and the biological. The Second Industrial Revolution (approximately 1870-1914) was a period of rapid industrial development following the first Industrial Revolution. It was characterized by mass production and the use of electricity. The Third Industrial Revolution was characterized by the beginning of digital technologies.

Freshwater
Naturally occurring water which is not salty.

Functional diversity
Variability in the things organisms do.

Gender gap
Difference in the condition or position of women and men in society. Also see pay gap.

Gender technology gap
Refers to deficiencies in women's and girls' technological training or women's under-representation in the technology workforce.

Genetic diversity
Variability in organisms' genetic material, which determines their inherited characteristics.

Global warming
The unusually rapid increase in the planet's average surface temperature over the past century, mainly due to greenhouse gases released by the burning of fossil fuels.

Green economy
There is no one definition. In general, this term refers to a resilient economy that provides improved well-being and social equity for all within the ecological limits of the planet.

Greenhouse gases emissions
Greenhouse gases (GHG) are gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit thermal radiation. The greenhouse effect is caused by high concentrations of greenhouse gases in the atmosphere.

Green jobs
Jobs that contribute to preserve or restore the environment, whether in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency.

Gross domestic product
The value of all final goods and services produced in a country in one year.

Groundwater
Water that flows or seeps downward and saturates soil or rock.

Habitat/habitat degradation
The natural home or environment of animals, plants and other organisms. Habitat degradation means the processes that make habitats less suitable or less available to these organisms.

Household air pollution
Household or indoor air pollution refers to chemical, biological and physical contamination of indoor air, which may result in adverse health effects. The main source of indoor air pollution in developing countries is biomass smoke.

Human health
Health encompasses physical, mental and social well-being.

Human well-being
The extent to which people have the ability to live the kinds of lives they have reason to value. It is also defined as the opportunities they have to pursue their aspirations. Basic components of human well-being include security, meeting material needs, health and social relations.

Hydrological cycle
The continuous circulation of water in the Earth-atmosphere system.

Hydrosphere
The total amount of water on the planet.

Hypoxia
Oxygen deficiency in a biotic environment (the living things in an ecoystem). A “dead zone” is an area in a water body where the oxygen required to support life has been depleted due to the presence of excessive nutrients, along with other factors.

Industrial Revolution
The transition to new manufacturing processes in Europe and the United States between approximately the mid-18th and mid-19th centuries. It is sometimes referred to as the “First Industrial Revolution” (see Fourth Industrial Revolution).

Informal and formal economy
The informal economy is usually characterized by small-scale activities that are not registered, taxed or monitored by any form of government authority. The hundreds of millions of women and men who work in this

sector often are poorly paid and carry out dangerous work. A high percentage of informal employment is in emerging and developing countries.

International organization
An organization established by treaty or other instrument governed by international law that includes more than one government among its members.

Invasive species
Introduced species that have spread beyond their area of introduction (and, rarely, native species whose populations have recently expanded). They are often associated with negative impacts on the environment and human health.

Land cover
The physical coverage of land, usually expressed in terms of vegetation cover or lack of it. Land cover is influenced by (but not the same thing as) land use.

Land degradation
Long-term loss of ecosystem function and services, caused by disturbances from which the system cannot recover unaided.

Land grabbing
Acquisition of (often large tracts of) land that may be in violation of human rights; may not be based on free, prior and informed consent of affected land users; and may not take into proper account social, economic and environmental impacts.

Landfill
A site where waste materials are disposed of.

Land use
The use of land for different human purposes or economic activities. Types of land use include agriculture, industrial use, transport and protected areas.

Land use change
Conversion of land for human use. It is a driving force behind serious losses of biodiversity.

Linear
In a linear economy raw materials are used to make a product, and after its use most waste is thrown away.

Mangrove
A tree or shrub that grows in chiefly tropical coastal swamps that are flooded at high tide. Mangroves typically have numerous tangled roots above ground and form dense thickets.

Massive open online course
An online course aimed at unlimited participation and open access via the Internet.

Microbead
A microscopic plastic sphere.

Microplastics
Microscopic plastic fragments.

Mitigation
Climate change mitigation refers to efforts to reduce or prevent greenhouse gas emissions.

Nature-based solutions
Nature-based Solutions are actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits.

Neonicotinoid
A neurotoxic class of insecticide used for crop protection. Neonicotinoids cause serious harm to birds, as well as to pollinators and other insects.

Nitrogen and phosphorous loading
The quantity of these nutrients entering an ecosystem at a given time.

Non-governmental organization
An entity established under national law as a not-for-profit organization, operating at the sub-national, national, regional or international level.

Novel entities
Man-made substances, including those which are toxic. The effects of these substances, which can remain in the environment for a very long time, are potentially irreversible.

Ocean acidification
Around a quarter of the carbon dioxide (CO_2) emitted to the atmosphere is dissolved in the oceans. The resulting increase in acidity makes it hard for organisms such as corals and some shellfish to grow and survive.

Online labour markets
Online labour markets make it possible for people from around the world to find jobs offered by a global pool of potential employers.

Organic agriculture
Crop and livestock production that sustains the health of soils, ecosystems and people by relying on ecological processes, biodiversity and cycles adapted to local conditions instead of using synthetic inputs such as fertilizers, insecticides and herbicides.

Ozone layer
A region of the atmosphere situated at an altitude of 10–50 km above Earth's surface which contains diluted ozone (O3), a naturally occurring gas (also see tropospheric ozone). At this level (the stratosphere) the ozone layer filters out ultraviolet (UV) radiation from the sun. If this layer is depleted, increasing amounts of UV radiation will reach ground level. This can cause a high incidence of skin cancer in humans, as well as damage to terrestrial (land) and marine biological systems.

Ozone-depleting substances
Substances that deplete the ozone layer.

Particulate matter
Tiny solid or liquid particles suspended in the air.

Pastureland
Land covered with grass or other low plants suitable for grazing animals such as cattle or sheep.

Pay gap
Difference in average earnings between women and men.

Pesticides
Substances, made up of chemical or biological ingredients, intended to repell, destroy or control any pest or regulate plant growth. The most commonly applied pesticides are insecticides to kill insects, herbicides to kill weeds, rodenticides to kill rodents, and fungicides to control fungi, mould, and mildew.

pH
A measure of the acidity or alkalinity of a solution.

Photosynthesis
A chemical reaction that takes place inside a plant, producing food for the plant to survive.

For photosynthesis to take place, plants need to take in carbon dioxide (from the air), water (from the ground) and light (usually from the sun).

Planetary boundaries
A framework designed to define a safe “operating space” for humanity.

Poaching
Killing animals illegally.

Pollinators
Pollinators (e.g. bees and butterflies) visit flowers to harvest their nectar and pollen. They transfer pollen and fertilize flowers as they go from plant to plant.

Primary energy
Energy embodied in natural resources (e.g. coal, crude oil, sunlight or uranium) that has not undergone any anthropogenic conversion or transformation.

Product life cycle
The product life cycle begins when raw materials are extracted and continues until the materials from the product are reused, recycled, recovered or discarded.

Rainforest
An area of tall, mostly evergreen trees and a high amount of rainfall.

Recycling
Conversion of waste into useable material.

Remote sensing
Collection of data about an object from a distance.

Renewable energy sources
Energy sources that do not rely on finite (exhaustible) stocks of fuels. Hydropower, biomass, solar, tidal, wave and wind are renewable sources.

Renewables
Renewable energy sources (above) are often referred to as “renewables”.

Repurposing
Using something for a purpose other than the one for which it was originally intended

R-value
In building and construction, a measure of how well a two-dimensional barrier (e.g. a layer of insulation, window, wall or ceiling) resists the conductive flow of heat.

Robotics
A branch of science and engineering that deals with the design, construction, operation and use of machines that can substitute for humans and replicate human actions.

Sea level rise
Trends in the rise of the surface of the sea relative to land level.

Sharing economy
A peer-to-peer-based activity for obtaining, giving or sharing access to goods and services, coordinated through community-based online services.

Socioeconomic
Related to a combination of social and economic factors.

Soft skills
Personality traits, including communication skills, empathy, good time management, and teamwork and leadership abilities.

Solar photovoltaic
Method of generating electric power by using solar cells to convert energy from the sun.

STEM
A term used to group together science, technology, engineering and mathematics.

Sport utility vehicle
A category of motor vehicle that combines features of passenger cars and off-road vehicles (e.g. raised ground clearance and four-wheel drive). SUVs are typically fuel inefficient.

Sustainable development
Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.

Synergies
Synergies arise when two or more processes, organizations, substances or other agents interact in such a way that the outcome is greater than the sum of their separate effects.

Synthetic fertilizers
“Man-made” inorganic compounds used as fertilizers. They are usually derived from by-products of the petroleum industry.

Tailpipe emissions
Chemicals (many of which are toxic) emitted by a vehicle’s exhaust pipe.

Tipping point
The critical point in an evolving situation that leads to a new and sometimes irreversible development.

Toxic cycle
Recycling of toxic substances in new products.

Transformational change
Process whereby long-term positive results are achieved.

Trifecta
A triple win.

Tropospheric ozone
Ozone (O3) is a gas that exists in two layers of the atmosphere: the stratosphere (see ozone layer) and the troposphere (at ground level and up to 15 km). Tropospheric ozone is harmful to human and ecosystem health. It is a major component of urban smog.

Ultraviolet (UV) radiation
A form of electromagnetic radiation that comes from the sun and some man-made sources (e.g. tanning beds). Two types of UV radiation contribute to skin cancer: UV-A is associated with skin ageing, and UV-B with skin burning.

Upcycling
Upcycling (which can also be referred to as “creative reuse”) is the process of transforming by-products, waste materials, and useless or unwanted products into new materials or products of better quality. This is the opposite of downcycling, which involves converting materials and products into new materials of lower quality.

Urban agriculture
Cultivating, processing and distributing food in and around urban areas. It can involve fruit and vegetable production, animal rearing, aquaculture, agroforestry, beekeeping and horticulture.

Virtual water
The volume of water used to produce various consumer products.

Vocational training
Education that prepares people to work as technicians or in jobs such as tradesman or

artisan. It is also sometimes referred to as “career and technical education”. In a changing job market, the distinction between this and other types of secondary or higher education are becoming less distinct.

Volatile organic compounds
Chemical compounds that easily become vapours or gases. They are released from burning of fuel such as gasoline, wood, coal or natural gas. They are also released from many consumer products. Human health risks depend on the concentrations in the air and how often they are breathed in.

Waste management
The collection, transport, disposal, recycling and monitoring of waste. This term is most often used in relation to waste material resulting from human activities, which is managed to avoid adverse health and environmental effects.

Wildlife conservation
The protection of wild species and their habitats to prevent these species’ extinction.

Zoonotic Disease
(also known as zoonosis) An infection or disease that is transmissible from animals to humans under natural conditions.

GEO-6 for Youth Reviewers

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