

TUNZA

ACTING FOR A BETTER WORLD:

GEO-5 FOR YOUTH



UNEP



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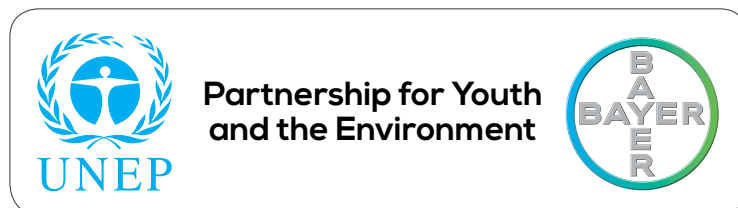
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TUNZA

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GEO-5 FOR YOUTH

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Foreword





Our planet now hosts more than 7 billion people, and that number is expected to rise to some 9 billion by 2050. The decisions young people make today and in the near future will be central in determining the long-term viability of sustainable development.

Written by youth for youth, *TUNZA: Acting for a Better World* is based on the United Nations Environment Programme's flagship environmental assessment, *Global Environment Outlook: Environment for the Future We Want (GEO 5)*. It examines a variety of trends related to the Earth's system, and explores whether internationally agreed environmental goals – such as those on climate change, biodiversity loss and dangerous chemicals – are being achieved.

The findings, first highlighted at the UN Conference on Sustainable Development (Rio+20), in June 2012, are discouraging. Despite numerous global, regional and national commitments, there has been little significant progress in reversing environmental decline in almost all areas of scrutiny.

Yet, there is a note of hope. *TUNZA: Acting for a Better World* highlights the efforts of young people to protect the Earth's atmosphere, land, water and biological diversity. It shows how youth are taking action – today – to build a better tomorrow.

I commend this report to readers of all ages interested in ensuring the integrity of the environmental pillar of sustainable development. *TUNZA: Acting for a Better World* is based on sound science – the bedrock of information needed by activists and policy-makers alike. By learning about the state of our environment and the options available for safeguarding it, we can all contribute to the effective solutions that will improve the state of our planet.

A handwritten signature in black ink that reads "Ban Ki-Moon". The signature is written in a cursive, flowing style.

Ban Ki-Moon,
UN Secretary-General

Preface





Of the 90 key environmental goals agreed by governments over the past 40 years, only four show significant progress and far too many are off track and heading in the wrong direction.

TUNZA: Acting for a Better World is in part a call to action and in part a casebook showing how young people are challenging the status quo in their homes and their communities.

Read about a rural lighting initiative of Indian students and the radio-based biodiversity awareness campaign aimed at reaching a million people in north west Cameroon. Be inspired by the setting up of a Fair Trade chocolate company by a young person in the Netherlands to reduce child slavery in West Africa and the breeding of the Mayan apple snail by Mexican young people to boost food supplies and livelihoods through shell-based handicrafts. These innovators are blazing a trail towards a more sustainable future.

The book, inspired by the findings of GEO 5, is also aimed at inspiring you, young people, to do more in your lives and the careers you choose, whether as entrepreneurs, scientists, activists or transformational policy-makers.

Tunza; Acting for a Better World also carries tips and ideas that can start changing the world in a second, a minute, a day or a decade such as unplugging the TV set or taking a short, warm shower rather than a long, hot one up to starting an environmental club or forging a vision to leave the planet in better shape than you found it.

You have probably got some ace ideas to add to these so let's get the word out now.

Tweet yours @GEOforYouth

A handwritten signature in black ink that reads "Achim Steiner". The signature is fluid and cursive.

Achim Steiner,

UN Under-Secretary General and Executive Director,
UN Environment Programme (UNEP)

A word from the Editors

Over the past century, the word 'environment' has evolved in meaning and substance. Ask your grandparents what they thought of the environment when they were your age. They would probably refer to their surroundings, their local forests or simply keeping their neighbourhood free from visible rubbish. We now know that environmental concerns are global issues.

But this book is not just about the environment or its problems. It is also about acting together for change. Its aim is to show that there is hope and that successes are happening every day. Our understanding of the interdependence between ourselves and our planet has also been transformed.

The extent of environmental degradation has become clearer. We are now facing the results and impact of our over exploitation of Earth's natural resources, as well as pollution and damage to its ecosystems. We are taking more from the Earth than it can provide or regenerate, and creating waste faster than the Earth can absorb it.

For more than 40 years, world leaders have discussed our environment and sustainable development (see Section 2). Socio-economic factors such as a growing population and urbanization are becoming of greater concern. But there is a lack of urgency.

We all have a responsibility to implement sustainable solutions that will protect our future and that of coming generations. We can no longer wait for someone else to fix things for us. The time for action is now. Don't wait until it is too late to make a difference! Change has to start with each of us.

We wrote this as youth for youth to be a credible resource for anyone who wants to find out about the current state of our environment and learn about ways of addressing environmental issues in their communities and worldwide.

The report is presented in a way that can be easily understood with ideas on how to address environmental problems. It is divided into three main sections:

1. Our world and its challenges today

This section is based on the Global Environmental Outlook 5 (GEO 5) (<http://www.unep.org/geo/geo5.asp>) with case studies to highlight successful action from around the world. This, combined with the scientific and policy data, we hope will inspire you to create your own success stories.

2. The future we want

This section explores the process and impact of Rio+20 from a youth perspective.

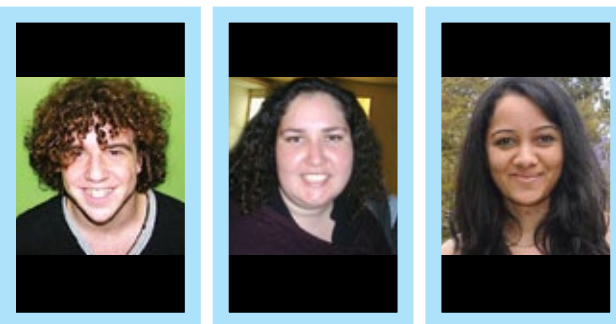
3. Change countdown

This introduces key concepts like the green economy and education for sustainable development. It also introduces 'OneOne' – our challenge to you to make one change that takes a specific unit of time. So, what can you do in one second, one minute, one hour or one week to create change?

Dive in, get informed, be inspired, and use GEO for Youth to educate your friends, your family, your school, your organization and even your government.

Change starts now – with *your* actions.

Andrew, Saba and Karuna



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SECTION 1

OUR WORLD AND ITS CHALLENGES TODAY

EARTH SYSTEM • DRIVERS • ATMOSPHERE • LAND • WATER • BIODIVERSITY
CHEMICALS • GLOBAL PROBLEMS CALL FOR GLOBAL SOLUTIONS



CHAPTER ONE

Earth System

With the dawn of space travel we were able to view our home, Planet Earth, from a distance and take in its beauty. One of the things that most struck those who viewed it first was the extent to which Earth can be called a 'closed system'. Everything alive today, everything we have seen or understood, and much more that remains hidden, interacts on some level, because everything is protected within the confined space of our planet. This is what we call the Earth System. In 2011, the Earth's population passed seven billion and it continues ►

EARTH SYSTEM

to grow. Our societies are recovering from a global economic recession. Our way of life – what we eat, value, study, how we live, think and what we buy – has shifted dramatically from when our parents were young. Our generation is more technologically dependent, we follow trends, travel more, own more gadgets and push for more material things.

We only have one planet and it still has the same resources but our demands are increasing. Within the Earth System, there are many sub-systems at work, which can all be further studied and subdivided. These range from water systems that move from mountain tops to the river deltas, to chemical systems such as sulphur (*Turchyn, 2005*).

Humans also make up an integral part of the Earth System, and growing economic expectations and population often result in unpredictable levels of damage due to the intensity of our activities and the complexity of the system.

With the increase of human pressure on our planet, it is being pushed towards critical thresholds, points beyond which the Earth's environment will no longer function in the ways that support us.

Although it is hard to pinpoint an exact tipping point beyond which damage may be considered irreversible, the edge of a safe zone within our planet's system is known as a planetary boundary. Studies have shown that of the seven planetary processes for which safe boundaries have been proposed, three have already exceeded their safe boundaries. (*Rockström et al, 2009a*).

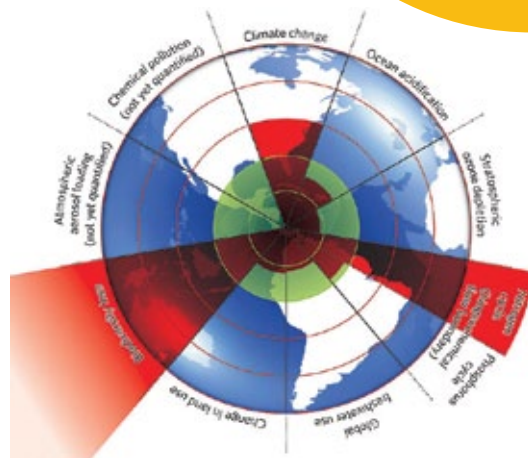
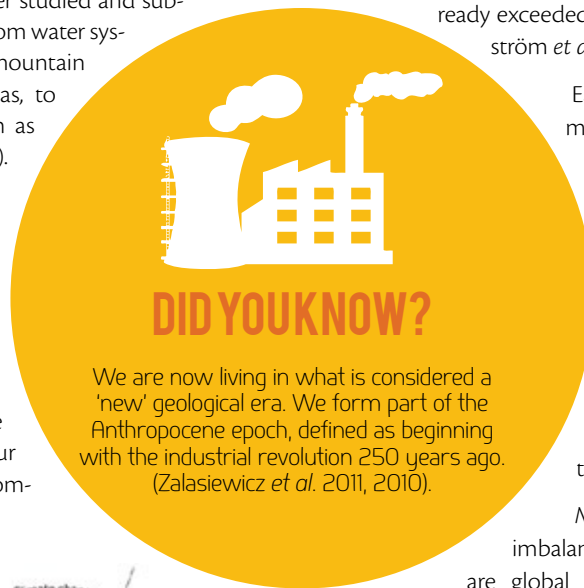
Early analyses indicate that climate change, the rate of biodiversity loss, and interference in the nitrogen cycle and phosphorus cycles have exceeded safe boundaries.

Ocean acidification, change in land use, global freshwater use and stratospheric ozone depletion are still considered to be within their safe zones.

Many effects that come out of imbalances within the Earth System are global ones. Pollution, acidification and unpredictable weather patterns are no longer country or a region-specific issues. On top of this, governments face the challenge of simultaneously trying to take steps towards eradicating poverty and ensuring global security.

This is because no security could ever be felt if global poverty stays at current levels. Informed decision making has to become adaptive to the changing conditions that concern various levels of society.

Understanding the concept of the Earth as a closed system will lead to an acknowledgement that everyone here today, and those yet to come, can only survive on what the planet provides.



Source: Stockholm Resilience Centre 2009



© SHUTTERSTOCK

Being part of a new epoch means that we have left the previous 10,000-year era during which we built our civilization, from the stone-age right up to the invention of the combustion engine. This new epoch is less than 300 years old, yet it has seen an alarming number of changes within the Earth System.

Since the early 19th century, the world's human population has risen from 1 to 7 billion people. Half of all carbon dioxide (CO₂) released since the pre-industrial era has only happened over the past 30 years (Steffen *et al.*, 2007).

Although background variations in CO₂ rates – that is, the natural rise and fall of CO₂ levels – and mass extinctions have taken place in the past, the unprecedented calm that followed the last ice-age has enabled our civilization to advance so far.

That being said however, the changes that we are seeing stand out from all previous forms of background

fluctuation. The current statistical trends go well above and beyond the natural occurrences noted in the past.

When studying these fluctuations, the complexities that arise from all the interconnecting systems means that they cannot be looked at in a straightforward manner. Because of this, a system that relies on feedback is adopted. Feedbacks can either be considered as positive, reinforcing change, or negative, dampening the effect of the change (Steffen *et al.*, 2004b).

Black carbon deposits found in the Arctic are an example of change that is progressing rapidly. Tiny particles of black carbon, released into the air from the burning of biomass or fossil fuels, are caught in the wind and atmospheric currents and deposited on Arctic snow.

The deposits darken the surface so that it absorbs more solar radiation, leading to warming in the area and the melting of the ice and snow. With less ground

“Black carbon deposits found in the Arctic is an example of change that is growing exponentially. Tiny particles of black carbon, released into the air from the burning of biomass or fossil fuels are caught up in the winds and currents and deposited on Arctic snow.”

EARTH SYSTEM



“There is a severe lack of comprehensive data on certain boundaries and different systems of our planet. **Informed decisions** are the only ones that will lead towards sustainable development and without the proper data to back them up, these decisions cannot be taken.

covered by ice and snow, the area reflecting the sun's radiation back into the atmosphere or into space has become smaller. So warming accelerates, and more snow disappears (Ramanathan and Carmichael, 2008).

In this situation the burning of fossil fuels has created a positive feedback within the Arctic system causing problems that do not naturally occur in the Arctic energy budget.

An increase in water in the atmosphere leading to the formation of more clouds and more cloud cover is an example of a negative feedback, a response that decreases the effect of a change, leading to a more stable outcome. The greater the percentage of certain types of cloud cover, the less solar radiation reaches

the Earth's surface leading to a decrease in temperature and thus a slower rate of evaporation. Less evaporation, however, would lead to less water in the atmosphere and therefore less cloud cover. In this situation, the clouds themselves might prevent more cloud cover. Other types of clouds act to prevent radiation from escaping into space, so the balance of the two effects are always in question (Dessler, 2010).

Within the Earth System there are several feedback systems that dampen a large number of the physical and chemical excesses that can be produced by natural variations. Today the buffers of the Earth System that dampen damaging tendencies are being pushed to their limits. Beyond these, the buffers will



The greater the percentage of certain types of **CLOUD COVER**, the less solar radiation reaches the Earth's surface, leading to a decrease in temperature and thus a slower rate of evaporation. Less evaporation means less water in the atmosphere and less cloud cover.

no longer be able to absorb the effects of our species' growth in population and waste production, leading to more positive feedbacks, including ocean acidification and melting snow and ice.

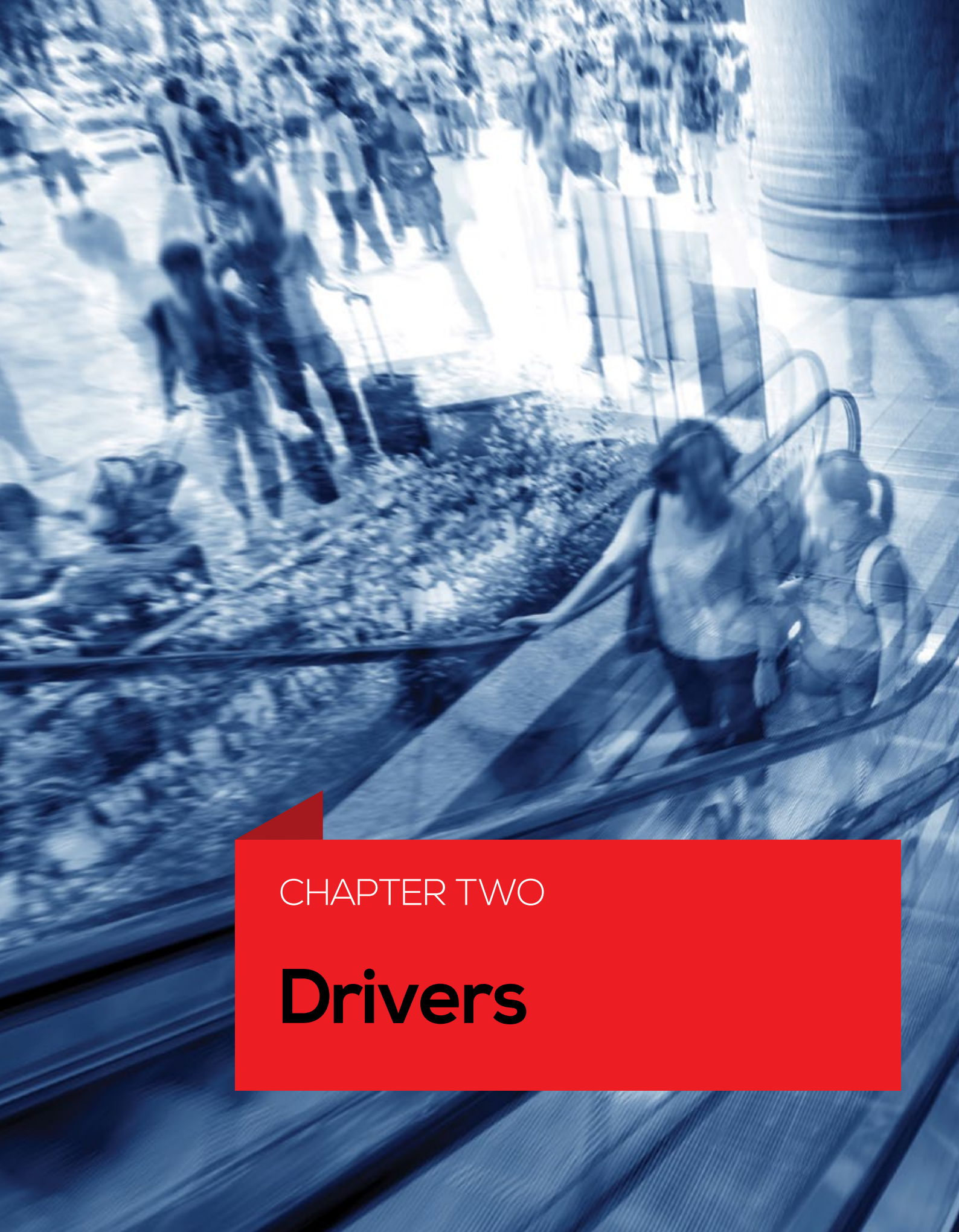
Informed decisions and evidence-based policy making requires comprehensive, reliable data, but there is a severe lack of it for many elements and boundaries of the Earth System.

YOU(th) can make a difference

1. Local and national non-governmental organizations (NGOs) can be extremely supportive and helpful with issues that may be affecting you.

Joining, or at least being aware of these NGOs, will allow you to ask them for help. You may even find someone in the NGO who experienced the same problems and can help you better understand what you can do. Having an established group backing up your cause can help you achieve the results you want.

2. More monitoring and data collection is urgently needed. See if you can help with the necessary training and fieldwork.



CHAPTER TWO

Drivers

At the moment, there appears to be a desire for unlimited economic growth. But this is happening within a limited system, Earth, causing pressures on our environment that are reaching dangerous levels. The two main drivers for this change are population increase and unsustainable economic development that are growing and changing at an unprecedented rate.

When looking at the Earth as a closed system, you can appreciate the fact that everything within it is ►

DRIVERS

► finite, and if the system is not cared for, it could be irreversibly damaged. This means that there is a limit to the carrying capacity of the individual systems as well as to the planet as a whole.

Unless swift action is taken, the changes that will take place will be irreversible. It is no longer enough to simply study or talk about the pressures. Sustainable progress will not be achieved unless the driving

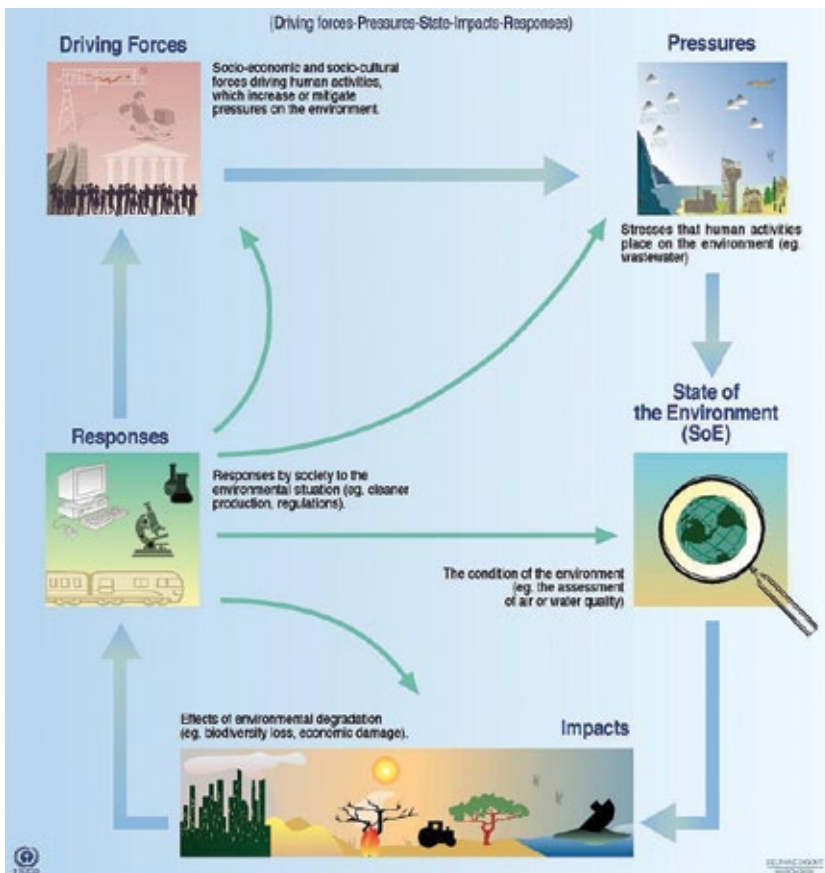
DID YOU KNOW?

It is estimated that the world's population is going to be close to 10 Billion by 2100. (UN 2011).

forces behind them are properly identified and action is taken. The complexities of the systems at work in, and within, the Earth System are undeniable and amazing. Everything on the planet is linked; a change in one system can no longer be considered as an isolated incident. The danger is that the forces that are affecting the different systems are growing in number.

It is starting to become clear that understanding the complexity within the Earth system needs an all-inclusive approach. Recognizing this, GEO-5 uses an analytical framework that studies the driving forces, pressures, states, impacts, and responses at work within the system (DPSIR Framework).

DPSIR framework diagram



Source: Global International Water Assessment (GIWA), 2001; European Environment Agency (EEA), Copenhagen.

This framework asks:

- what is happening to the environment, and why;
- what are the consequences of change;
- what is being done about this change and how effective is the effort?

This framework makes a clear distinction between the driving forces of change and the resulting pressures on the environment, but identifying the cause and effect is not enough. To solve the problems, simple questions that clearly define the issue also have to be asked. For example, what are the current size and rate of growth of the drivers and resulting pressures? How do the drivers behave, what influence do they have, and how far reaching is their influence?

THE POPULATION EFFECT

While the total human population is increasing, the average size of families is decreasing. Smaller families find it easier to move around to find better living conditions or work opportunities. Smaller families also mean more resources and care can be devoted to each individual which can lead to lower infant and maternal mortality rates and to better opportunities for improved health and education.

Source: U.S. Census Bureau
0 10 000 9 000 8 000 7 000

The downside is that each family member is likely to expect more and consume more. Housing for each smaller family still requires a basic level of resources such as energy. The new smaller families also bring about a lifestyle change in terms of consumption such as demands for a wider variety of food, fruit and vegetables that are not in season and beverages sold are expected to be cold. All of these further contribute to the pressures on the environment.

As urban populations grow, far removed from the source of the food and water they consume, pressures on surrounding resources will increase. More land may be needed to produce food but less concern shown for where food comes from or how it is processed.

Recent studies suggest that the largest increase in population over the next few years will happen in some of the world's poorest cities (UN, 2009b).

CASE STUDY ►

Project Chirag – a solar energy initiative

In India, students at the Free Enterprise H.R. College have launched Project Chirag with a 5-point rural transformation model that aims to tackle:

1. environment;
2. healthcare and sanitation;
3. education;
4. economic empowerment;
5. social development.

Acknowledging that energy is vital for lasting change, the students wanted to find a long-term sustainable solution using free

plentiful resources. Their project targeted villages that have no access to electricity and where more than 75 per cent of the population live below the poverty line. But the students had no money; so they decided to start a marketing campaign to make a difference.

The campaign, which was supported by college staff, started with a team of 250 students removing tube lights and other sources of light from all the common areas like corridors, so the 6,000+ student body could understand what it is like to have no electricity. Posters were strategically placed where lights had been removed, with messages such as 'Tubelights missing for a mission'. A poster above the urinals in the men's toilets read 'The person standing before you is missing for a mission', and in the canteen they left signs saying 'The person who ate before you is missing for a mission'. There was even a poster in the principal's office that read 'missing for a mission'.

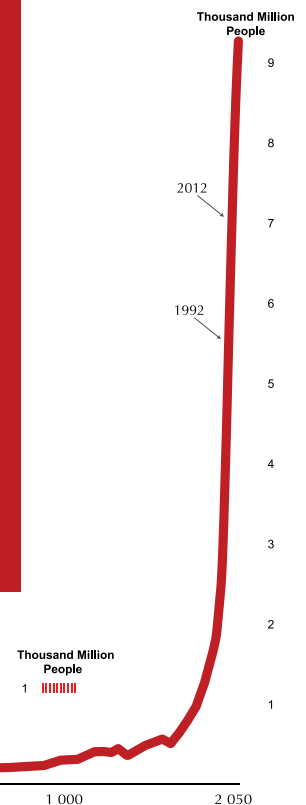
The posters generated a buzz around the college; what could this secret mission be that everyone was missing for? The team then backed up the physical campaign with a social media one, creating a Missing for a mission Facebook group. Within a month they had 950 followers not just in India but from Australia, Germany and Malaysia – all genuinely wanted to help the campaigners in their mission, whatever it was.

For the final stage the team replaced the signs with 'This many Indian villages could be lit up with your help, if you would only give Rs 10 (US \$ 0.18) for lighting up a rural home'. The 250 volunteers also had message boards across their chests that read 'Rs 10 for light' –

5

BILLION

PEOPLE AROUND THE WORLD USE MOBILE PHONE TECHNOLOGY (ITU2010)



World Population since 10 000 BC

DRIVERS

they collected Rs 515,000 (US \$ 9,400) in just four days. Most students donated more than Rs 10 with each contributor being given a receipt to prove that every donation would be accounted for.

But the challenge was not over. The project team needed to find an affordable, reliable vendor to provide solar lamps. They met a vendor, Mr Kumar, who both knew how to make the solar lamps and was willing to teach the volunteers. His only requirement was that the project provided work for disabled people who would be paid a decent amount. As a result project became sustainable – the lamps were affordable for villagers while providing income for the project and its workers.

The grassroots approach of Project Chirag is making a positive mark in the targeted villages. The project cuts households costs and reduces carbon dioxide (CO₂) emissions as the villagers no longer need to buy kerosene to have light. It also increases safety as there is less risk of fire.

In Phase 2 of the project, activities to improve livelihoods were carried out along with the establishment of public kitchens, improving educational infrastructure, and adult literacy and skills enhancement programmes started.

Lessons learnt:

- It's not about talking, it's about doing;
- It's not about problems, it's about solutions.

New technology has been extremely beneficial, improving people's living conditions as well as making life more comfortable and a whole lot more enjoyable. This sudden increase in technology has been a large contributor to globalization, making very little on Earth unreachable.

Communication has boomed over the past 100 years and it is estimated that five billion people around the world use mobile phone technology (ITU, 2010), which means that five out of every seven people on Earth are connected by cellular phone. This is an incredible achievement, but we must also consider the concentrated pressures this causes on specific regions due to resource extraction for the production of these technologies.

Another factor in the global level of economic development is the availability of product choice, often from a vast selection of the same type of product. Social pressure and mass media play a huge role in influencing the consumer's decision making. And the more products that are sold, the more likely it is that they will keep on being produced.

CASE STUDY ►

Talk green, teach green, live green

In Cameroon, a group of youth realized that there were very few initiatives to raise awareness of environmental issues that affected their lives (TTL3G, 2012). The group felt that they needed to reach a large audience and thought about how media could be utilized as a major platform for communication about sustainability. They also discussed how reward schemes could be an incentive for environmental activities within the community. Their goal was to 'paint the world green via talking, teaching, and living'.

The solution? Talk green, teach green, live green (TTL3G).

The group decided to use communication as a tool for conservation and create a radio programme to promote conservation and sustainability.

OVER
5000
BIODIVERSITY PRIZES
HAVE BEEN GIVEN OUT
BY TTL3G



They wanted to have incentives and agreed to award biodiversity prizes to active participants.

It wasn't easy, but the group managed to launch their programme by reaching out to those in their community with the skills. It had four key objectives were:

1. start petitions to foster sustainability;
2. teach environmental sustainability in communities;
3. give out 20,000 biodiversity prizes via the radio by the end of 2012;
4. clean and green about 10 schools before the end of 2012.

The overall goal is to reach 1,000,000 people from the north west region of Cameroon via the radio.

By the end of 2011, more than 5,000 biodiversity prizes had been given out by TTL3G. Cleaning and greening activities had been carried out at Nursery and Primary School Mile 3 and in the local community. And waste management, pollution and drainage problems were addressed.

Lessons learnt:

- The media can be utilized as a major platform for communication about sustainability;
- Young people can identify needs in their community and use their talents to fulfil them;
- If you don't have all the skills you need from the start, ask someone who has them whether they would be willing to teach you. You get to learn something new, and they get involved in a good cause;
- Reward schemes provide great incentives for environmental activities within the community;
- It is important to combine fun with something you are passionate about.

A recent survey found that the general public is unwilling to pay more for environmentally sensitive products. One of the main reasons why people don't buy things that are beneficial or at least not harmful to the natural environment is that they feel there is no need to do so. Worse, some people feel it is not socially acceptable to buy them. This attitude is one of the main reasons that the idea of sustainable development is not catching on rapidly. Environmentally-sound products are often marketed as if we have to choose between a quality product or one that appeals to our green consciousness. This mode of thinking must be abandoned, and a new wave of environmentally safe products is needed that are both sustainable and keep up with modern standards. There are examples of young people leading the change all over the world.

The free services that we take from the natural world and which we often take for granted are called ecosystem services. If properly calculated, the value of such ecosystem services, for instance in terms of environmental and food security, is much greater than the perceived benefits of converting natural areas to industrial land use (Costanza *et al.*, 1997).

Environmentally-sound products are often **marketed** as if we have to choose between a quality product or one that appeals to our green consciousness.

CASE STUDY ►

Chocoholics, beware of slave chocolate?

Are you aware of the whole food chain? Do you know from where what we eat comes or how the products we use are produced?

Chocolate can be a treat. It is milky meltingly smooth, bittersweet dark or creamy rich ... most people agree that it is deliciously and decadently rich. Chocolate can be a treat, a snack or dessert or a present. Chocoholic is a term we joke about, but few of us think about where it comes from.

It is scary to link chocolate and child slavery but the issue with chocolate comes from how the cocoa it's made from is produced.

DRIVERS

Seventy per cent of the world's cocoa beans are grown in West Africa and 40 per cent comes from just one country, Ivory Coast (CNN, 2008). http://money.cnn.com/2008/01/24/news/international/chocolate_bittersweet.fortune/

In 1998, the United Nations Children's Fund (UNICEF) reported on how a lot of Ivory Coast farmers used child slaves, mostly from neighbouring countries. In 2000 and 2001, the media, including the BBC, shocked the world with documentaries on how child slave labour was being used on West African farms to produce the cocoa that is used to make chocolate.

One response was more original than writing a letter or signing a petition: Teun (Tony) Van de Keuken filmed himself eating approximately 19 bars of chocolate; then he called the police and insisted that they arrest him for breaking the law and buying chocolate that was produced from slave cocoa. Predictably the police refused. Tony then tried repeatedly to take himself to court for buying chocolate that was produced using child labour, but that didn't work either. What it did do was to raise public awareness of the issue. In 2005, Tony started Europe's first fair trade chocolate company, Tony's Choclonely, which was a success – showing that people buy differently if awareness is raised. While this gesture started changing some habits, it did not stop slave trade in chocolate.

Despite more than 10 years of media focus, the issue with chocolate slavery has not been solved. In January 2012, CNN noted that an estimated 200,000 children were working the fields in the Ivory Coast alone. There is a huge difference between children doing chores like washing the dishes after dinner, babysitting or weeding, and child labour. The International Labour Organization (ILO) defines child labour as work that *'is mentally, physically, socially or*



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morally dangerous and harmful to children; and interferes with their schooling by depriving them of the opportunity to attend school; by obliging them to leave school prematurely; or by requiring them to attempt to combine school attendance with excessively long and heavy work.' Child labour is illegal everywhere. The ILO talks about the worst forms of child labour, but in the context of cocoa farming it has been taken one step further – child slave labour. Are you comfortable eating a bar of chocolate knowing that it was produced using child slaves? Or don't you care?

You can pressure chocolate manufacturers to change by using your wallet. Don't buy chocolate that supports child labour – choose fair trade instead and you will still have lots of options. Is saving someone from a life in misery and pain worth a little extra cost? We all need to think about the cost involved in what we eat and what it is worth.



DESPITE MORE THAN

**10
YEARS**

**OF MEDIA FOCUS,
THE ISSUE WITH
CHOCOLATE SLAVERY
HAS NOT BEEN SOLVED.**

A reform of the old measure of economic value, gross domestic product (GDP), is much needed. Increasing a nation's GDP is one of the main forces exerting pressures on the local environment. A shift in priorities is necessary to balance short term profits and long term benefits.

For example, the long term economic impact of failing to preserve natural habitats could be catastrophic and may not be reversible. Currently, only if there is time or money to be spared is it devoted towards conservation. With this outlook there is no way the environmental situation can ever improve, as it will always come second to financial gain.

One idea to counter this would be to assign a financial value to all the natural assets in a country. If, at the end of the year, they have been taken care of, as opposed to being degraded for instant gratification, these assets will boost the nation's GDP. The idea could greatly improve the preservation of natural assets. However, the severe data limitations that currently exist cause problems for a project of this scale. Setting international standards for valuing assets such as forests, lakes, and rivers and having a good method of accounting are challenges for introducing the idea.

The time to act has come. The old style of an authority-driven, top-down approach is no longer

enough. If problems keep being tackled as isolated issues then sustainable progress cannot be achieved. What is really needed is an integrated Earth System approach. This is one based on informed decision making, and one that addresses the drivers behind the pressures on our planet.

When studying the drivers and their resultant pressures, the precautionary principle of keeping away from the planet's boundaries is important. This will ensure that a safe and stable zone is maintained without the risk of overshooting any critical thresholds.



**1 BILLION PEOPLE
LIVING IN HOUSING
THAT IS NOT ADEQUATE
AND MORE THAN**

**100
MILLION**

**PEOPLE ARE
HOMELESS.**

UNHABITAT ESTIMATE

CASE STUDY ▶

ConstruCycle – social entrepreneurship

As society becomes more urbanized, it is important to adapt to changing needs. At the moment, one out of every three city dwellers lives in a slum. UN Habitat estimate that one billion people living in housing that is not adequate and more than 100 million people are homeless. As our population increases this problem is likely to grow. At the same time, we are producing a lot of waste which we do not adequately recycle or reuse. Most waste is burnt or buried in landfills. We are not dealing with our problems together and trying to solve each one in isolation isn't working.

Ricardo R. Amador, who grew up in Nicaragua, has shown that it is possible to effectively address these problems simultaneously through social entrepreneurship. He realized that housing is crucial to solving poverty – vital to real social development.

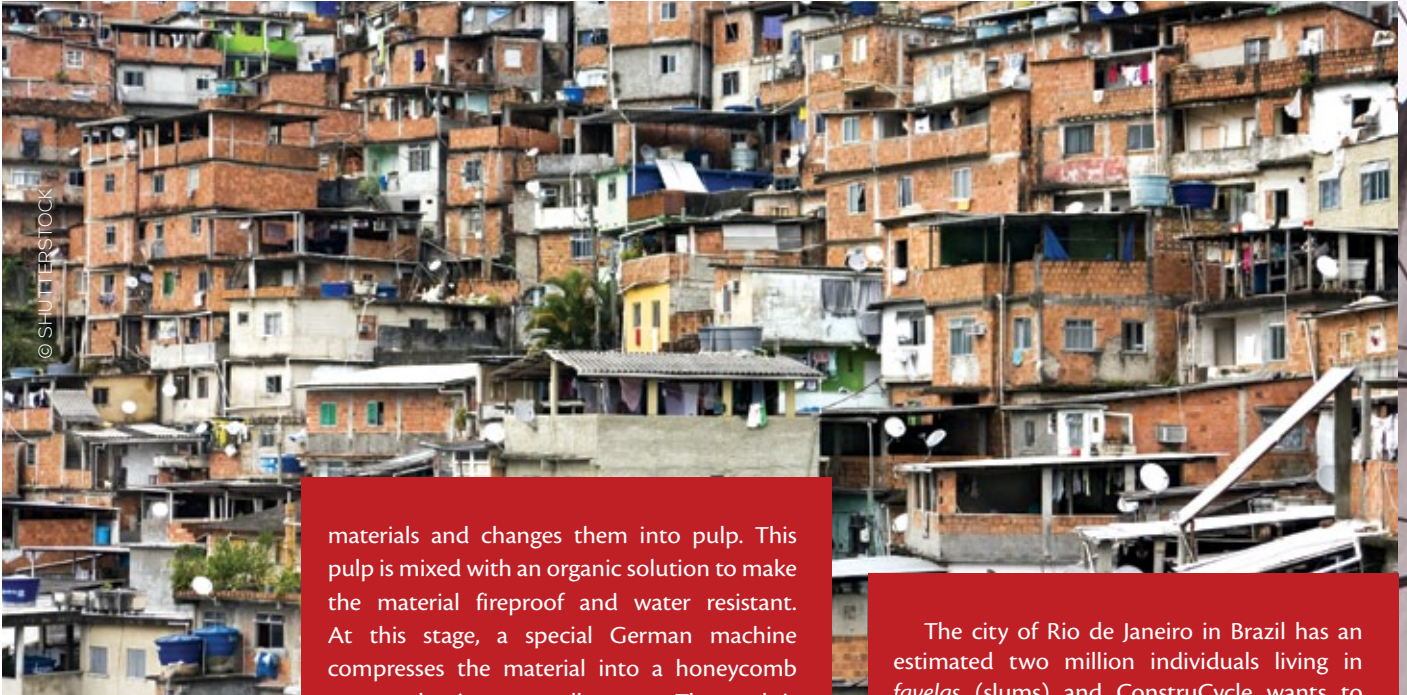
This resulted in ConstruCycle which is trying to tackle two global problems – decent housing and the excess of garbage – using safe and locally available raw materials such as scrap paper. A local company recycles the



DID YOU KNOW?

The gross domestic product of a country is the total value of the goods produced plus the value of the services provided over one year. During the 20th century the gross domestic product of the world increased more than 20 times (Maddison, 2009).

DRIVERS



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The city of Rio de Janeiro in Brazil has an estimated two million individuals living in **favelas** (slums)

materials and changes them into pulp. This pulp is mixed with an organic solution to make the material fireproof and water resistant. At this stage, a special German machine compresses the material into a honeycomb pattern that is structurally strong. The result is prefabricated eco-construction panels that are fast to put together and take apart. A low-cost, 40-square meter house takes four people with no previous building experience one week to erect, but has a life expectancy of more than 50 years. The panels have the added benefit of being termite proof and suited to most natural hazards, such as earthquakes and hurricanes.

The city of Rio de Janeiro in Brazil has an estimated two million individuals living in *favelas* (slums) and ConstruCycle wants to start there. They also promote an holistic approach by trying to connect the government, private enterprise, NGOs and the poorest of communities.

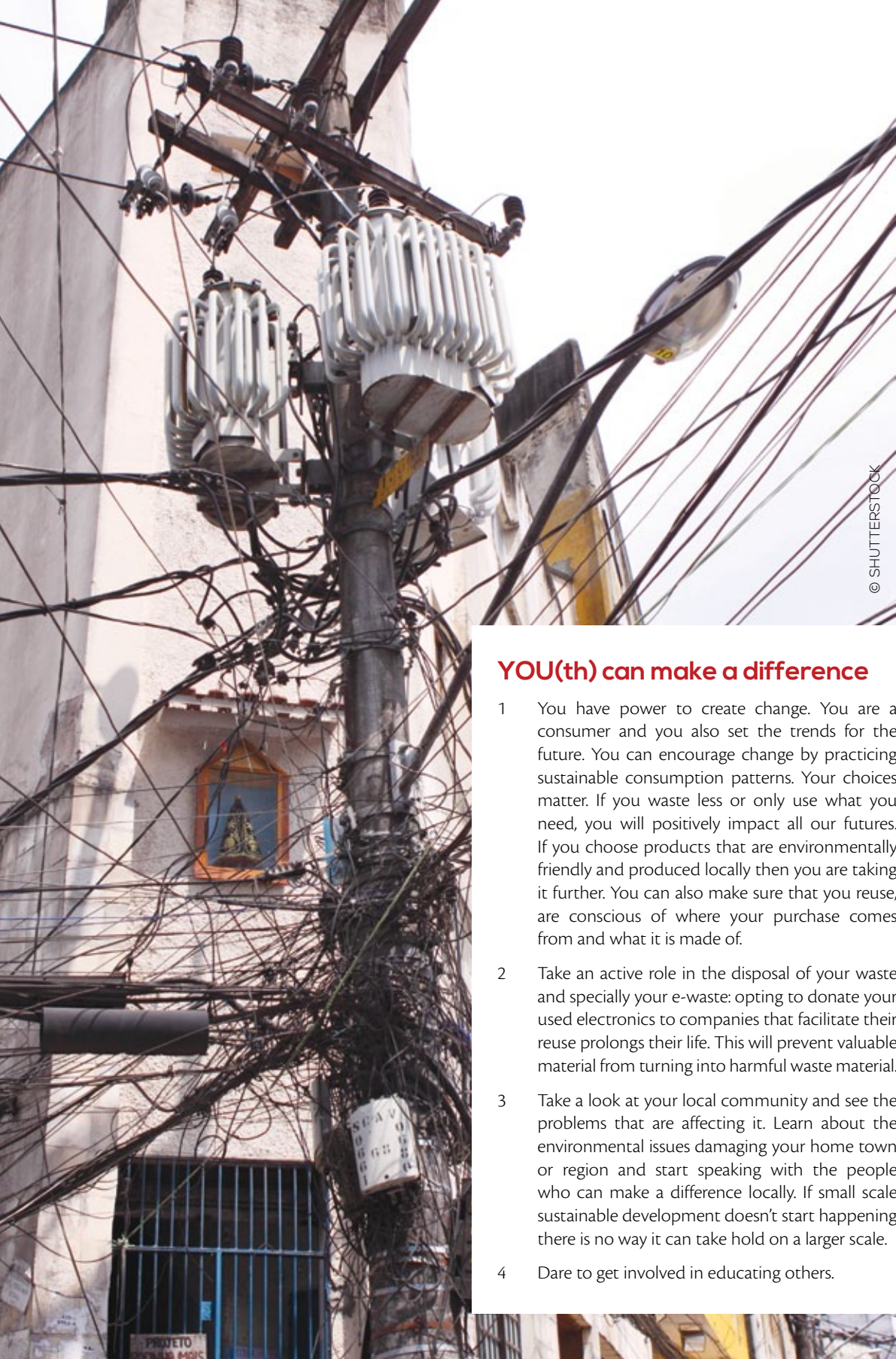
The concept of trash being cash is one that ConstruCycle hopes to promote. They expect that by promoting the value of scrap, eventually businesses might accept scrap as payment of for electricity, health care and water, allowing more people to have access to these resources. They think this may also slow the high rate of consumerism. If we consume better then we will produce better. This would result in extracting fewer natural resources and reducing pollution rates.

Lessons learnt:

- start small, learn and scale it up;
- rubbish/waste can have a value and contains important materials that can be recycled or used to solve problems. Take a cradle-to-cradle approach;
- you can make money while saving the environment. Become a social business;
- creative thinking is needed!



Symbol	Explanation	Symbol	Explanation
	Trash Collectors collect corrugated scrap paper.		We identify candidates for housing.
	We buy scrap paper and deliver it to factory.		We customize design, take orders and calculate costs.
	Factory Transforms scrap into HoneyComb Panels.		We guide and support costumers to obtain subsidized governmental loan.
	Deliver house kit for self construction		We provide technical support to customers to self-construct their house.



YOU(th) can make a difference

- 1 You have power to create change. You are a consumer and you also set the trends for the future. You can encourage change by practicing sustainable consumption patterns. Your choices matter. If you waste less or only use what you need, you will positively impact all our futures. If you choose products that are environmentally friendly and produced locally then you are taking it further. You can also make sure that you reuse, are conscious of where your purchase comes from and what it is made of.
- 2 Take an active role in the disposal of your waste and specially your e-waste: opting to donate your used electronics to companies that facilitate their reuse prolongs their life. This will prevent valuable material from turning into harmful waste material.
- 3 Take a look at your local community and see the problems that are affecting it. Learn about the environmental issues damaging your home town or region and start speaking with the people who can make a difference locally. If small scale sustainable development doesn't start happening there is no way it can take hold on a larger scale.
- 4 Dare to get involved in educating others.



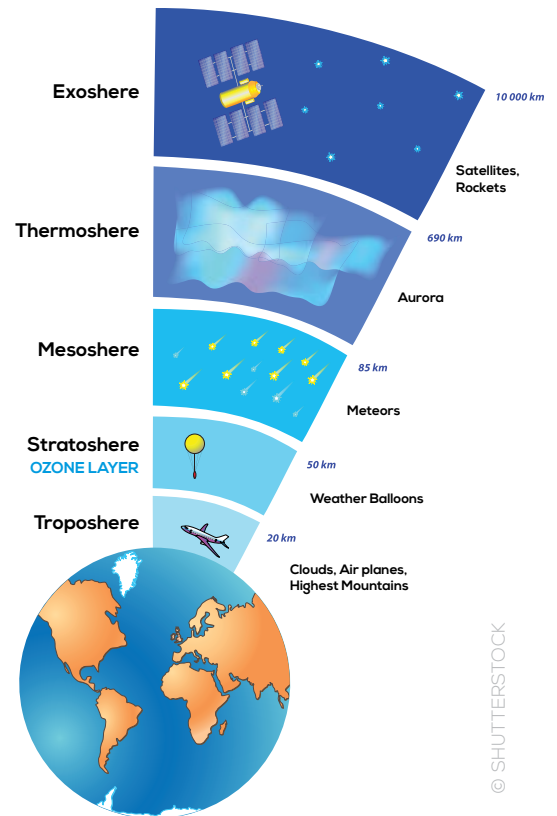
CHAPTER THREE

Atmosphere

The atmosphere is much more than just the air we breathe. It is the reason that so many different species can call Earth their home. The atmosphere allows us to enjoy the sunlight without suffering from extreme heat and damaging radiation from the sun. It is what keeps our sky blue on a sunny day and what provides us with water – the elixir of life – on a grey day. Through the atmosphere, water has a channel to heat, evaporate, cool and move around the planet. In this sense, it is one of the main supporters of life on Earth. ▶

ATMOSPHERE

► Problems affecting the atmosphere, therefore, have grave impacts on the well being of all forms of life. It shows how we are all interconnected. Pollution reaching the atmosphere on one side of the world can cause environmental and health problems on the other. Climate change, air pollution and stratospheric ozone depletion are critical atmospheric issues to be addressed as priority areas for environmental efforts. While the world is on the right track to solve stratospheric ozone depletion, climate change and air pollution remain challenges.



STRATOSPHERIC OZONE DEPLETION

Ozone – good up high, bad low down

On a molecular level, the ozone molecule (O_3) is simply the addition of a third oxygen atom to the normal oxygen molecule (O_2) that we breathe. However, ozone is a highly significant molecule, given that it is both beneficial and harmful to our health, depending on its location in the atmosphere. In the lower atmosphere and at ground-level, ozone is an air pollutant. Yet, its presence in the upper atmosphere, known as the stratosphere, protects all forms of life by absorbing the damaging ultraviolet (UV) radiation from the sun. This is known as the ozone layer.



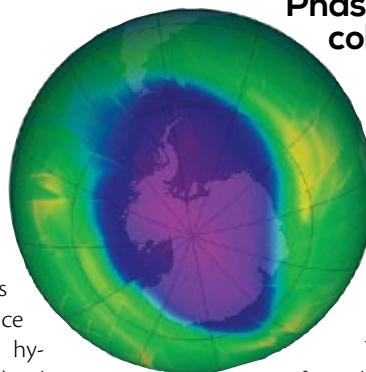
BY 2009, THE PRODUCTION AND CONSUMPTION OF OZONE DEPLETING SUBSTANCES WAS REDUCED BY

98%

(UNEP, 2011)

The wear off of the Earth's sunscreen

The naturally occurring stratospheric ozone layer that filters out harmful effects of the sun has been thinning because of the steady increase of ozone depleting substances (ODS) such as chlorofluorocarbons (CFCs) since the 1970s and, more recently, hydrochlorofluorocarbons (HCFCs). These man-made chemicals were previously used for refrigeration, air conditioning, and for propellants in aerosol spray cans such as hair sprays and paints.



Phasing out of ODS – a global collaborative action

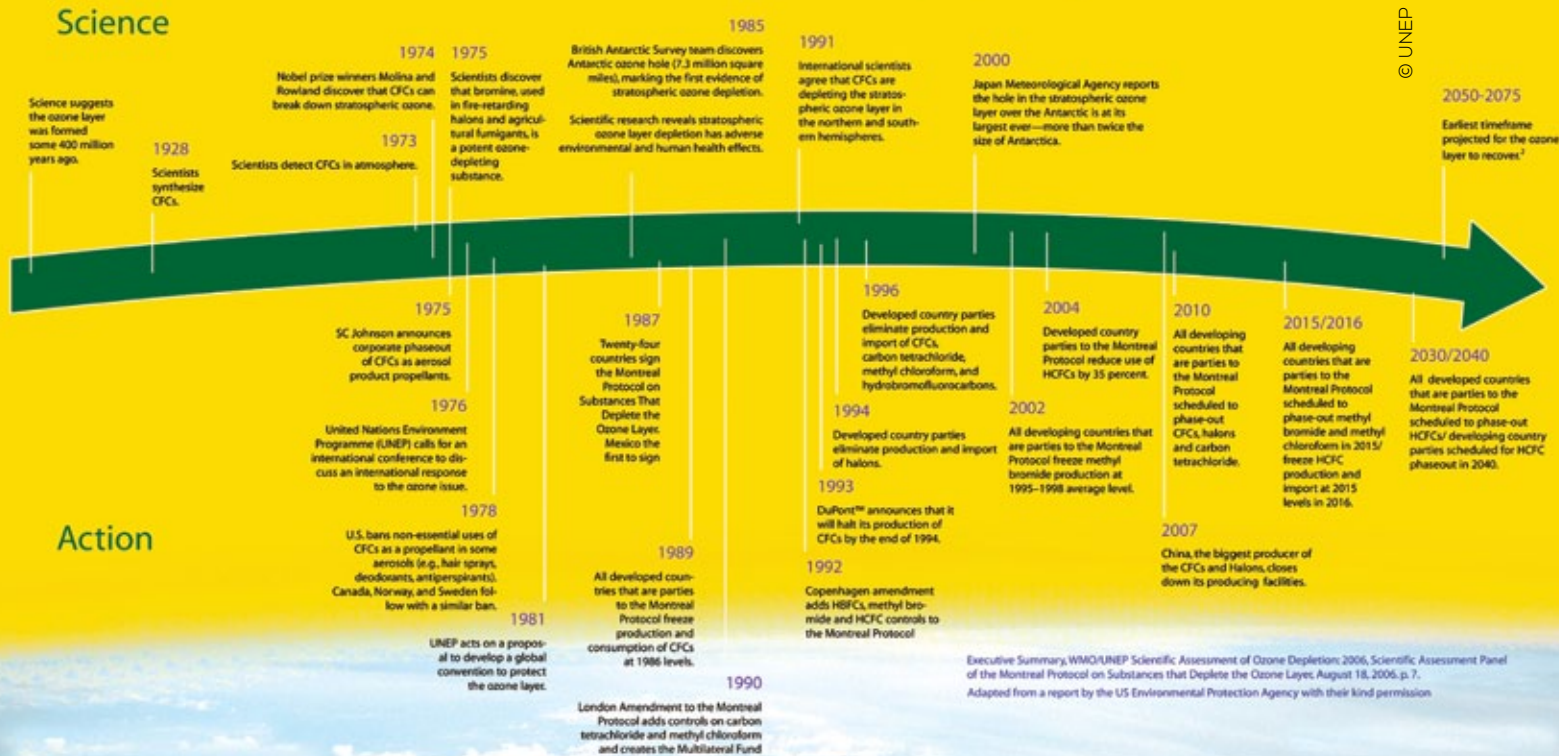
The phase out of ODS, conducted under the Montreal Protocol, is the best example of how the global community can agree on solutions to protect our environment. By 2009, the production and consumption of ODS was reduced by 98 per cent from 1986 levels (UNEP, 2011).

The ODS remain in the atmosphere for a long time. Therefore, each year Antarctica experiences springtime ozone loss due to ODS from previous decades. Predictions suggest that the ozone layer will recover at different rates in different

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a walk through history

© UNEP



regions. The global average ozone layer will return to 1980 levels between 2025 and mid-century, with tiny Antarctic ozone holes likely to persist till the end of the 21st century (WMO, 2011). However, issues remain, related to the capture and destruction of ODS trapped in old equipment.

last two decades, reports from the Intergovernmental Panel on Climate Change (IPCC) tell us that human or anthropogenic emissions of carbon dioxide (CO₂) and other GHGs are the leading cause of present-day climate change (IPCC, 2007). These anthropogenic GHGs are emitted mainly from the burning of fossil fuels in industry, transport vehicles, agriculture, and household energy consumption, as well as cement production and use, deforestation, destruction of wetlands, and thawing of permafrost.

“It’s getting hot in here. There’s too much carbon in the atmosphere.”
www.itsgettinghotinhere.org

CLIMATE CHANGE

When the sun’s radiation reaches the Earth’s atmosphere, some is reflected back into space and some passes through to be absorbed at the Earth’s surface where it is converted into infrared radiation, or heat. This heat would escape back into space, except for the presence of greenhouse gases (GHGs) that absorb the heat and reflect it back to Earth’s surface. This process, called the greenhouse effect, is what keeps our Earth warm enough to sustain life.

The problem does not lie with GHGs but rather with increasing amounts of it that intensify warming and increase the Earth’s temperature. This is known as global warming. Over the

But isn’t warming good news?

Global warming is not good news! We all love warm weather but the warming that we are talking about here is beyond the levels tolerated by many organisms that have evolved over millennia.

Most importantly, the effect of climate change extends beyond temperature increases. It threatens human well-being and international development directly through threats to human health, lack of freshwater and food secu-

DID YOU KNOW?

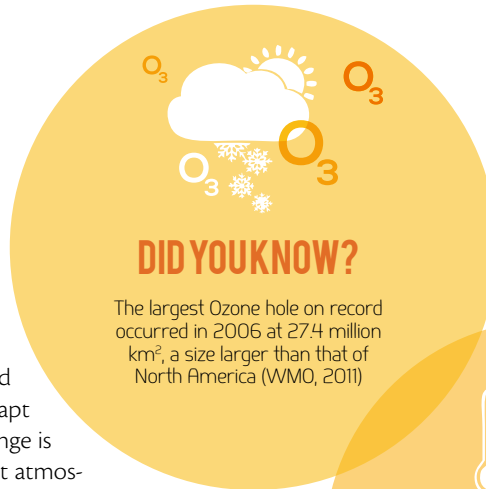
In the USA alone, the Montreal Protocol is estimated to have spared 22 million cases of cataract for people born between 1985 and 2100 and 6.3 million skin cancer deaths avoided up to 2165 (USEPA 2010, USEPA, 1999)

ATMOSPHERE

riety; and indirectly through losses of biodiversity, ecosystem integrity and socio-economic opportunities. Many ecosystems, communities and economies lack the capacity to adapt to the expected effects. Climate change is therefore seen as the most significant atmospheric issue being faced by humans today and by future generations tomorrow.

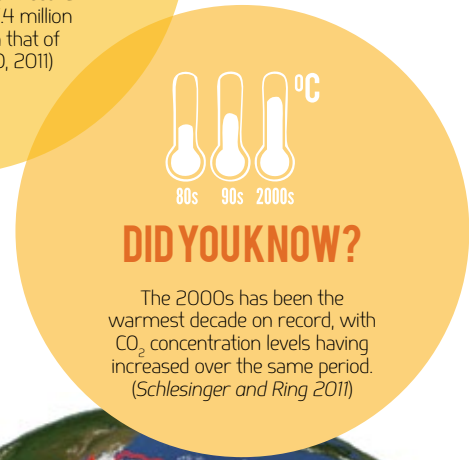
The most visible evidence of climate change has been the melting of up to 40 per cent of the Arctic sea ice over the northern hemisphere summer (NSIDC, 2012). Rapid melting is also evident in Greenland and Antarctic ice (Rignot *et al.*, 2011). As the Earth warms up, significant damage is expected in low-lying areas as a result of sea-level rise and drier conditions in subtropics such as the western Sahel, the Mediterranean, and Northern India (Hulme *et al.*, 1998).

Extreme weather events including heat waves, severe cyclones, heavy rainfall and intense droughts are also expected to become more common (IPCC, 2007). In the last decade, mounting evidence of ocean acidification, resulting from increased ocean absorption of CO₂ from the atmosphere, indicates that many marine species and ecosystems are already threatened by rapidly changing conditions (Fabry *et al.*, 2008).



DID YOU KNOW?

The largest Ozone hole on record occurred in 2006 at 27.4 million km², a size larger than that of North America (WMO, 2011)



DID YOU KNOW?

The 2000s has been the warmest decade on record, with CO₂ concentration levels having increased over the same period. (Schlesinger and Ring 2011)

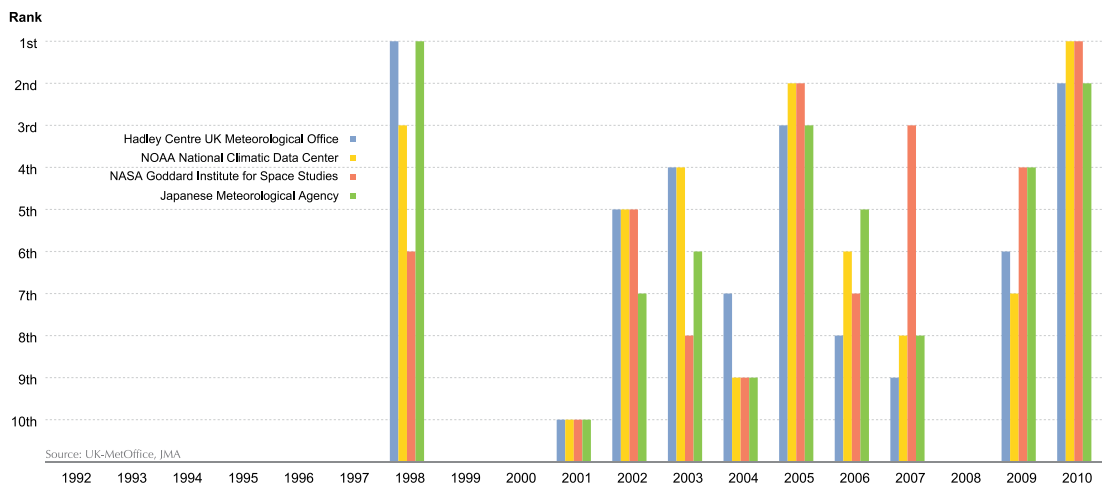


THE MOST VISIBLE EVIDENCE OF CLIMATE CHANGE HAS BEEN THE MELTING OF UP TO

40%

OF THE ARCTIC SEA ICE OVER THE NORTHERN HEMISPHERE SUMMER (NSIDC, 2012).

The Ten Hottest Years on Record
highest rank = warmest year since recording began in 1880





OUR CHALLENGE

Climate change is a complex problem. The problem is that inaction will take us to the climate tipping point of 2 °C – the global temperature increase over pre-industrial levels that, once passed, will lead to catastrophic effects, some irreversible. One such drastic consequence could be widespread permafrost thawing, releasing the carbon stored in frozen soils. This massive release of additional GHGs to the atmosphere could result in runaway global warming (Shaefer *et al.*, 2011; Lawrence *et al.*, 2005).

To prevent this, atmospheric CO₂ concentrations will have to remain below approximately 450 parts per million (ppm). To achieve this, developed countries will need to reduce GHG emissions by 25-40 per cent below 1990 levels by 2020 (IEA, 2010; IPCC, 2007); similarly, developing countries are required to reduce emissions by 15-30 per cent relative to business-as-usual by 2020 (den Elzen and Höhne, 2010; den Elzen and Höhne, 2008). Further reductions will be required beyond 2020 to achieve the target. In short, a series of bold, collaborative efforts is required from governments, businesses, and civil society, including young people, to reduce GHG emissions.

CASE STUDY ▶

Investigative Journalists Gambia

In 2011, six high-school students from Isle of Man, in the British Isles, won a trip to Gambia to see the work that Concern Universal, a development charity, was doing there. When the students saw first-hand the impacts of climate change in Gambia, they realized that climate change is not a mere chapter in their science textbooks. Carbon dioxide emissions produced on one side of the world are causing negative consequences on the other, often affecting some of the world's most vulnerable people.

In fact, climate change was the most influential of many other issues facing Gambia. Two of the most significant impacts of climate change seen in Gambia were:

1. Salinization: rising sea levels are making River Gambia more saline, causing the farmland on the river's banks to become infertile. This is a serious problem because agriculture is Gambia's second-largest industry, and the country lies on the river's floodplain.
2. Desertification: the Saharan winds which blow sand on to the Gambian farmland cause a significant yearly decline of the farmland.

The Gambia trip was an eye-opener to the six students who decided to do something about it back home. Thus, Investigative Journalists Gambia was born.

Firstly, as mitigating climate change will require all individuals to be aware of their environmental impact and take bold steps to reduce their carbon footprint, the six students started by reducing their school's environmental impact.

Secondly, getting all individuals to reduce their carbon footprint will require educating people about the impacts of climate change, both locally and globally. It will require educating people on practical ways of reducing their carbon footprint. Taking the example of their Gambian friends, the six students decided that educating children would be the most effective way of spreading information because they go home and tell their friends and family.

The six students set up an eco-committee to pilot a series of initiatives at the Queen Elizabeth II High School. These aim to cancel out the school's carbon footprint and have climate change on the school's curriculum.

“Global warming is one of those things, not like an earthquake where there's a big bang and you say, "Oh, my God, this really, has hit us". It creeps up on you. Half a degree temperature difference from one year to the next, a little bit of rise of the ocean, a little bit of melting of the glaciers, and then all of a sudden it is too late to do something about it.”

Arnold Schwarzenegger,
Governor of California and
former actor



DID YOU KNOW?

Economists predict that damage from climate impacts may amount to as much as five per cent of world GDP by 2100 and if a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20 per cent of GDP or more (Aldy *et al.*, 2010; Stern, 2007)... (Schlesinger and Ring 2011)

ATMOSPHERE

They include:

1. planting of more than 4,000 tree saplings;
2. setting up a recycling scheme for used batteries;
3. using timers on lights and computers as part of a Switch-on-to-switching-off programme to teach people about the importance of switching off lights and appliances;
4. putting paper recycling boxes in every classroom;
5. setting up an online learning forum, with most homework now being done online;
6. meeting with the local bus corporation to ensure that bus travel remains a viable option for children who had previously been driven to school by car;
7. fundraising for Concern Universal through bake sales, assemblies and talks, a Gambian evening, and more. The money will be used to fund projects that will stop salinization and desertification in Gambia and help people adapt to deal with these problems;
8. educating a wider national community through blogging, appearances on national radio and writing articles for the local press.

Successes include:

1. carbon emissions from transporting students to Queen Elizabeth II High School have been offset by planting trees;
2. 1,104 kg of woodland equivalent have been saved by the recycling of 24,460 newspapers into 615 paper briquettes. Paper briquettes are cleaner-burning than fossil fuels and are used by the elderly in the community;
3. the school's electricity bill has been reduced by US \$ 1,700 compared to April/November 2010;
4. more than US \$ 2,600 has been fundraised for Concern Universal;

5. The school was ranked first out of more than 14,000 schools for sustainable credentials in Pod, EDF's Energy Programme for greener schools in the United Kingdom.

Lessons learnt:

- every single person should do their bit to contribute to the global fight against climate change. You can start from your home or school;
- no action taken to reduce your carbon footprint is small; it eventually adds up to something big;
- education, especially starting at school, is the key to developing a sustainability-based culture.

Dealing with climate change

In 1997, many countries adopted the Kyoto Protocol, an international binding agreement that sets GHG emission reduction targets for industrialized nations. However, despite it entering into force in 2005, anthropogenic GHG levels continue to rise. Most countries will not reach their Kyoto targets. In addition, the present emission-reduction pledges still fall short by a gap of few gigatonnes of CO₂ equivalent in order to keep temperatures within the 2 °C threshold.

Combined short term, medium term, and long term approaches need to be pursued. Carbon dioxide is a relatively long-lived GHG. However, reducing emissions of more short-lived climate forcers will help address climate change in the short term and would allow us time to implement policies addressing longer-lived forcers. Policy and technological solutions already exist.

THE LONG-TERM ACHIEVEMENT OF GLOBAL CLIMATE GOALS WILL ONLY BE POSSIBLE THROUGH THE AGGRESSIVE REDUCTION OF ANTHROPOGENIC CO₂ EMISSIONS.

What are short-lived climate forcers (SLCFs)?

These are substances such as black carbon, methane and ground level ozone that have significant impact on climate change but have a relatively short lifespan in the atmosphere compared to carbon dioxide and other longer-lived gases.

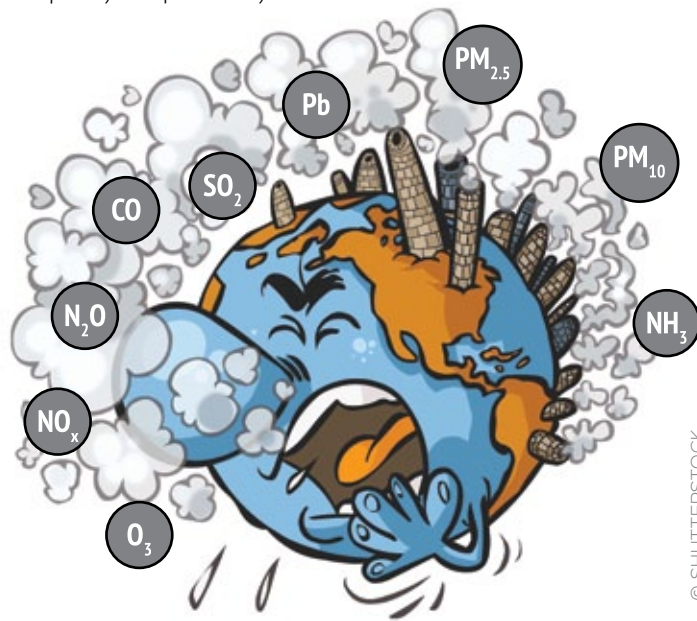
In the medium term, action will also be required at a national level, with pledges to cut emissions based on individual country circumstances. For instance, climate change could be integrated into a government's laws and policies for poverty reduction, improvement of income, health, education, and the general well-being of its people.

Nevertheless, the long-term achievement of global climate goals will only be possible through the aggressive reduction of anthropogenic CO₂ emissions. Additionally, transformative change in society will be required to address the major root causes of anthropogenic GHG emissions, such as the way electricity is generated, the efficiency with which energy and resources are used, and consumption and production patterns. And action has to start now.

AIR POLLUTION AND AIR QUALITY

Atmospheric issues do not only occur on the largest possible scale, as with climate change and stratospheric ozone depletion. Small-scale, localized impacts also occur. While climate change impacts are also felt at a local level, small-scale localized pollution occurs more frequently and pervasively.

“There's so much pollution in the air now that if it weren't for our lungs, there'd be no place to put it all.”
Robert Orben, magician



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POLLUTANT	SOURCE	HEALTH IMPACT	ENVIRONMENTAL IMPACT	WHAT'S HAPPENING NOW
Sulphur dioxide (SO₂)	Burning fossil fuels in: - Power generation plants - Industries - Transport	Respiratory illnesses, mainly due to formation of particulate matter	- Acidification of natural ecosystems (Rodhe <i>et al.</i> , 1995) - Corrosion of buildings (Kucera <i>et al.</i> , 2007) - Biodiversity (Bobbink <i>et al.</i> , 1998) & forest loss (Menz and Seip, 2004)	- Emissions significantly reduced in Europe & North America. - Global SO ₂ emissions will continue to decrease due to global initiatives. - Yet, emissions are likely to keep increasing in East Asia due to growth in industrialisation.
Nitrogen compounds (Nitrogen oxides –NO_x, nitrous oxide – N₂O and ammonia – NH₃)	- Burning of fossil fuel in transport and industrial sectors. - Fertilizers, livestock and other organic matter.	Respiratory and cardiovascular illnesses due to formation of particulate matter and ozone	- Positive: Increase in crop yields and carbon sequestration. (ENA, 2011). - Negative: Nitrogen cascade, i.e. GHG emissions, climate change, biodiversity loss in water bodies through acidification and eutrophication. (Galloway <i>et al.</i> , 2003)	- Nitrogen is increasingly becoming a major environmental threat. - NO _x globally increased until 2000 and remained constant due to a balance between reduction in North America and Europe but slight continuous increases in developing world. - NH ₃ will continue increasing in almost all regions mainly due to it not being a regulated pollutant. - Effective policies and changes in consumption pattern of dairy and meat products are needed.

ATMOSPHERE

POLLUTANT	SOURCE	HEALTH IMPACT	ENVIRONMENTAL IMPACT	WHAT'S HAPPENING NOW
Particulate Matter (PM, commonly referred to as dust and soot)	<ul style="list-style-type: none"> - Emitted both directly and when other pollutants react. - Human activities such as transport, construction, industries, solid waste and crop residue burning. - Natural sources such as wildfires. 	<p>Most health damaging air pollutant, even in low levels. (Carnelley and Le, 2001; WHO 2011).</p> <ul style="list-style-type: none"> - Respiratory and cardiovascular illnesses. - Premature death. - Mainly affects women and children. 	<ul style="list-style-type: none"> - Travels over a long distance in air and settles over land and in water. - Impaired visibility. - Acidification of natural ecosystems. 	<p>Urban/outdoor PM concentrations:</p> <ul style="list-style-type: none"> - Within targets in Europe and North America due to control measures such as improved technology and energy efficiencies, cleaner fuels and filters. - Continue to remain high in Asia, Africa and Latin America due to increased consumption. <p>Indoor PM concentrations:</p> <ul style="list-style-type: none"> - Very high in poor rural areas. - Transition towards cleaner cooking stoves needed.
Ozone (tropospheric and surface ozone)	<ul style="list-style-type: none"> - Reaction of pollutants NO_x, carbon monoxide (CO) and volatile organic compounds (eg. methane) in sunlight. - Largely sourced from human actions. - Transported from the stratosphere. 	<ul style="list-style-type: none"> - One of the most health-damaging air pollutants after particulate matter (UNEP, 2012). - Respiratory illnesses, including permanent lung damage (Royal Medical Society, 2008). 	<ul style="list-style-type: none"> - Most important air pollutant causing damage to vegetation. (Ashmore, 2005; Emberson <i>et al.</i>, 2009). - Reduced crop yields. - Losses in forest productivity. - Third most important GHG (IPCC, 2007). - Ecosystem losses. - Reduced carbon sequestration. 	<ul style="list-style-type: none"> - High ozone levels are found in regions experiencing high levels of emissions and solar radiation. - Peak concentrations are decreasing in Europe and North America but being offset by increasing background ozone. - Concentrations increasing in other regions of the world, mainly Asia. - The growing interest in ozone as an SLCF makes it a pollutant of particular interest for policy intervention.
Lead	<ul style="list-style-type: none"> - Biggest source is lead in gasoline (WHO 2010). - Other sources include paints and pigments, e-waste, cosmetics, toys, medicines, contaminated food and drinking water systems. 	<ul style="list-style-type: none"> - Mainly in children. - Brain and central nervous system damage (lowered IQ, convulsions and even death). - Damage to immune, reproductive and cardiovascular systems (WHO, 2010). 	<ul style="list-style-type: none"> - Accumulation in soil and freshwater systems. - Low biodiversity and reproductive rates in aquatic life. - Neurological effects in fish and other vertebrates. 	<ul style="list-style-type: none"> - Lead removed from gasoline globally except in six countries, but complete elimination is expected within a few years. - Lowered lead levels in children's blood. - Lead from other sources, such as paint, remains to be tackled globally.

It is estimated that annually deaths of about 3.1 million people worldwide are attributed to **air pollution** which is more than other environmental risks combined. Ozone causes an estimated 700,000 respiratory deaths globally each year, more than 75 per cent of which are in Asia (WHO, 2009; Anenberg *et al.*, 2010).

CASE STUDY ▶

Project Jatropa



Adarsha Shivakumar and Apoorva Rangan are two young siblings from USA who visit their grandparents in India frequently. When they visited villages in the Hunsur Taluk area in South India, they realized that many farmers grow tobacco as it is one of the few crops that generates income therefore them. However, the processing of raw tobacco leaves in the kilns (barns) requires firewood. This has forced farmers to cut down the tree cover and forests. The processing of the tobacco leaves therefore produces a large amount of carbon dioxide and other pollutants.

There are other problems associated with tobacco cultivation. The Indian government signed the World Health Organization Frame-



work Convention on Tobacco Control, and aims to cut tobacco cultivation by half by 2020. Farmers feared that the compensation being offered by the government for moving away from tobacco cultivation may not last for long. Therefore, an alternative commercial crop had to be found.

Jatropha curcas, a small perennial shrub with oil-rich seeds was the answer. The plant meets the four criteria that any biofuel should meet: it must have a large positive energy input, not destroy biodiversity rich land, must not release large amounts of CO₂ when grown, and must not solve one problem only to create another.

In December 2007, Adarsha and Apoorva co-founded Project Jatropha, an international non-profit collaboration. They facilitated a collaboration between Labland Biotech, a plant biotechnology company located some 45 kms from the villages where tobacco is grown, and with Parivarthana, an NGO working in rural poverty alleviation, environmental protection, and sustainable rural development. Project Jatropha aims to combat climate change, environmental degradation and poverty in developing countries using the plant Jatropha curcas as an environmental-friendly and economically sustainable source of biofuel.

What they did:

1. Held several town-hall meetings with farmers to introduce Project Jatropha and train them in the agronomics of jatropha.
2. Organised tours for interested farmers to Labland Biotech to see jatropha planting and the extraction of biofuel, as well as facilitate a Q&A between the Labland scientists, field workers from Parivarthana and farmers.
3. Purchased 13,000 jatropha seedlings from Labland Biotech and distributed them to 40 farmers from two villages.
4. Purchased the jatropha seeds harvest at market price, extracted the biofuel at Labland Biotech and distributed it to the farmers of two neighbouring villages. The biofuel was used by farmers to fuel their irrigation pumps as test runs.
5. Involved youth from 33 rural schools and 268 farmers from 14 villages in planting 23,000 useful tree saplings, including teak, pongamia, neem, moringa and silver oak.

Successes include:

- 1 farmer has agreed to participate in the next phase of the project following successful test runs;

Project Jatropha aims to combat **climate change**, environmental degradation and poverty in developing countries using the plant Jatropha curcas as an environmental-friendly and economically sustainable source of biofuel.

ATMOSPHERE



- 2 13,000 jatropha plants given to farmers have produced seeds and income for the farmers who could no longer rely on tobacco as their cash crop, and thus reduced deforestation;
- 3 assuming each jatropha plant produces 2.5 kg of seeds, the total seed yield would be around 30,000 kg. As jatropha seeds are 30 per cent oil, more than 10,000 litres of biofuel can be produced annually. By producing a clean alternative fuel that has a high demand, Project Jatropha can help alleviate GHGs.
- 4 a mature jatropha plant is a carbon sink – just two plants absorb a tonne of CO₂ each

year. The seedlings provided will remove 6,500 tonnes of CO₂ annually.

Lessons learnt:

- solutions to climate change exist in every sector. For instance, Project Jatropha farmers can be the part of the climate change solution;
- collaboration is the key to solving any problem. By providing alternatives and inspiring others, you can generate greater changes towards sustainability than you would on your own.

POLICY OVERVIEW AND ANALYSIS

The atmospheric issues addressed here are closely inter-related. For instance, ozone emission causes both air pollution and climate change whereas the use of some compounds designed to replace ODS actually act as GHGs. Yet, most governments address these atmospheric issues separately, mainly because goals were set this way many years ago when the intricate

relationships among elements of the Earth System were poorly understood. This presents a risk of different atmospheric policies working against each other.

Major goals for the protection of the environment and human well-being for atmospheric issues were established as long ago as 1992's *Agenda 21* and 2002's Johannesburg Plan of Implementation (see table below). To reach these internationally agreed goals today, integrated policies will be needed.

Internationally agreed goals set for atmospheric issues

LEVEL OF PROGRESS	ATMOSPHERIC ISSUE	AGREEMENT	REASON FOR PROGRESS OR LACK OF PROGRESS
Good progress	Stratospheric ozone depletion	Vienna Convention	- High concern - Low complexity - Low-cost solutions - Benefits exceed cost
		Montreal Protocol	
Some progress	Air pollution and air quality - Sulphur pollution - Nitrogen compounds - Particulate matter (PM) - Tropospheric and surface ozone - Transboundary air pollution	WHO Guidelines	- High concern - High complexity and high-cost solutions for PM and tropospheric ozone - Some regions better equipped than others
		EU Directives	
		Long-Range Transboundary Air Pollution (LRTAP) Convention / Gothenburg Protocol	
Very little to no progress	Climate change	United Nations Framework Convention on Climate Change	- Mixed concern - High complexity - High-cost solutions - Inadequate level of pledged GHG reductions - Long lead times between actions and benefits
		Kyoto Protocol	
		Cancun Agreements	
		EU 20-20-20 Targets	
		Durban Agreements	



DID YOU KNOW?

Millennium Development Goals (MDGs) affected by atmospheric issues

MDG	GOAL	ATMOSPHERIC ISSUES AFFECTING THE MDG
Target 1c	Halving proportion of people suffering from hunger by 2015	Climate change Air pollution (tropospheric ozone)
Target 2a	Achieve universal primary education by 2015	Lead exposure
Target 4a	Reduce child mortality by 2015	Indoor air pollution Lead poisoning
Target 7b	Reduce the rate of biodiversity loss by 2010	Climate change Air pollution (nitrogen and tropospheric ozone)

YOU(th) can make a difference

Air pollution and climate change, primarily caused by burning fossil fuels, will not be solved unless bold steps are taken by governments, businesses, and individuals. As equal partners and the beneficiaries or victims of decisions made, you(th) play a crucial role in tackling atmospheric issues.

1. Reduce your carbon footprint to sustainable levels

Your carbon footprint is the effect that your daily activities have on climate change, in terms of CO₂ equivalent units. Governments can sign policies to reduce GHGs, but reduction targets cannot be reached unless action is taken individually. Currently, the average individual carbon footprint is being exceeded in most regions around the world. Keep track of yours, using a carbon footprint calculator. A number of general and country-specific calculators are available online. After all, to manage you need to measure.

2. Opt for ethical and sustainable consumerism

Consume only what you need and avoid any form of waste. Also, use your consumer power to favor environment-friendly products and eat less meat. If people do not purchase a product, manufacturers will stop producing it.

2. Be energy-efficient

Energy efficiency adds up to an additional source of fuel. It can help businesses save on overhead costs in heating, air conditioning, refrigeration, transportation, etc. and saves you money at home. So, whether at your house, school, or office, use energy efficient appliances and unplug all electronics when you're not using them.

3• Educate others about climate change and air pollution

Saving the world requires well-informed citizens. Use figures, facts, and a hands-on approach to educate your family, friends, and communities about the climate crisis. Maybe even write an article for a newspaper. Knowledge is power.

4• Lobby governments and corporations

Young people around the world, just like you, are standing up to politicians and polluters. Demand that governments pursue positive policies on climate change. Ask them to include young people in such decision-making processes. Similarly, ask corporations to publish their carbon footprints and to reduce their contribution to environmental threats, especially climate change.

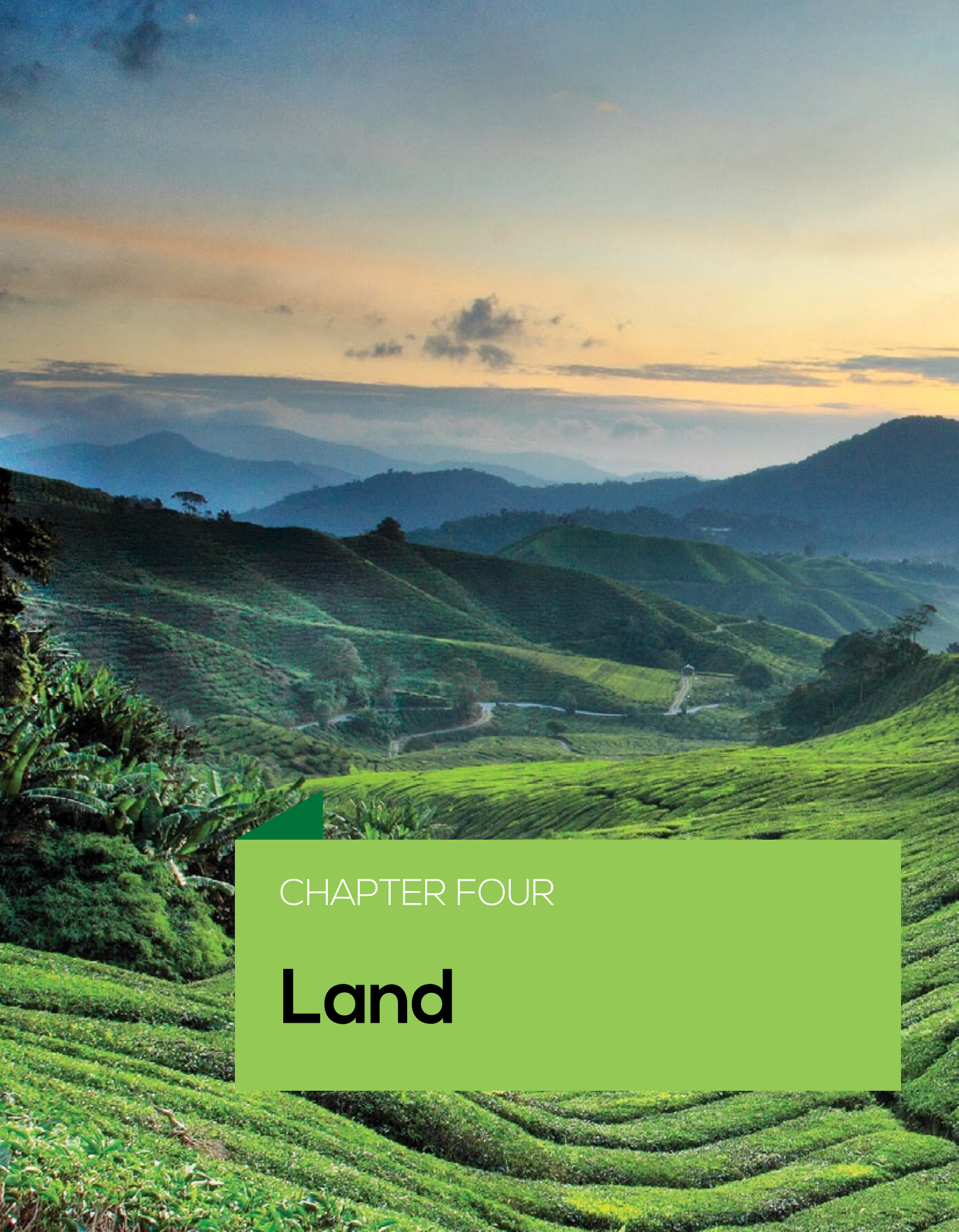
“Your **carbon footprint** is the effect that your daily activities have on climate change, in terms of CO₂ equivalent units.

OZONE CAUSES AN ESTIMATED

0.7
MILLION


RESPIRATORY DEATHS GLOBALLY PER YEAR

(ANENBERGET AL., 2010)




CHAPTER FOUR

Land



If you take a few moments to sit outside and look around, you will realise that our planet is full of life, differences and beauty. Earth is comprised of several different landforms ranging from deserts to grasslands and swamps. Deserts can be made of ice as well as sand. The rainforests are home to thousands of animal and plant species. Water can be found in many forms ranging from vast oceans to fresh lakes.

Every day, we are learning more about how our planet's different land uses are interconnected and this system works to support life in ways that we have ►



LAND

► not completely understood. Although we now have the ability to go further, deeper and higher than ever before, we haven't finished exploring all the mysteries on the planet we occupy. But are we running out of time?

Land is a key part of the Earth System. It is where we live, increasingly in growing concentrations in cities. Land is where we grow or graze what we eat. It sustains trees that produce the oxygen we need to breathe and stores the CO₂ that would otherwise be released to the atmosphere.

In 1992, if the world were divided into 32 equal parts, fertile land would have made up only one slice (UNCCD, 2012). Since then, we have continued to exploit our soil, and this means there is less land that is useable. Rapid urbanization has been accompanied by higher consumption of water and energy and by increased carbon emissions. The production of meat, fish, and seafood has risen faster than the global population, reflecting changes in diets associated with higher purchasing power.

The idea of food security encompasses more than whether enough food is produced. It includes whether people have access to and can afford food. No matter where you live, there are hungry people. Most developed countries have homeless people or families who are under-nourished. Just making more food available doesn't solve the problems. The answer isn't as simple as producing more food

“What we are doing to the forests of the world is but a mirror reflection of what we are doing to ourselves and to one another.”

Mahatma Gandhi

and building better shelter for everyone. Our planet is suffering. For example, the soil is deteriorating, eroding and we are cutting down the trees that support ecosystems and protect our land from erosion.

Today, one out of every five people lives on degraded soil or land (UNCCD, 2012). This means that the land can grow less and fewer animals can live off it. Our changing lifestyles are becoming more and more unsustainable, populations are concentrating in cities and demands on our natural resources rise in step.

The Earth has limits. There are signs that we will reach ours. But what does this mean from a land perspective?

SOME NATURAL RESOURCES TO PROTECT

We use land for many different purposes and it has many different forms. It is hard, if not impossible, to replicate the natural benefits our habitat offers. The following three examples show why you should care about land and why we all need to protect existing ecosystems.

Forests

Forests are a source of fuel, food, fodder, timber, security, and employment. They provide shelter and habitat, medicine and clean water, carbon storage and nutrient cycling. They are vital for a stable global environment.

Forest loss is alarmingly high. Every year, we are losing forest area the size of Costa Rica to short term benefits like timber extraction or conversion to farms or to build houses and other infrastructure (FAO, 2010). But long term values do not seem to be considered. Our forests provide ecosystem services like CO₂ absorption and flood control that save millions of dollars. The highest losses of tropical forest are in South America and Africa.



DID YOU KNOW?

Around 1,150 gigatonnes of carbon are stored in forests – almost half of all terrestrial carbon and around 35 per cent more than carbon present in the atmosphere (Parish et al. 2008, Ravindranath and Oswald 2008).

There are many reasons why we continue to lose forests. These include poverty, economic growth, land pricing, globalization, insecure rights of local people, and incomplete valuation of forest ecosystems (Lambin *et al.*, 2001; Carr *et al.*, 2005).

But are the reasons good enough, considering that the richness of an indigenous forest – one that has existed for thousands of years – cannot be replaced simply by planting new trees?

CASE STUDY ►

Forest Fire!

The forest is vital to the people of Rustay in Russia – they live in wooden houses, warm themselves by burning wood and wash in wooden bath houses. Most gather mushrooms and berries from the forest, too.

In 2010, 50 per cent of the 20,000 hectare national reservoir forest and 5 per cent of all regional woodland burnt; in all that year Russia lost around 10.7 million hectares of forest to fires (PHOTO: Satellite image of forest fire // photo of forest fire). This was not just a story on the news for the youth in the area. Their forest was burning, animals and people were dying, and many lost their homes. The youth who started the Forest Fire! project were really lucky – the fire stopped just 7 km from their homes. But it motivated them to take action.

First, to re-establish the burnt forest, they planted 25,000 seedlings. But they thought it was important to conduct research, monitor the forest ecosystem particularly its butterfly biodiversity, start a climate investigation, and do sociological research.

This involved a survey that had some shocking results. Despite 10-years of meteorological data showing a temperature

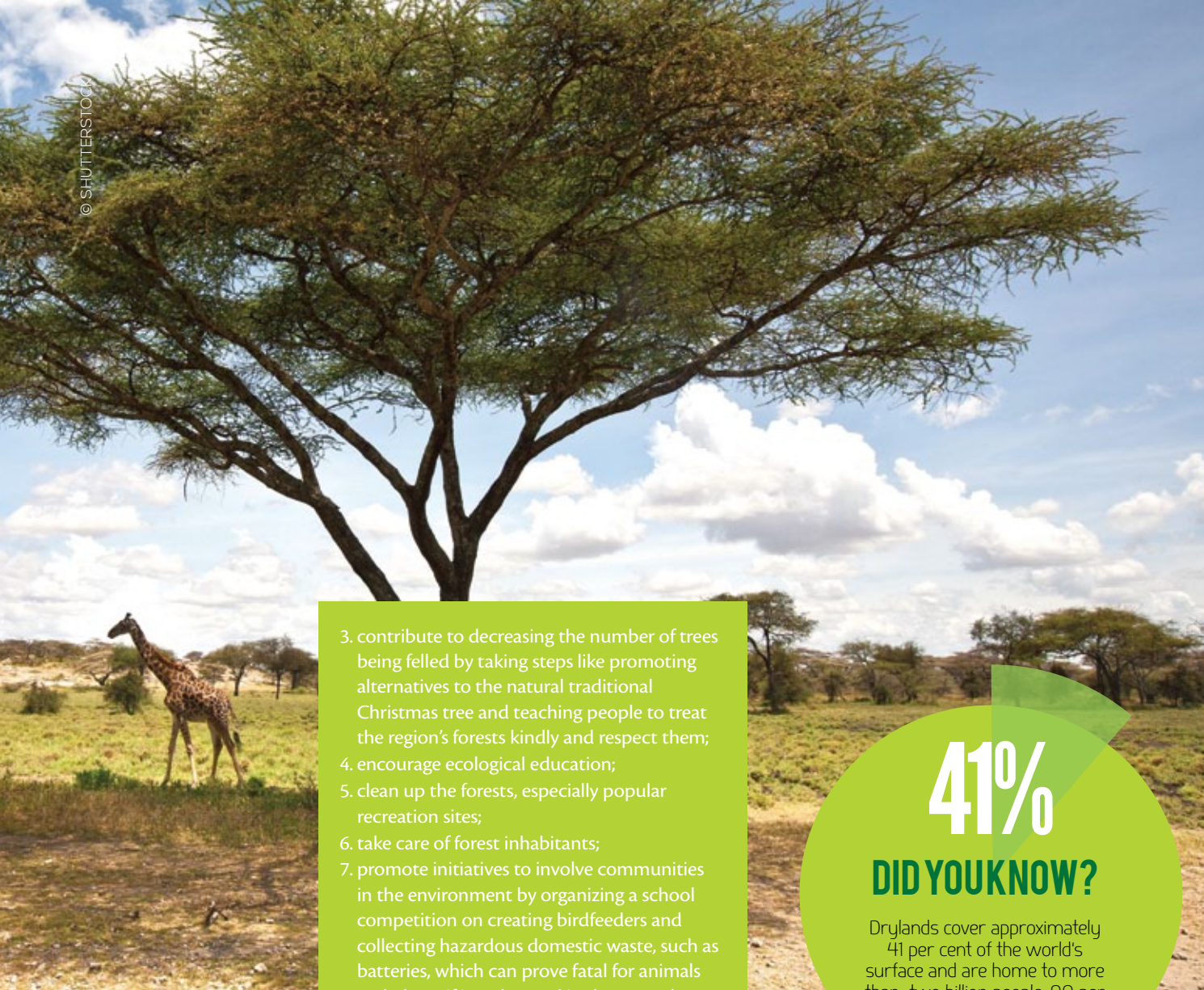
increase of 1.5 oC, the majority of those from the Nizhny Novgorod who responded to a questionnaire didn't believe in climate change and only 30 per cent had heard of sustainable development. The Forest Fire! team also observed changes in seasonal dynamics of butterfly activity, and noticed southern butterfly species which were new to their area. This concerned them as a temperature rise meant that it was more likely that forest fires would increase in the future.

The youth in the area really wanted to support their forest. To them, this meant that they wanted to increase forest area, to decrease consumption, and to protect it and its inhabitants). Under the theme of 'Russian forest', they organized a photo competition, street action, exhibitions and an interschool birdfeeder competition, which resulted in 200 birdfeeders being located in the woods.

They decided that they had to start by changing themselves, taking responsibility for things like everyday waste treatment and recycling as much as possible. Their first step was to recycle 8,100 kg of waste paper, saving 81 trees. They inspired regional schools to set up recycling enterprises and organize periodical waste paper collections from schools. A hazardous domestic waste collecting point was set up to protect soil, animals and plants from batteries being thrown out into the forest.

But they decided that this was not enough. They agreed that their goals were to:

1. restore woodlands by planting new trees in burnt areas and encourage their community to get involved;
2. decrease number of trees that are cut down. They decided that this could be done by increasing the waste paper recycling;



3. contribute to decreasing the number of trees being felled by taking steps like promoting alternatives to the natural traditional Christmas tree and teaching people to treat the region's forests kindly and respect them;
4. encourage ecological education;
5. clean up the forests, especially popular recreation sites;
6. take care of forest inhabitants;
7. promote initiatives to involve communities in the environment by organizing a school competition on creating birdfeeders and collecting hazardous domestic waste, such as batteries, which can prove fatal for animals and plants if just dumped in the natural environment.

One of their biggest successes was when the Legislative Assembly deputies followed their example, planting trees in burnt down areas rather than just in the city.

Lessons learnt:

- be inspired and pick a cause that affects you or your community;
- don't limit your horizons; you can learn a lot in doing your project that will open up more opportunities;
- young people can make a big impact at a local level;
- just a year's project can have a long term impact and will affect the global environment for years to come.

41%

DID YOU KNOW?

Drylands cover approximately 41 per cent of the world's surface and are home to more than two billion people, 90 per cent of whom live in developing countries (UNEP 2007)

DRYLANDS, GRASSLANDS AND SAVANNAS

Grasslands range from very dry, almost desert-like types, to humid ones. Savannas are mixed tree-grass ecosystems, ranging from almost treeless grasslands to closed-canopy woodlands that occupy large areas in the tropics and subtropics, particularly in Africa, Australia and Latin America. If we do not work to conserve or improve our drylands, then they could become deserts – shifts in weather patterns may reduce rainfall and the demands we make on our land may disrupt natural plant growth.

Wetlands

The value of ecosystem services provided by naturally functioning wetlands, including flood control, ensuring shoreline stability and water purification, is often much greater than the perceived benefits from converting them to intensive uses such as shrimp farming. Coastal wetlands additionally provide protection services and reduce the severity of the impact of storms. Wetlands can also contribute to poverty reduction by providing local people with income from fishing and tourism.



on natural resources such as water and biodiversity. As local fish stocks decreased, fishing became more difficult and the bad economic situation led to members of their families leaving school, moving to cities or emigrating to find work. The friends decided that they had to use the water in efficient ways to try and solve this issue. And designing a project to save their hometown's economy in an environmentally sustainable way.

The team decided to breed the Mayan Apple Snail, using 25 aquaculture-hydroponic (aquaponics) pools. These optimize the use of water by creating artificial wetlands in which the team combines aquaculture, breeding aquatic creatures, and hydroponics, growing crops in just sand and water that contains all the necessary nutrients.

When the snail is born, it is just 2mm long, but doubles in the first four weeks and after four months the snails are the perfect size to be sold as pets. But this isn't a normal pet, once it is 11 months old, the snail can be eaten and their shells used for handicrafts including jewellery.

CASE STUDY ▶

Pet snail?

Yucatán's coastline is one of 10 important national wetlands in Mexico but unfortunately it is polluted and its biodiversity endangered. The Mayan apple snail (*Pomacea flagellata*) used to live in the south east of Mexico, especially in Peninsula de Yucatán, where in Mayan times it was also eaten. Twenty nine friends, ranging from 3-17 years old, realized that their towns' development depended



**COASTAL WETLANDS
PROVIDE STORM
PROTECTION SERVICES
AND REDUCE THE
SEVERITY OF**

IMPACTS

**FOR EXAMPLE,
HURRICANES IN THE
UNITED STATES**

LAND

At the moment, the team is producing 5,000 snails, 1,000 fish and 500 plants for food, handicrafts and pets using pools containing 900 litres of water. As this water is also safe for animals it is not thrown away but used for their livestock to drink.

Some of team are back at school and only spend their spare time on this project, but they are all saving money and helping their families.



Their project has evolved since it began and in the process has protected the native biodiversity of their wetlands. The projects phases were:

1. aquaculture training, 2005-2007;
2. rescuing native biodiversity from the wetlands, 2005-2008;
3. installing pools to breed fish, snails and plants, from 2006;

4. training children in workshops, from 2005;
5. selling, from 2007;
6. including hydroponics, from 2008.

There are now more child-partners than at the beginning and the project is starting to get recognition from the authorities. The partners are all able to help their families with some money, and profits from production also enables them to pay for transportation to go to school. As news has spread of their success, some of their mothers have become interested.

Although these young people are from five different towns, they have managed to work together. Before the project started there was no jobs or activities that could bring about positive change. Now, this group has proved that young people can be sustainable entrepreneurs and should be taken seriously even if they have no experience. Today more families want to copy the project, or adapt it for other states and countries.

Lessons learnt:

- it is possible to combine conservation efforts with entrepreneurship as long as you are ethical and keep your original goals in mind;
- it is possible to combine a passion for the environment with making money.

POLAR REGIONS

The Arctic plays an important role in the global carbon balance. Its frozen soils contain large deposits of organic carbon while the Arctic's tundra and boreal forest ecosystems act as a sink for carbon. The release of this into the atmosphere in the form of both methane and CO₂ is an important consequence of thawing soil and degraded forests, and is likely to represent a substantial source of increased atmospheric carbon over the next century as the Arctic is now experiencing some of the most rapid warming on the planet. You can read more about this in the Biodiversity chapter.

INTERVIEW: Polar regions

We talked to Joey (18), Michael (19), Cassandra (18) and Andrew (19), about their motivation in actively campaigning for the polar regions. Here's what they had to say:

Why should young people care about the polar regions?

Cassandra: The polar regions are some of the last true pristine wilderness on our planet, yet they too have been touched by mankind. Changing temperatures up north are resulting in drastic changes to the way of life of the Inuit, the flora and fauna of the north, and of course the ice at both poles. These regions are the first to experience the impact of climate change. Everyone will someday be living with the consequences of what is occurring there now.

The northern indigenous people understand how to live sustainably and this sustainable lifestyle is under threat from the desire to extract natural resources in the Arctic. Youth need to be made aware now while we can still affect the future.

Open your eyes to the spectacular beauty of nature around us and reconnect with the outdoors. When connected with nature, people pay more attention to living a sustainable life and protecting the planet. You can make a difference in the world, and bring about awareness on the need to protect our planet.'

Michael: Young people should care about the polar regions for two main reasons, the first being they are incredibly sensitive and iconic wildernesses and problems in the Arctic act as indicator of larger global problems.

Everyone in North America, if not around the world, is familiar with images of the enigmatic polar bear, blue whales, humpbacks and penguins. To lose these regions would be to lose one of nature's most beautiful ecosystems. From a purely aesthetic perspective, to lose the Arctic is to lose one of the most magnificent places on Earth. The sense of adventure, which is such a critical part of human nature, is no doubt dependent on wilderness such as the polar regions. To lose the Arctic is also to lose a part of who we are.

Young people should care because any change in the remote parts of the polar regions signals larger global problems. The Arctic is also showing higher and higher



concentrations of toxic chemicals and elements. This is also a warning to the world about other pit-falls of industrialization.

It is for these reasons that the polar regions should be at the forefront of the thought of today's youth. It is for both the aesthetics and the signal of problems to come that the polar regions are critical.'

How can youth get involved?

Joey & Michael: 'We are currently seeking ambassadors from Arctic nations to work alongside other ambassadors from their country to reach out to their Arctic delegation and demand greater youth representation. Please contact Joey at me@joeyloi.com for more information or if you have any questions.

Our goal is to attach a small group of youth representatives to each permanent participant's delegations. This will hopefully bring a new perspective to the council's discussions.'

Andrew: There are many ways youth can join us in taking action. Some ideas include learning more about sustainable development in the polar regions, participating in a Students on Ice Expedition (www.studentsonice.com) or watching a film about the polar regions such as: March of the Penguins; Qapirangajuq (Inuit Knowledge and Climate Change); or Frozen Planet: On Thin Ice. Even better, read a book about the polar regions such as Antarctica: A Call to Action by Sebastien Copeland or The Vanishing Arctic by Bryan and Cherry Alexander.

You might have fun measuring your ecological footprint: <http://footprint.wwf.org.uk/>

and you can use it to reduce your ecological footprint: <http://www.davidsuzuki.org/what-you-can-do/reduce-your-carbon-footprint/>

You can also send an email or letter to your government representative explaining why the polar regions matter to you.'

“The **polar regions** may seem like distant places, but our future – your future – depends heavily on the sustainability of the polar regions. That is why it is so important for us to care about the polar regions, to speak up and to act to ensure a sustainable future for the polar regions.



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THE NEW TRENDS IN LAND USE

Meeting the global need for food will be one of the most important challenges of this century, but how can we eradicate extreme hunger and poverty for a growing population without destroying our environment and meeting our other needs?

Agriculture

The need and potential for improvement in land use is greatest within the agricultural sector, since approximately 70 per cent more food will need to be produced by 2050 to cope with growing population and dietary changes. Examples of some problems facing agriculture include:

1. shifts from small household farms to large industrial units producing soy, meat and dairy products, palm oil, sugar cane;
2. land degradation;
3. increasing demand for meat;
4. price fluctuations;
5. extreme weather such as storms, droughts and floods.

Biofuels

Our need to switch to renewable energy sources and cut GHG emissions has led to policies that promote the use of biofuels. However, recent research shows that the GHG balance of crop-based biofuels varies widely depending on types of crops grown, location of crops, and methods of production. The emerging pattern is of large-scale, industrial monoculture that does not enrich local biodiversity, but does provide ecosystem services

including timber, carbon and water storage and soil stabilization.

Once land-use change is taken into account, biofuels' carbon balance often becomes negative, meaning that more carbon is released through their production and use than the equivalent amount of energy from fossil fuels (Fargione *et al.*, 2008; Searchinger *et al.*, 2008, Melillo *et al.*, 2009). Land-use changes to produce biofuel crops have been linked to deforestation, for example in Indonesia, and to water stress.

Biofuels are not all bad. Under certain conditions, community-based biofuel production for local consumption can have some desirable effects – for example, in Brazil some small-scale farmers produce fuel for their own vehicles and equipment (Fernandes *et al.*, 2010). For biofuel to be considered effective, the energy gains must counterbalance its production and use in terms of GHG reductions, preserving biodiversity and maintaining food security (Tilman *et al.*, 2009).

Cities and urbanization

The world's population is now evenly divided – around half of us live in towns and cities, and the number of urban people is increasing due to migration of rural populations (DeFries *et al.*, 2010). This is happening fastest in developing nations where two-thirds of the population will be urban by 2050, with more than 70 per cent of China's and 50 per cent of India's people living in cities (Seto *et al.*, 2010). As a result, managing the urban environment is a great challenge for many governments, organizations, and communities.

Large cities, which cover 0.5 per cent of the planet's surface (Schneider *et al.*, 2009), can give for young people more options and opportunities, but they also raise a number of issues. There may not be the infrastructure to cope, resulting in a lack of access to such basics as water and sanitation, which can have health implications. For reasons of trade, cities tend to be in coastal areas and their growth can lead to the destruction of sensitive and important ecosystems such as mangrove swamps, beaches, and reefs. It also means that they are vulnerable to rising sea levels and



TWO-THIRDS OF THE POPULATION IN DEVELOPING COUNTRIES WILL BE

URBAN

BY 2050
(UNDP)



© SHUTTERSTOCK

the associated salt water incursion, and increased storm frequency and intensity – all linked to climate change (Seto *et al.*, 2010). And rapid urbanization means that not everyone can find a job immediately and the poor are especially vulnerable to the environmental problems associated with cities.

With high population densities, the demand for resources and finished goods to be transported from other areas increases, while demand for fresh agricultural products puts very high pressures on surrounding agricultural land.

What can we do?

There are no easy solutions for these complex problems, and single and isolated actions might achieve only limited positive outcomes rather than broad solutions. Here are 5 suggested actions (UNEP, 2012):

1. think about the whole food chain. Improving transport, storage, and distribution of food is a small change that can make a big difference. If possible, encourage innovative approaches to food production, such as urban agriculture, to shorten food supply chains;
2. raise awareness to try and change behaviour patterns in wealthier societies where a lot of food is wasted in supermarkets and homes;
3. campaign to remove artificial food pricing that make unsustainable or unhealthy food cheaper than food locally grown. Change what the food costs to make and this will result in us being healthier too;
4. instead of cutting down more forests or destroying wetlands, use land that has already been converted like pasturelands;

5. limit biofuel production to degraded lands or areas with soils not suitable for food production;
6. hold governments accountable for the way they treat your natural resources. It is your future after all.

YOU(th) can make a difference

The changes you make as the current generation will ensure that the next generation will have a future, but we all need to start making changes now. As an individual, there are some things that you can do:

- 1 Whenever possible, eat food that is in season and locally grown.
- 2 Run a campaign or create an environmental club with your friends in your school or community to promote awareness and involvement.
- 3 Compost your food waste and use this as fertilizer in your garden. Yes, you can grow things like vegetables!
- 4 When buying food, don't insist on perfect-looking fruit or vegetables as they are more likely to have a higher pesticide residue.
5. But you are innovative; you understand your community more than anyone else and can see the needs. Can you think of better ways to actually make a positive change? Jot them down in Section 3 and put them into action.
- <http://footprint.wwf.org.uk/>
6. Send an email/letter to your government representative about why the polar regions matter to you.

But you are innovative; you understand your community more than anyone else and can see the needs. We hope can think of better ways to actually make a positive change...and we hope that you will put it into action.

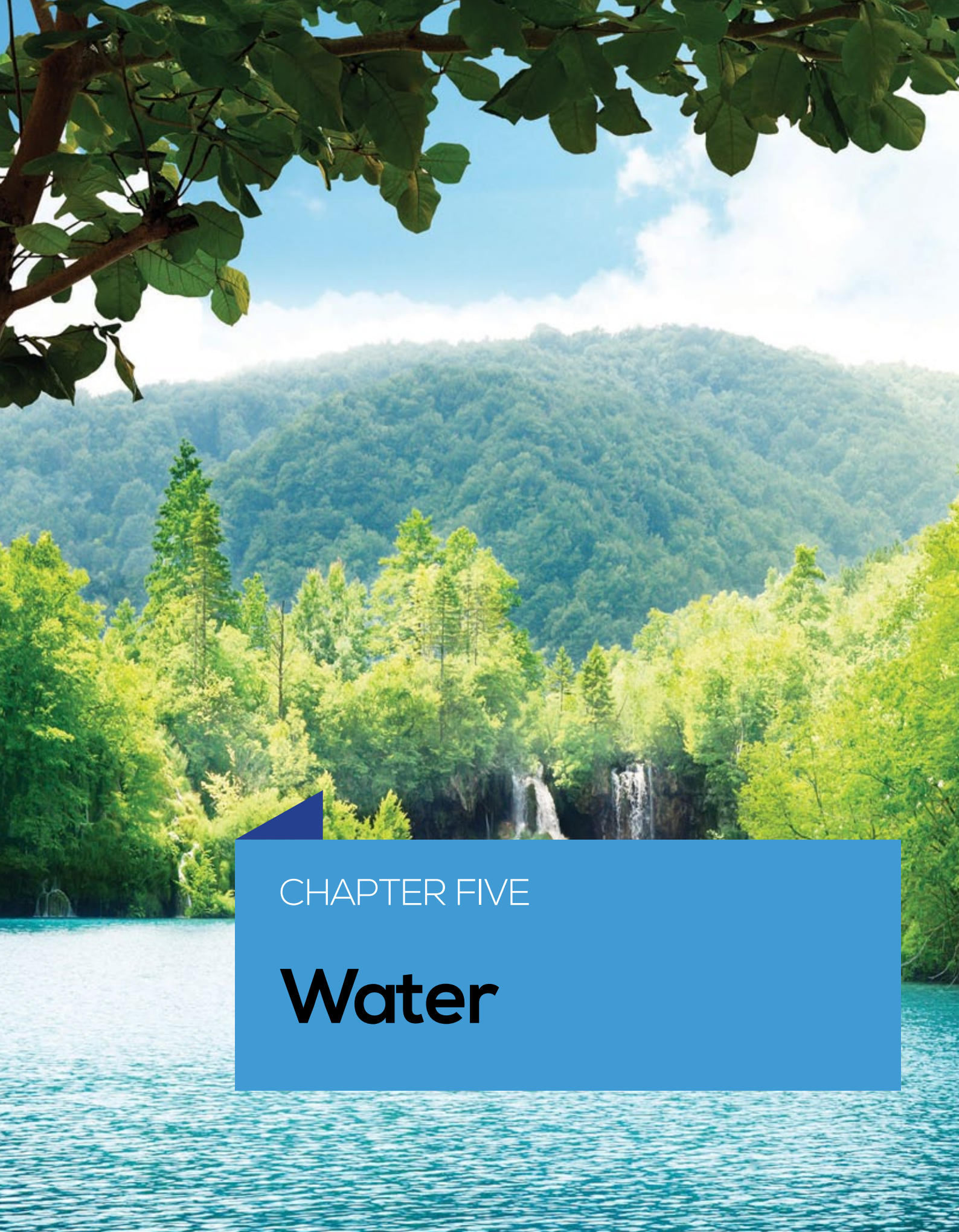


LARGECITIESFORM

0.5%

OF THE PLANET'S SURFACE

(SCHNEIDER ET AL. 2009)



CHAPTER FIVE

Water

Try to imagine life without water – it's impossible. Water can be found in many forms ranging from vast oceans to freshwater lakes. Water impacts all our lives and it links all our Earth's systems. Water is in what we eat, drink, breathe, wear and touch.

Water is a natural resource that we cannot replicate. Oceans control the Earth's temperature, chemistry, currents and make the Earth livable. We, and all living things on our planet, rely on water to survive, but climate change is going to have a large impact on it. ▶

WATER

► Climate change and water security are linked. You can see it in the shifting patterns of rainfall, floods, droughts and the increase of natural disasters, higher sea levels and extreme weather.

If we want to imagine – or even have – a future, then we must protect our oceans and we must plan how we use our existing freshwater. Do we really want to wait for a crisis before we act?

**OF OUR BRAINS;
OUR BODIES;
EARTH'S SURFACE;
OF FRESH WATER USED
BY HUMANS IS USED IN
AGRICULTURE;
MORE FOOD WILL BE
NEEDED BY 2050 TO
COPE WITH GROWING
POPULATION AND
DIETARY CHANGES
(BOELEE, 2011).**



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Water is a critical factor in development strategies for the future, particularly in the growing number of areas where water resources are already scarce relative to the population (UNEP, 2012). Water use is not efficient, fair, or equal. As pressure on resources, including water, increases due to a growing human population, we are ignoring habitat loss and degradation.

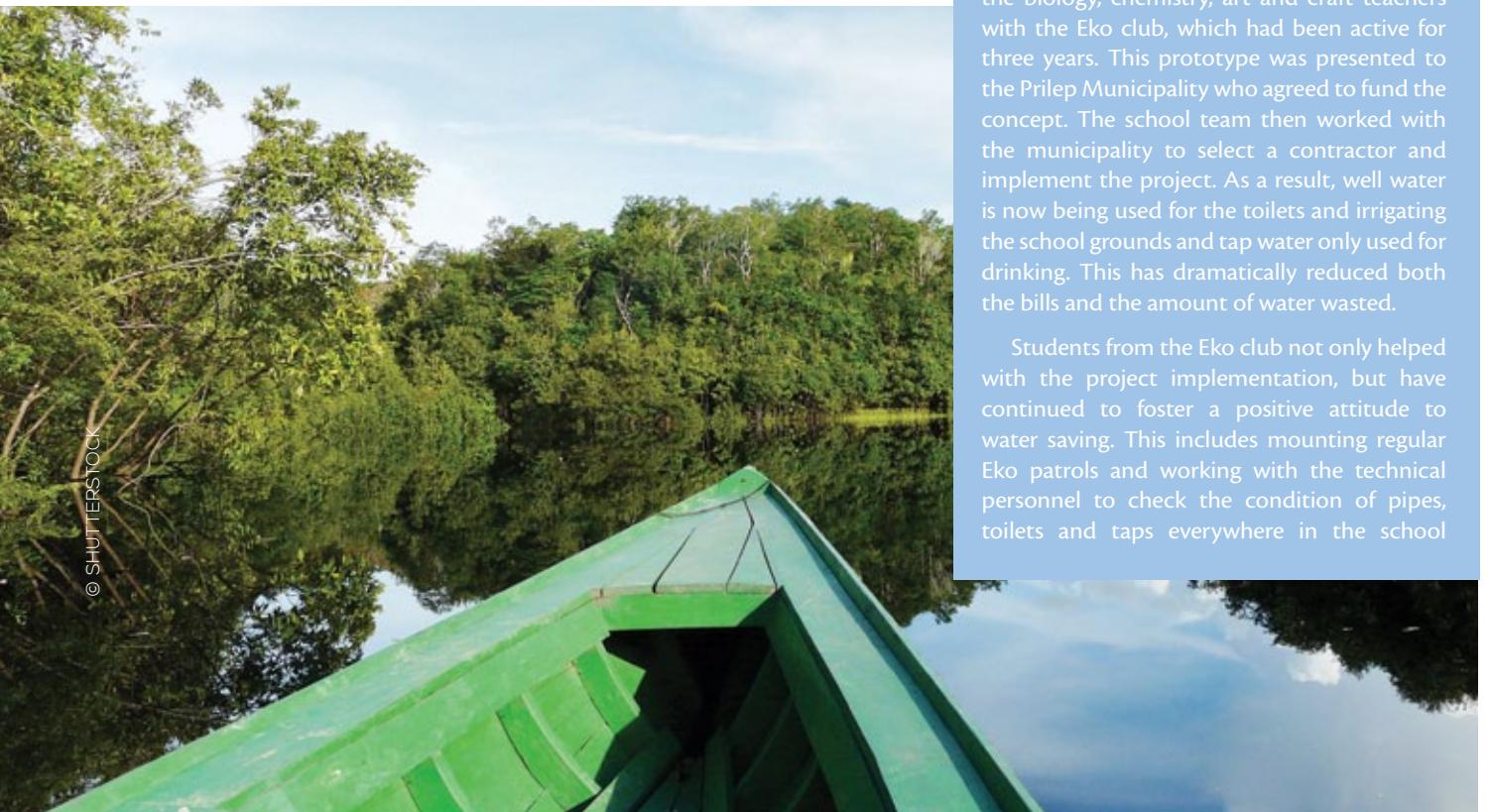
CASE STUDY ►

Save water!

A school in the Former Yugoslav Republic of Macedonia has entered the government-supported OHO Saving water programme: the objective is to save water.

The school's principal was aware that the school was over using water because the accountant from the Prilep Municipality had expressed concern about its large water bills. A model of toilets made of eco-friendly materials with small plastic pipes connecting them to wells was created in a collaboration between the biology, chemistry, art and craft teachers with the Eko club, which had been active for three years. This prototype was presented to the Prilep Municipality who agreed to fund the concept. The school team then worked with the municipality to select a contractor and implement the project. As a result, well water is now being used for the toilets and irrigating the school grounds and tap water only used for drinking. This has dramatically reduced both the bills and the amount of water wasted.

Students from the Eko club not only helped with the project implementation, but have continued to foster a positive attitude to water saving. This includes mounting regular Eko patrols and working with the technical personnel to check the condition of pipes, toilets and taps everywhere in the school



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and look out for leaks. Tutorials, lessons and lectures on the saving water help spread the message and positive attitude throughout the school.

This initiative received support from the Prilep Municipality, USAID and the governments of the Former Yugoslav Republic of Macedonia and Switzerland.

The results? The school's water bills decreased from around US\$ 1300 to US\$ 130 per month; students have become active participants in water-saving activities, and the environment has benefitted as the newly designed toilets use less water. You can find out more on the school's website: www.oublazekoneski.edu.mk.

Lessons learnt:

- collaboration means that different technical skills, capacities and talents are strengthened;
- team work is vital for long term success;
- if you see a problem, you can get help with the solution as long as you are prepared to work hard;
- funding is there if you have a well researched and developed project.

Fresh water from surface and groundwater ecosystems provides for drinking, sanitation, cooking, and agriculture uses. Reliance on groundwater is particularly high in arid and semi arid regions. These

surface and groundwater systems also provide for key services such as water purification, erosion control and storm buffering (Morris *et al.*, 2003).

We currently demand more water than ever in many areas and this trend is getting worse. Water scarcity is a significant, increasing threat to the environment, human health, development, energy security, and global food supply (Pereira *et al.*, 2009). As water scarcity increases farmers will need to adapt, and support will be needed to enable that, since approximately 70 per cent more food will be needed by 2050 to cope with growing population and dietary changes (Boelee, 2011).

'Improve the efficient use of water resources and promote their allocation among competing uses in a way that gives priority to the satisfaction of basic human needs and balances the requirement of preserving or restoring ecosystems and their functions, in particular in fragile environments, with human domestic, industrial and agriculture needs, including safeguarding drinking water quality.'

DID YOU KNOW?

About 2 billion people worldwide depend on groundwater (IAHS 2006.)

WATER

AS WATER SCARCITY
INCREASES
FARMERS WILL NEED
TO ADAPT, SINCE
APPROXIMATELY

70%

MORE FOOD WILL BE
NEEDED BY 2050 TO
COPE WITH GROWING
POPULATION AND
DIETARY CHANGES

(BOELEE, 2011)

People are using more but not thinking about the amount of water is limited. There are water shortages in some regions and too much water in others. Wet areas are getting wetter. Dry areas are getting drier. Sea levels are rising and this means that coastal cities are being hit harder by extreme weather.

There's strong evidence that our regional water cycles are changing (IPCC, 2007). You can see this in extreme weather. Have you noticed any change in your rain or snow patterns? [[Glacier photo 90810848]]

Preserving freshwater and marine ecosystems is important. But it is hard because there is a lack of published information, making it harder for us to see dangers or to hold companies and nations accountable for their actions.

CLIMATE CHANGE, ENERGY, AND WATER

The world has the knowledge, ability, technology, resources and capacity to raise living standards in a sustainable way. Humanity's most urgent problem is climate change and it is already affecting Earth's water systems (Block *et al.*, 2010). Trying to treat the symptoms – waste management, unsustainable consumption and production, environmental degradation, pollution, and GHG emissions – is not solving the problems; we are just masking the real issues and convincing ourselves that we are making progress.

The Earth's water cycle is changing. This threatens water ecosystems, water supplies, and sea levels. The solutions do exist but we are not acting on them. The Earth is a system and the solutions need to be based on that.

Governments have agreed on certain plans on water resources and how to put them into action. Documents such as the *Agenda 21*, the Johannesburg Plan of Implementation (JPOI), and the Millennium Declaration have commitments for increasing water access and improving water management (*Agenda 21*, 1992; JPOI, 2002). The Millennium Development Goals and JPOI even have dates by which targets for action need to be achieved (UNEP, 2012).

We are not going to meet these water targets. The clash between short-term interests and national priorities can mean that international agreements are ignored. For example, if a government has limited money, it may spend it on schools or increasing energy access, improving farming methods or technology instead.

While this is important, if we do not have water, or if our water is unusable, then being able to farm better or being trained to work is not really going to help. There needs to be a value placed on our long-term futures and a balance must be created.

THE WAY FORWARD

Action is needed to implement existing agreements as there is hope and we can still stop the current trend. Issues cannot be tackled in isolation as they are all interconnected. Good governance is needed to make sure that human and environmental water issues do not result in increasing demands on freshwater and ocean resources (World Water Forum, 2012; IAHS, 2006).

We have to protect life-supporting ecosystem services such as pollination by bees or nutrient cycling and make sure that the environment's water needs are also met. Pollution needs to be reduced and the impact of new pollutants considered.



THE EARTH'S WATER CYCLE IS CHANGING.
THIS THREATENS WATER ECOSYSTEMS,
WATER SUPPLIES, AND SEA LEVELS. THE

SOLUTIONS

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Johannesburg Plan of Implementation 26(c)

CASE STUDY ►

CAKAU BULA Our Living Reef , Our Heritage

Kia Island is situated on the Great Sea Reef in Fiji, which is the third largest barrier reef system in the world. It has the highest diversity recorded in Fiji, including 55 per cent of known coral-reef fish species, 74 per cent of known coral species, 40 per cent of known marine flora and 44 per cent of Fiji’s endemic reef fish species. 12 species on the IUCN red list have also been documented there.

Kia is an isolated community of around 300 people on one of the most important coral reef ecosystems in the world. Household surveys conducted on the island in 2011 revealed that over 80 per cent of the population relies on fishing for their primary source of income. Unfortunately, increasing fishing pressure is damaging the marine ecosystem and resulting in lower catch, which has serious implications for the community’s livelihoods.



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In 2004, the WWF, the international conservation organization, had recommended increasing education and awareness in their biological assessment to promote compliance with fishing rules and regulations.

WATER



But not much was being done.

That changed in 2011 with the Reef Ranger's programme that was developed to empower and educate the community, in particular children and youth, about marine ecology and threats facing the natural resources they rely on. After a lesson in the island's school by Community Centered Conservation (C3) the Reef Rangers began implementing conservation and awareness-raising activities across Kia. As the future resource users, the rangers want to change the way the Kian community view and manage their marine environment. It is just one part of an action plan addressing these issues.

Regular beach clean-ups are reducing the amount of rubbish polluting the sea and encouraging the community to better manage their waste. Tree-planting afternoons are strengthening the coastline against soil erosion, and building awareness of the negative effects of deforestation. The entire community is brought together to celebrate the diversity of the Great Sea Reef in an annual Ecofestival, held each November.

At the festival activities included a parade of Reef Rangers dressed up as marine creatures, the performance of sea-related poems written

by Reef Rangers, promotion of environmental issues such as pollution through fancy dress and information boards, and a display of stuffed toys made from material collected during the beach clean-ups.

This allowed all ages to get involved and learn in a fun way.

Success is measured in the decreasing amount and variety of waste collected at successive clean-ups, and increasing numbers of community members taking part. Tree planting activities have improved resilience to coastal erosion while events such as the Ecofestival have helped raise awareness and improve local knowledge of marine conservation issues in the wider community.

These young people saw a need for change and created a process to start the shift. They prove that you can, too.

Lessons learnt:

- success isn't instant but you can make a difference;
- young people can lead community change through collaboration and creativity;
- lack of knowledge is not the single reason for unsustainable resource use but it does contribute.

if we just used existing technology for irrigation more widely, **efficiency would increase** by approximately one-third, or if we considered the amount of water it takes to produce something, then we could plan our use of existing water better (IAHS, 2006; World Water Forum, 2012; UNEP 2012;).



“**Good governance** is needed to make sure that human and environmental water issues do not result from the increasing demands on freshwater and ocean resources.

Greater integration of policies and institutional responses, including effective engagement of local communities through capacity building or civil society consultation, is required to stop and reverse current trends.

For example, if we just used existing technology for irrigation more widely, efficiency would increase by approximately one-third, or if we considered the amount of water it takes to produce something, then we could plan our use of existing water better (IAHS, 2006; World Water Forum, 2012; UNEP 2012);

Apart from an integrated approach, the enforcement of relevant agreements and goals, improved monitoring, inclusion of all stakeholders and overcoming transboundary issues are vital if we are to make real change.

YOU(th) can make a difference

1. Turn off the tap when brushing your teeth.

This simple, but underestimated, action will save you approximately 7,300 litres of water each

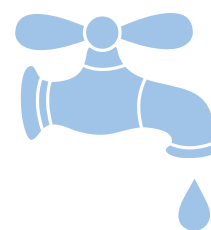
year — equivalent to more than a person’s total consumption for one month!

2. Check for and repair water leaks, taps and toilet flushes indoors and hoses outdoors.

Every drop of water counts. Leaks, which may seem insignificant, actually build up – and so does your water bill!

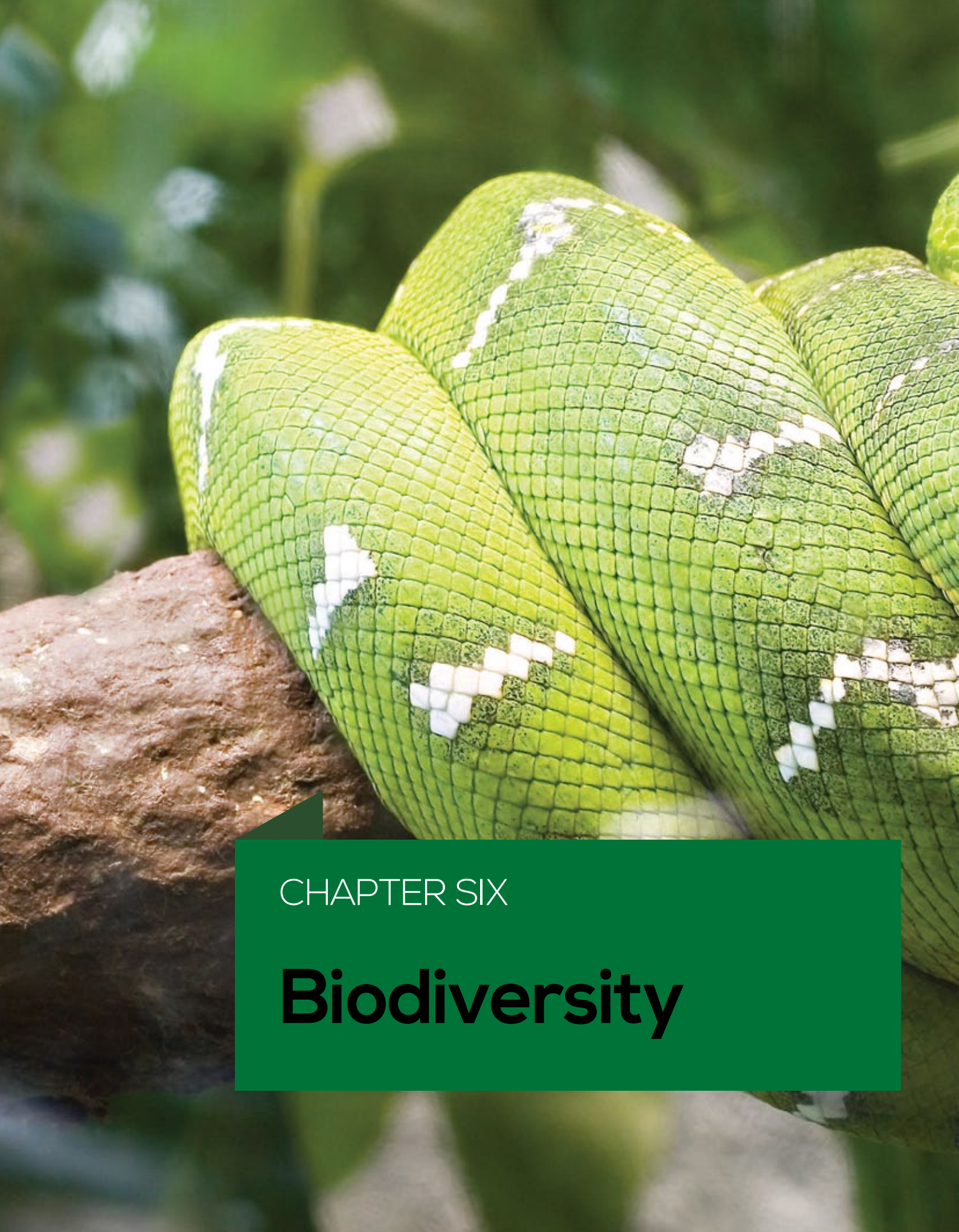
3. Lobby your government and corporations.

Remember, young people have power and a voice. You can use it to contact your elected officials and business leaders to lobby for effective water management system or to unite a group of campaigners. You can make a difference.




TURNING OFF THE TAP WHEN BRUSHING YOUR TEETH WILL SAVE YOU APPROXIMATELY

7,300
LITRES
OF WATER EACH YEAR



CHAPTER SIX

Biodiversity



Our planet is simply marvellous. Just take a look around and you will find a massive variety of animals, plants, and other species that are all dependent on each other in numerous ways. Then you will find the beautiful, healthy world that results from their interactions over countless years – in water, on land and in the air.

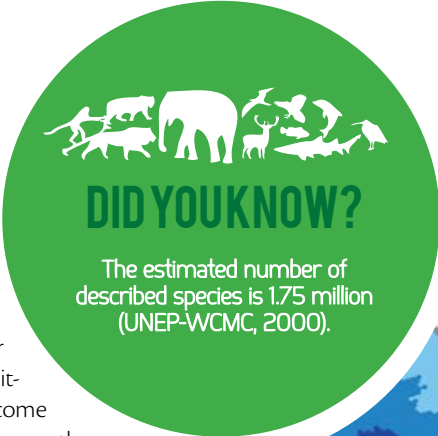
This is what we call biological diversity or simply biodiversity. It is the essence shared by all living organisms, binding each into an interdependent ecosystem, in which all species have their roles. ▶



BIODIVERSITY

► Everyone, including future generations, depends on biodiversity for survival.

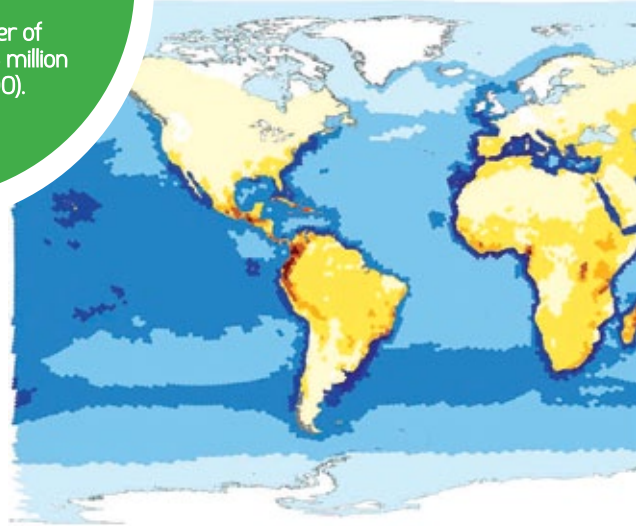
Biodiversity has existed almost as long as our planet has, but the word itself is quite new and has come into the limelight only recently. Biodiversity can mean different things to different people – a zebra to a Kenyan, a polar bear to a Canadian, coral reefs to a Maldivian and tropical wood to a person living in Panama. As much as we are learning about the benefits humans derive from biodiversity, we are learning more and more about the evidence of on-going biodiversity loss. After decades of effort to remedy this loss, we realize that internationally agreed targets have not been met. Biodiversity loss can sound alarming but rest assured there is still much hope.



DID YOU KNOW?

The estimated number of described species is 1.75 million (UNEP-WCMC, 2000).

Red List Index' graph
Measuring Progress



THE CURRENT STATE OF BIODIVERSITY

We live in a big and complex world. There are millions of species on Earth but determining a specific number is not possible. New species are being discovered all the time, some are going extinct and others are evolving. But what is definite is that the state of biodiversity continues to worsen worldwide at the levels of species, populations, and ecosystems.

Species and population

Many of us are aware of threats to some animals, but how many of us know that two out of three species of some families are at the risk of extinction (Baillie *et al.*, 2010; Hoffmann *et al.*, 2010, UNEP, 2012). Threatened species of some mammals, birds, amphibians, and corals have actually moved closer to extinction over the past few decades. Similarly, there has been an ongoing decline and loss in species populations. For instance, assessed vertebrate populations have declined by 30 per cent on average since 1970 and will continue to do so (Collen *et al.* 2008; Loh 2010).

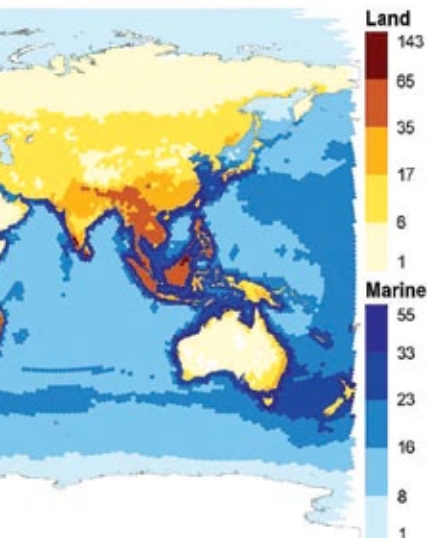


What is the Red List Index of Species Survival?

It is a measure of the extinction risk to species of birds, mammals, amphibians, and other threatened species selected for monitoring and assessment.

The highest index value of 1.0 equates to a species that is not expected to go extinct in the near future (categorized as Least Concern), while the lowest index value of 0.0 equates to a species that has gone extinct. A small change in the level of threat can have significant impacts on species decline (Hoffman *et al.*, 2010).

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What is the Living Plant Index?

It reflects changes in the health of the Earth's ecosystems. It is based on monitoring almost 8,000 populations of more than 2,500 vertebrate species.

20%

OF SEAGRASSES AND MANGROVES HAVE DECLINED SINCE 1970 AND 1980 RESPECTIVELY

(BUTCHART ET AL. 2010, WAYCOTT ET AL. 2009, SPALDING ET AL. 2003)

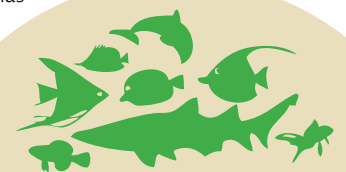
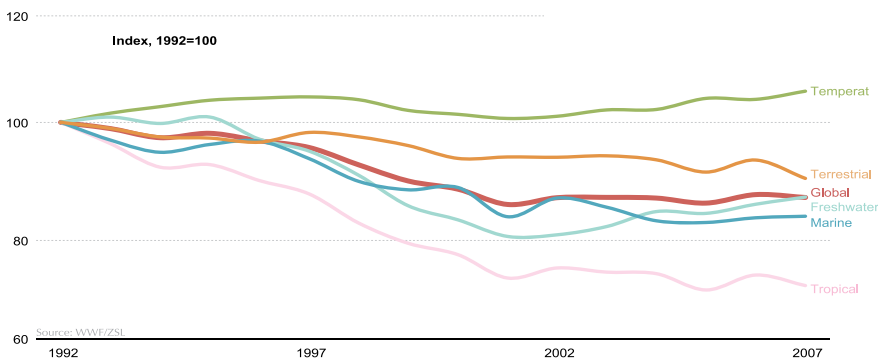
Natural habitats

Natural habitats in most parts of the world continue to decline in extent and health. For instance, between 2000 and 2005, more than 1 million km² of forests were cut down globally – that is more or less equivalent to the size of Egypt (Hansen *et al.*, 2010; CIA, 2012). Similarly, 20 per cent of sea grasses and mangroves have declined since 1970 and 1980 respectively, and the condition of coral reefs has declined by 38 per cent since 1980 (Spalding *et al.* 2003; Waycott *et al.*, 2009; Butchart *et al.*, 2010; Butchart *et al.*, 2010). Forests, rivers and other ecosystems are disintegrating at ever-increasing rates (Nilsson *et al.*, 2005; Ribeiro *et al.*, 2009).

WHY ARE WE LOSING SO MUCH BIODIVERSITY?

The current species extinction challenge has nothing much to do with the mass extinctions that took place millions of years ago, such as the extinction of the dinosaurs. It seems that there is one single species wholly responsible for the decline and possible extinction of others – humans (MA, 2005; UNEP, 2012).

Living Planet Index



DID YOU KNOW?

In 2005, 32 per cent of marine fish stocks were overexploited, depleted, or recovering from depletion (FAO 2010a; Worm *et al.* 2009) / The proportion of marine fish stocks that are overexploited, depleted or recovering from depletion more than tripled between 1974 and 2008.



VERTEBRATE
POPULATIONS HAVE
DECLINED BY

30%

ON AVERAGE SINCE
1970 AND WILL
CONTINUE TO DO SO

(LOH2010, LOH ET AL)

CASE STUDY ►

Junior Ecoguards – Young Environmental Leaders Network

The 'Junior Ecoguard' initiative, established by C3-Comores is a collaborative programme between the national Ministry of the Environment and a British non-profit organization, Community Centred Conservation (C3). The Junior Ecoguards acquire information and ideas for their projects by linking traditional knowledge with the modern training they receive with the marine park rangers and C3. This concept has now evolved into activities which engage entire communities in awareness-raising about endangered turtle conservation. The Junior Ecoguards now want to develop and expand their programme into an island-wide, self-sustaining network.

Comoros faces serious challenges in effective management of marine resources, particularly in the face of climate change and burgeoning population growth. In contrast to their poverty, the islands host a number of ecologically important and vulnerable coastal habitats, including coral reefs, mangroves and seagrass beds, which support high marine biodiversity.

The green turtle is endangered and the hawksbill turtle is critically endangered. The island of Mohéli in Comoros is one of the world's most important nesting sites for these species; however, poaching of these endangered sea turtles is a serious threat.

The beautiful beaches of Mohéli have been ruined by the carcasses of sea turtles, as impoverished communities search for a cheap way to feed their ever-growing families. Mohéli



Marine Park, established in 2001, succeeded in reducing turtle poaching, but the park is now running out of money and the grisly sight of slaughtered turtles is again commonplace. The village of Nioumachoua lies in the centre of the Park and is particularly hard-hit by turtle poaching.

The turtles that nest at Nioumachoua could be an important tourist attraction that could provide income for the Junior Ecoguards' own children in the future. If all the turtles are killed, there will be nothing left. After a particularly bad incident when nine nests were raided for eggs, the young poachers



were gathered together by concerned community elders to discuss solutions. They decided that something had to be done to ensure that their own children would still be able to see these majestic animals nest on the island's pristine beaches, so they formed a group of young leaders, comprised mainly of the ex-poachers, who could use their own experiences to educate their peers. The Junior Ecoguards, a group of around thirty teenagers, were established in July 2006, in Nioumachoua to stop sea turtle-egg poaching among youth.

What they did

1. Create sketches that emphasize the negative impacts of turtle poaching and poor waste management, often using humour and including song and dance. They are presented in the middle of villages and attended by large audiences.
2. Patrol beaches and speaking personally with peers to dissuade them from poaching.
3. Clean up beaches with full community participation.
4. Organize awareness-raising parades held during local festivals.
5. Run training in sea turtle conservation and snorkelling.

The majority of the Junior Ecoguards were once turtle egg poachers themselves. The fact that they have all stopped and are now educating others is one of the project's greatest successes. There have been several others, too:

- egg poaching in Nioumachoua is now almost completely stopped. Youth caught taking eggs are made to clean-up the beach in their village;
- youth and communities have been inspired and educated by sketches, beach clean-ups, and awareness-raising parades;

- funds have been raised by the ecoguides working at weekends as tour guides and recycling waste to make souvenirs;
- a sense of pride and environmental stewardship is being passed on from the youth to entire communities.

Lessons learnt

- education is a tool for conservational efforts; it serves as a great platform for knowledge and understanding;
- the youth are key players in advancing the goals of a community;
- projects and activities that stimulate interest, as well as ecotourism, are aids to conservation;
- environmental governance is an important aspect in the preservation of natural resources.

What follows are descriptions of the five major causes of biodiversity loss (CBD, 2010), but emerging threats such as genetically modified organisms, nanotechnology, and geo-engineering should also be considered (Sutherland *et al.*, 2008; Sutherland *et al.*, 2009; Hölker *et al.*, 2010; Gough, 2011).

Unsustainability and over exploitation of natural resources

Over the past few decades, we have accelerated our exploitation of natural resources to unprecedented and unsustainable levels. Traditional human activities, pushed beyond sustainability, have become too much for the Earth to bear. These activities include:

- logging trees for fuel and urban development;
- hunting animals for food and trophies;
- harvesting plants for food and medicine;
- fishing in oceans, lakes, rivers, and wetlands.

BIODIVERSITY

This over-consumption has led to severe biodiversity decline. We are currently consuming resources faster than they can regenerate and creating waste faster than the environment can absorb. In a typical year, we consume the equivalent of 1.5 planets-worth of productive biological capacity to support our lifestyles (Butchart *et al.*, 2010). This is our ecological footprint – the demand people place upon the natural world.

Habitat loss and degradation

With an increased population came unprecedented levels of development through agricultural and infrastructure projects. The expansion of agriculture, coupled with urbanization and the growing demand for biofuels, are the main causes of terrestrial habitat loss such as forests and natural lands (Rosset, 1999; Belfrage, 2006; Fitzherbert *et al.*, 2008; Danielsen *et al.*, 2009). Similarly, aquaculture, the farming of aquatic animals and plants for food, is threatening coastal ecosystems (Valiela *et al.*, 2004). In some regions, 95 per cent of wetlands have been lost due to drainage and infrastructure projects.

Climate change

Climate change only adds to the pressure on biodiversity and it is already having profound effects. It has been widely shown that climate change is adversely altering the behaviour, reproduction rates, and distributions of different species (Rosenzweig *et al.*, 2007). The Arctic ice is melting very rapidly, thereby affecting ice-dependent species and other marine species, while marine species worldwide are having to adapt to rising ocean temperatures of some kind (Perry *et al.*, 2005; IPCC, 2007; Richardson, 2008; Hiddink and Ter Hofstede, 2008; Dulvy *et al.*, 2008; McRae *et al.*, 2010).

Meanwhile, ocean acidification, the change in the natural chemical balance of oceans, is already contributing to the widespread deterioration of coral reefs while changes in rainfall patterns are affecting freshwater ecosystems (Nilsson *et al.*, 2005; Hoegh-Guldberg *et al.*, 2007; Baker *et al.*, 2008; Carpenter *et al.*, 2008).

Pollution

Many of the world's wetlands and marine habitats face major threats caused by the use and careless dumping of industrial and agricultural chemicals, including oil spills (CBD, 2010, UNEP, 2012). Meanwhile, atmospheric pollution in terrestrial systems by sulphur compounds and, more so, nitrogen promotes oxygen-deficient conditions. Eutrophication, an excessive amount of nutrients causing rapid plant growth and decay, and acidification is what causes this oxygen deficiency (UNEP, 2012).

Invasive alien species

The introduction of alien species causes untold damage to native plants, animals, and other species principally through predation, competition, and habitat modification (Strayer *et al.*, 2006; Vié *et al.* 2009; McGeoch *et al.*, 2010). The introduction of cane toads, which are proving tough to get rid of, to Australia is the most striking example of an invasion of alien species. Some of the invasions, however, have been unintentional, brought about, for example, through the increasing levels of global trade and transport of pets, garden plants, and aquarium species (Bax *et al.*, 2003; Reise *et al.*, 2006). Invasive species are found in nearly all countries and habitats but have particularly severe effects on the biodiversity on small islands (McGeoch *et al.*, 2010). Governments can minimize the impacts of invasive species with successful eradication and control programmes and other types of proactive management.

HOW DOES BIODIVERSITY LOSS AFFECT US?

We say we want to save our planet but what that actually means is saving biodiversity. If there is a biodiversity crisis, it means that our health and livelihoods are at risk, although this has been cleverly camouflaged by large-scale unsustainable developments. Specifically, biodiversity loss means that the survival of millions of the world's poorest people

is put in peril. This is because the benefits humans derive from biodiversity is enormous and the need to preserve biodiversity cannot be emphasised enough.

Biodiversity is about saving lives

Many traditional and modern medicines are produced from terrestrial and aquatic ecosystems. Yet, medicinal plants face a high risk of extinction in those parts of the world where people are most dependent on them. For instance, in some Asian and African countries up to 80 per cent of the population depends on traditional medicines (WHO, 2003).

Biodiversity is also about food security

Globally, more than 80 million tonnes of aquatic life, in the form of biomass, is taken annually from the ocean and inland waters for food (Sumaila *et al.*, 2010). Biodiversity also supports agricultural food production – meat from sustainable livestock production, for example, critically contributes to food sources and livelihoods in many countries, especially for local communities with high levels of poverty and food insecurity (MA, 2005; UNEP 2012).

Biodiversity preserves water – the elixir of life

Freshwater from surface and groundwater ecosystems provides for drinking, sanitation, cooking, and agricultural uses. Reliance on groundwater is particularly high in arid and semi arid regions. These ecosystems also provide key services such as water purification, erosion control and storm buffering (Morris *et al.*, 2003).

Our energy needs depend on biodiversity.

Biomass – in the form of wood, charcoal, plant debris and animal wastes – is the most commonly used fuel for heating and cooking in much of the world (Berndes *et al.*, 2003).

The loss of ecosystem services, for example through increased forest fires, is often felt by already marginalized groups who have to rely on these ecosystem services to meet their household energy needs (CDB, 2010b).

Biodiversity is our source of inspiration

How can one put price on the natural beauty of the scenic mountains or on hearing the chirping of birds when taking a walk in the woods?

Aesthetic and spiritual values derived from biodiversity are inherent in our cultures. Many communities have exploited the recreational value of biodiversity of lakes, rivers, and coastal ecosystems, especially for tourism (Ehrlich and Ehrlich, 1992). Water obtained from aquatic ecosystems has also been vital to many social, spiritual, and religious activities.

Biodiversity supports climate change mitigation and adaption

Climate change contributes to biodiversity loss but biodiversity plays an important role in mitigating climate change. Ecosystems store carbon, notably forests. Therefore, reducing deforestation and forest degradation has the potential to mitigate climate change. Significant carbon storage is also found in soils and the oceans and lakes as the result of healthy ecosystem functioning (Parish *et al.*, 2008).

Ecosystem-based adaptation to climate change offers multiple social, economic, and environmental benefits to local communities. For instance, healthy ecosystems boost human security by reducing risks from disasters and extreme weather conditions (ISDR, 2009).



DID YOU KNOW?

In 2000 alone, the potential global catch losses due to overfishing resulted in a landed value loss of between US\$ 6,400 and US\$ 36,000 million, an amount that could have prevented around 20 million people worldwide suffering from undernourishment (Srinivasan *et al.* 2010)

“If we continue to address the issue of the environment where we live as though we’re the only species that lives here, we’ll create a disaster for ourselves.”

Gaylord Nelson, politician, founder of Earth Day



HOW ARE WE DEALING WITH BIODIVERSITY LOSS?

Biodiversity loss and degradation have been addressed by an increasing number of measures including:

- increases in the designation of protected areas;
- species recoveries and habitat restoration;
- increased engagement with indigenous people and local communities;
- adoption of policies to manage invasive alien species and genetically modified organisms;
- regulations that support sustainable agricultural practices and reduce pollution;
- international financing for biodiversity conservation.

Nevertheless, continuing declines in biodiversity surpass the results of these responses by far and more effort is needed.

CASE STUDY ►

Fältbiologerna (Nature and Youth, Sweden) – The Forest Network

Sweden is covered by forests, but most of them are used for industrial purposes. Forests are cut down replanted, but cut down again in a 60 years cycle for timber and paper production. Biodiversity is very low in these forests since almost all the trees are of the same age and stand in straight lines. Old-growth Nordic forests are unique; they have many species that don't exist anywhere else in the world. The ancient Taiga forest, a hotspot for biodiversity and endangered species, is of particular concern as it covers less than 1 per cent of Sweden. Yet, these are cut down since the industries see only a short-term economical gain (Fältbiologerna, 2011).

In 2003, young people within the environmental youth NGO Fältbiologerna (Nature

and Youth Sweden) decided that it was crucial to protect the last ancient forests that remain in Sweden, and set up the Forest Network. Different organizations, including the Swedish Society for Nature Conservation (Fältbiologerna's mother organization) and the Swedish Environmental Protection Agency support this network financially.

Swedish forestry companies officially announce the forest areas they plan to fell by handing in a marked area map to the local authorities. Since these documents are public, youth from The Forest Network take these maps and train volunteers from all over Sweden on conducting inventory trips on the state of biodiversity in these forests. During these inventory trips, the volunteers search for endangered species and other signs that show that the forest should not be cut down. These inventory trip reports are then produced as evidence of why these ancient forests should not be cut down.

What they did

The Swedish companies are big and powerful compared to The Forest Network, and see the network as a threat. Although some members of the network have received threats, the youth network does what it must to protect Sweden's last of ancient forests. They have:

1. carried out two-week inventory trips to threatened ancient forests every summer since the start of the network;
2. trained 10-30 young people on every inventory trip who are now skilled investigators;
3. produced detailed biodiversity reports on these forests that have been shared with the media and authorities.

These inventory reports have gone as far as the national ministry of environment. One of the forests that was to be felled has now become a protected nature reserve area instead.

“The earth we abuse and the living things we kill will, in the end, take their revenge; for in exploiting their presence we are diminishing our future.”

Marya Mannes,
author and critic



DID YOU KNOW?

International financing for biodiversity conservation now stands at US\$ 3.1 billion per year. Nevertheless, continuing declines in biodiversity surpass the results of these responses by far and more effort is needed.

Lessons learnt:

- it is important to be well-versed in the cause you are fighting for, forests and biodiversity in this case, to be able to debate and communicate effectively with the industries, and get the authorities, media and public on your side;
- protecting forests and biodiversity in your community area is not only the duty of national authorities; you can also do your bit.

INTERNATIONALLY AGREED GOALS

The Convention on Biological Diversity (CBD) is the first global agreement addressing all aspects of biodiversity: genetic resources, species, and ecosystems (CBD, 2007). The convention was opened for signature at the Earth Summit in Rio de Janeiro in 1992 and entered into force in 1993. However, the 2010 Biodiversity Targets set by CBD have not been met.

The current internationally agreed biodiversity goals and targets are governed by the Strategic Plan for Biodiversity 2011-2020, adopted against the backdrop of the Conference of the Parties to the CBD, in 2010 in Nagoya, Japan (CBD, 2011). It has five strategic goals and 20 Aichi Biodiversity Targets. Another crucial internationally agreed goal is Millennium Development Goal 7 to ensure environmental sustainability (UN 2011).

YOU(th) can make a difference

If we want to save our world of healthy ecosystems, we have to protect biodiversity, and you(th) – as the beneficiaries of the future world – have a key role to play. We are not in a hopeless situation and even the simplest action taken in our everyday activities will help.

1. Educate yourself on biodiversity loss in your community

Biodiversity can sound alien to many young people and efforts to protect biodiversity should start at local and national levels. So, begin learning about its benefits and the extent of habitat loss in your own community. You are the best person to know what is happening there. Research how the biodiversity loss will affect you – for yourself. And while you are at it, educate others.

2. Look out for the souvenirs that you buy

Manufacturers will continue to produce bad souvenirs only as long as people buy them. Therefore, ensure that what you find pretty is not made from the skin, fur, bone, shell, horn, ivory, beak or hooves of an endangered species. Always inquire about the origin of products. Just asking will raise awareness among dealers and manufacturers.

3. Save forests by buying sustainably-produced wood

Buy wood and paper products that come from a sustainable legal source. Also, reduce, reuse paper and opt for recycled paper whenever you can.

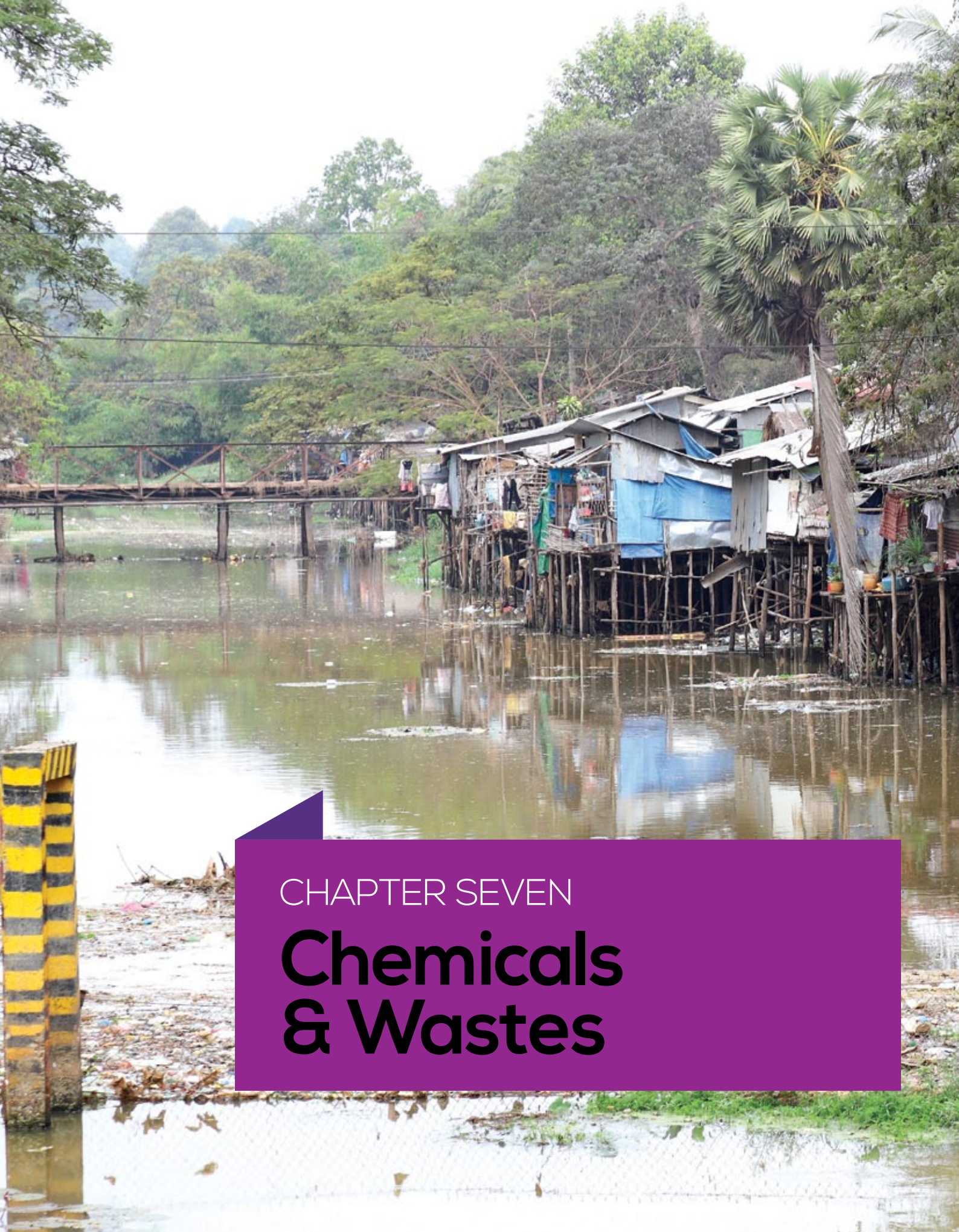
4. Consume sustainably

Most of the world's fisheries are now fully or over exploited. Ensure that the fish you eat at home or at a restaurant are not endangered species. Vary eating fish with other sustainable sources of protein. Cutting your consumption of meat, protein, poultry, fish and dairy is one of the best things you can do to mitigate climate change.

5. Lobby governments and corporations to ensure that ecosystems and species are protected


Find out if forests are being cut down or endangered animals are being hunted in your community. Investigate the extent of biodiversity loss that this would imply. You can then use your findings to debate with governments and corporations and convince them to protect these ecosystems and species.

“Our **energy needs** depend on biodiversity. Biomass – in the form of wood, charcoal, plant debris, and animal wastes – is the most commonly used fuels for heating and cooking in much of the world's population (Berndes et al. 2003)



CHAPTER SEVEN

Chemicals & Wastes



Chemicals play an important role in all our lives. They are used to make our phones, cars, clothes, computers, and food. The way we overuse, misuse or mismanage chemicals can, however, cause dangerous pollution. We are inventing new chemicals daily but scientific understanding of their possible effects in the environment cannot keep up. The issue isn't the chemicals themselves but their impact in large quantities on us or ecosystems. We also need to be aware of all the products we use and manage their entire life cycles ▶

CHEMICALS & WASTES

► As we shift our habits and more of us live in cities, we are creating more waste than ever before. The problem is that Earth is a limited system and we are starting to run out of some materials that have just been put into landfills. If we started to look at our waste differently and took out important metals or parts that we could use again, we could make much of what we have last longer.

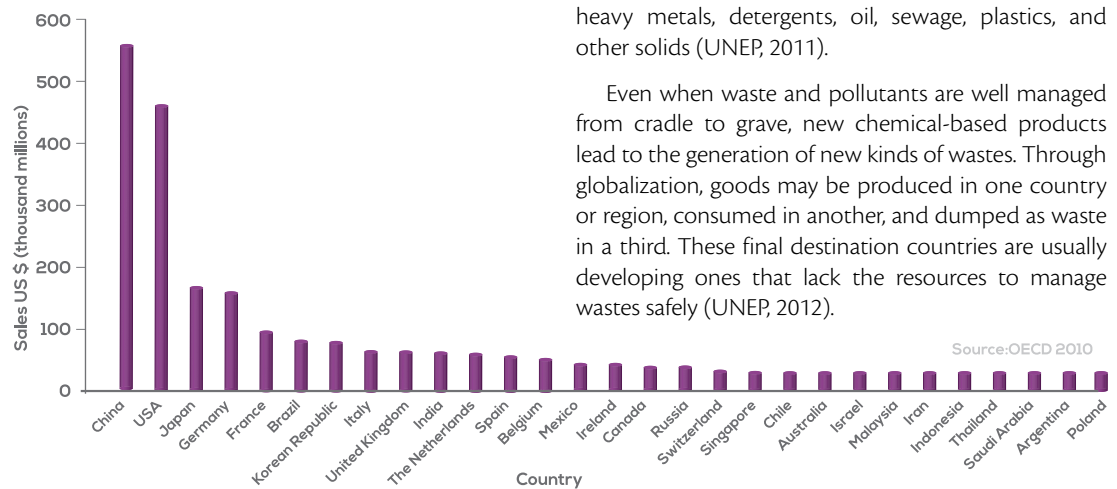
CHEMICALS

Why are chemicals important?

Many chemicals are used in the production of modern goods. Everyday products often have many chemical compounds in them, and these compounds can leach out into the environment during use. We do not know enough about the degradation of products throughout their life-cycles, but what we do know is enough to cause concern.

The rules we introduce to manage chemical compounds can fall short when unexpected side effects are traced back to the cause.

Figure 6.2: Chemicals sales by country (data 2009)



COMMON
MAN-MADE
CHEMICAL
POLLUTANTS
INCLUDE PESTICIDES,
FERTILIZERS,
HEAVY METALS,
DETERGENTS, OIL,
SEWAGE, PLASTICS,
AND OTHER SOLIDS
(UNEP 2011B).

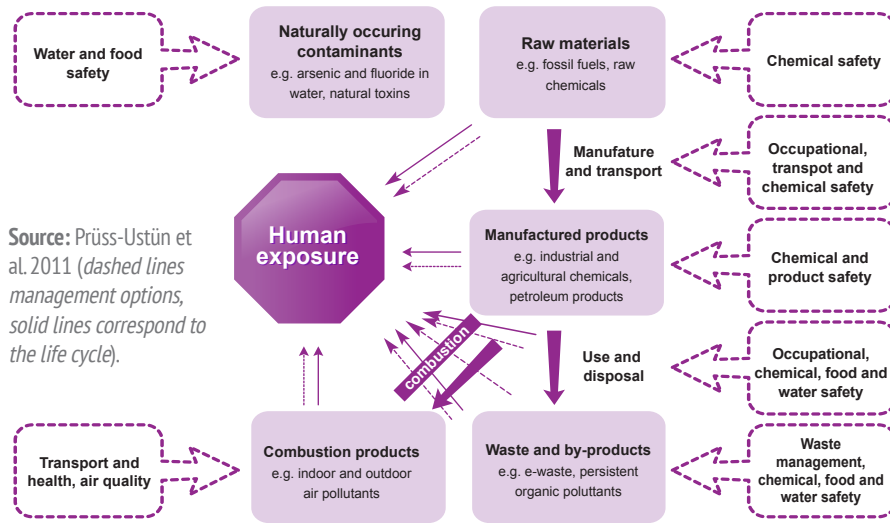
DID YOU KNOW?
A recent study has indicated that 4.9 million deaths were attributable to environmental exposure to chemicals in 2004 (Prüss-Ustün et al. 2011)



Danger is not limited in time or place. Polluting material may be released at many stages of the life cycle of chemical-based products from extraction of raw materials; through production, transport, and consumption; to final waste disposal. This means we do not always know the complete environmental or health risks until it is too late. Common man-made chemical pollutants include pesticides, fertilizers, heavy metals, detergents, oil, sewage, plastics, and other solids (UNEP, 2011).

Even when waste and pollutants are well managed from cradle to grave, new chemical-based products lead to the generation of new kinds of wastes. Through globalization, goods may be produced in one country or region, consumed in another, and dumped as waste in a third. These final destination countries are usually developing ones that lack the resources to manage wastes safely (UNEP, 2012).

Figure 6.3: Life cycle analysis of chemicals



Source: Prüss-Ustün et al. 2011 (dashed lines management options, solid lines correspond to the life cycle).

We hold parties (aka countries) responsible for their own nuclear, hazardous, agricultural, medical and electronic wastes. Internationally, this responsibility must include ratifying the Basel and Bamako conventions. Domestically, all parties must protect the health of formal and informal waste workers, and implement zero-waste, zero-landfill, and waste-to-energy policies for a sustainable future.... This is what we expect. This is the future that we are prepared to inherit

– UNCS-19 Major Group of Children and Youth

CASE STUDY ▶

Safe disposal of Pesticide Packaging

A scout group in Brazil became aware that, around where they have lived, there was a lot of litter from pesticide packaging on the ground and in the Suzana River. They noticed it had increased over a two-year period and that there were dead fish in the area. They were concerned because the contamination could have harmed to people because the river supplies two small cities with water. They decided to do something.

The scouts researched the environmental legislation and other technical information and discovered that although Brazilian federal law regulates the final destination of pesticide packaging, the rules were not being followed correctly because of a lack of guidance and inspection. In the Scouts' area there also were smuggled pesticides which are illegal in Brazil. These increased the risks as some could have been fake or more dangerous than the farmers realized. To make matters worse, the farmers were reusing empty pesticide packaging without consideration of its previous dangerous contents.

The group also discovered that most of the small farmers are functionally illiterate and therefore needed help to read the instructions. They agreed that they needed to talk to the farmers and stop them reusing the pesticide packaging or disposing it unsafely in the environment. But they agreed that talking to farmers about environmental legislation and the procedures for washing and returning pesticide packaging wasn't enough. They also needed to clean up the area as damage was already happening.



CHEMICALS & WASTES

The scouts reached out to the organization responsible for protection of human and environmental health, Instituto Nacional de Processamento de Embalagens Vazias (INPEV), who had produced explanatory, illustrated leaflets detailing the minimum necessary procedures for the safe disposal of empty packaging. It was agreed that the scouts could collaborate on distributing information about procedures for washing, reusing or returning the packaging.

Through networking and determination, the scouts also received a lot of support from other organizations: technical and logistic support from Secretaria do Meio Ambiente de Erechim, help for cleaning the river Suzana from an NGO, Elo Verde – Project for the revitalization of the rivers in Erechim, and technical and scientific support from the Postgraduate Department of Environmental Education at the Universidade Federal de Santa Maria (UFSM), who recognized the project as a practical example for students and give academic credits to those who help out. The scouts also received a lot of support from the local press.

The group created fun plays to let children, teenagers and adults know how important it is to follow the rules while using chemicals. They also held presentations of products manufactured from recycling the empty pesticide packaging, cases for automotive batteries, for example, cases for electric wiring, corrugated conduits and packaging for lubricants. But more importantly, they visited farmers regularly to make sure the information was not forgotten and evaluate the impacts of the project.

After 22 months, the scouts estimate that more than 30 rural properties benefitted by adopting the process of washing and returning

the packaging and literally hundreds of pesticide bottles have not been disposed of incorrectly in the environment.

Lessons learnt:

- networking and collaboration is important. If you know of someone or an organization or local government that is doing similar work to yours, then reach out to them and work together. That will make it stronger!

What are young people doing?

Young people globally are involved in action for change, including oil spill cleanups and cleaning up their communities. However, a lot of chemical and waste problems link to existing policy.

In preparation for the 2011 sessions of the UN Commission on Sustainable Development, thousands of young people held online discussions and finally agreed key actions that need to be carried out by governments to deal with chemicals.

The key issues that were identified were:

1. Governance of chemical management must be strengthened through supporting development, implementation and monitoring of national regulatory policies and legislation.

2. Existing multilateral chemical agreements must be fully implemented. Existing multilateral chemical agreements that we want to see implemented are the Rotterdam, Stockholm, and Basel Conventions.

3. Management of chemicals by producers should be based on four principles: the precautionary principle, the polluter-pays principle, the right to know principle, and the substitution principle.

4. Public participation in government projects and policy must be encouraged. These key points were the basis for youth lobbying of governments and decision makers. Can you think of better ones?



THE GLOBAL ISSUE OF WASTE

All countries have issues with decreasing consumption and managing waste. Today's society wants more, makes more and throws away more, and as a result that has been a rapid increase in the volume and type of both solid and hazardous waste. Urbanization, industrialization, natural disasters, and armed conflict are all adding to our waste problem.

More people are moving to cities that, if managed correctly, can bring lots of benefits through efficiencies and economies of scale (Seto *et al.*, 2010; UN-Habitat, 2010). But cities in developing countries do not always have the money or the technical capacity to deal with their own waste.

Broadly a two-speed situation exists: developed countries have comprehensive systems for chemical and hazardous waste management in place, while developing countries lack these. Developing countries and countries with economies in transition often have a difficult time with basic landfills. Given these circumstances, there is not enough capacity to safely manage new streams of waste such as those from electronics (UNEP, 2012).

Waste quickly becomes dangerous to health and safety. To add to our waste problem, a number of developed countries transport their waste to the developing world where there are fewer or no rules about their safe disposal (Thébaud, 2010).

The overall lack of facilities to recycle, reuse, or recover precious components, means that we are not only ignoring our waste, but neglecting its potential value. If you combine this with a tendency to burn or bury our waste – we have a serious problem. Burning waste releases toxic chemicals into the air and burying waste means that the potential for it to contaminate our soil, water, and environment increases.

We need to address the social and poverty issues related to formal and informal waste management, including the livelihoods, occupational health and safety of waste scavengers and rag-pickers, especially children (Prüss-Ustün, 2011).

CASE STUDY ►

Prescription pill and drug disposal programme

In the United States P2D2 is a student-led organization that educates the public about the dangers of improper disposal of pharmaceutical drugs and initiates authorized disposal sites. Jordyn Schara, one of the originators, describes how a simple idea grew into a nationwide environmental campaign.

'When we started our programme, people were disposing of their medicines by pouring them down the drain, flushing them down the toilet or throwing them out in the trash because this is what they were told to do and they weren't provided any alternatives.

All of these methods are seriously detrimental to the environment. The United States Environmental Protection Agency (US EPA) states that the sewage treatment systems are not specifically engineered to remove pharmaceuticals. According to an Associated Press investigation, a concoction of drugs – including antibiotics, anti-convulsants, acne medication, mood stabilizers and sex hormones – have been found in the drinking water supplies of at least 41 million Americans. This investigation reviewed hundreds of scientific reports, analyzed federal drinking water databases, visited environmental study sites and treatment plants, and interviewed more than 230 officials, academics and scientists.



DID YOU KNOW?

Electronic waste is the fastest growing waste stream in the world, estimated at 40-50 million tonnes per year – an amount more or less equal to the amount of solid municipal waste that Germany generates per year (Widmer 18 *et al.* 2005, OECD 2010).

CHEMICALS & WASTES



DID YOU KNOW?

Global plastic consumption is now well over 500 thousand million plastic bags per year or almost 1 million per minute.

While many developing countries have ratified the **chemicals and waste** Multilateral Environmental Agreements (MEAs), these are not always translated into national legislation. If these are implemented—we would be much closer to solving the problem—but we cannot forget that things are changing, so policy should as well.

The United States government doesn't require any testing and hasn't set safety limits for drugs in water. Even users of bottled water and home filtration systems are exposed. Some bottlers simply repackage tap water and do not typically treat or test for pharmaceuticals. The same goes for the makers of home filtration systems. But contamination is not confined to the USA.

More than 100 different drugs have been detected in waterways throughout the world. Fish and prawn in China exposed to treated wastewater had shortened life spans. In Norway, Atlantic salmon exposed to oestrogens in the North Sea had severe reproductive problems. Recent studies have found alarming effects on human cells and wildlife. Male fish are being feminized, and female fish have developed male genital organs. Recent research has found that small amounts of medication exposure have caused human breast cancer cells to grow faster; kidney cells to grow too slowly; and blood cells to show signs of inflammation.

Since consumers were being told by pharmacies, doctors and the government to dispose of their medications down the drain and toilet or to throw them out in the trash, our desired outcome was:

1. educate the world that improper disposal of drugs contaminates our groundwater, which results in deformities in amphibians and unknown genetic problems in humans;
2. provide communities with a safe means to dispose of their drugs.

We started our project by diving into environmental and drug collection research and realized early on that these programmes were rare and that there were no organized directions on how to run one. The US EPA,

the Department of Natural Resources (DNR) and the Drug Enforcement Agency (DEA) all refused to help us coordinate our programme. Each of these agencies published reams of research on the subject – but none would go so far as to help communities by setting up a disposal programme.



So, how are communities supposed to fix the problem?

We decided to create our own drug collection programme. Once we worked out the details, we contacted our local police chief, who said that it was a great idea, but that it wouldn't work because he had already tried to convince our town council to start a programme but they had voted against it.

P2D2 wasn't worried because we knew that sometimes youth can be more empowering than adults in situations such as this. So we did our homework and made a presentation

to the city council. They gave us a standing ovation and even provided US\$ 250 to start our programme. At that point we made presentations to the hospital, pharmacists, civic organizations, business leaders and schools to recruit volunteers and spread awareness. We launched a marketing campaign by creating our own brochures and flyers and distributed them around town. We made posters, had banners designed, and created funny and engaging t-shirts. The most novel and interesting way that we promoted P2D2 was when we paid to have a mascot costume sewn, Phil the Pill Bottle. Needless to say, Phil was a huge hit! To help support P2D2 financially, we became the first teen organization to have applied for and been awarded a state drug grant.

Since our state and federal governments did not acknowledge that this danger existed, let alone try to address it by providing us with secure disposal options, P2D2's impact on our local area was significant. Reedsburg was the first town in Wisconsin to receive a P2D2 24/7 drug drop off container and the event brought the community together. Hundreds of people stood in line at our multiple events to dispose of their drugs safely. Civic leaders, police, nurses, pharmacists, business leaders and youth volunteers all joined forces to clean up our environment.

So far around 1,000 kg of drugs have been collected from this small town of 8,000 people and the container has to be emptied twice a week. P2D2 is a teen organized drug collection programme that is dedicated to keeping the water systems of the world safe from the irreversible damage that is caused by the improper disposal of medication. It has accomplished this by spreading awareness and providing countless communities with permanent disposal containers and

incinerators, as well as through the use of mentorship to both adult and youth leaders. P2D2 has even passed a bill to make its efforts permanent and lasting and is currently working in 17 states (and counting!) and has prevented more than 270,000 kg of drugs from contaminating our precious environment.

Our goal is to educate the world about the environmental harm done when consumers improperly dispose of prescription and over-the-counter drugs.

Lessons learnt:

- teens can lead the change;
- the strongest weapon a young person has is not knowing what isn't achievable and having no hidden agenda, because then you don't limit yourself;
- sometimes the somebody who needs to do something is you.



“For the first time in the history of the world, every human being is now subjected to contact with dangerous chemicals, from the moment of conception until death.”
Rachel Carson, 1962

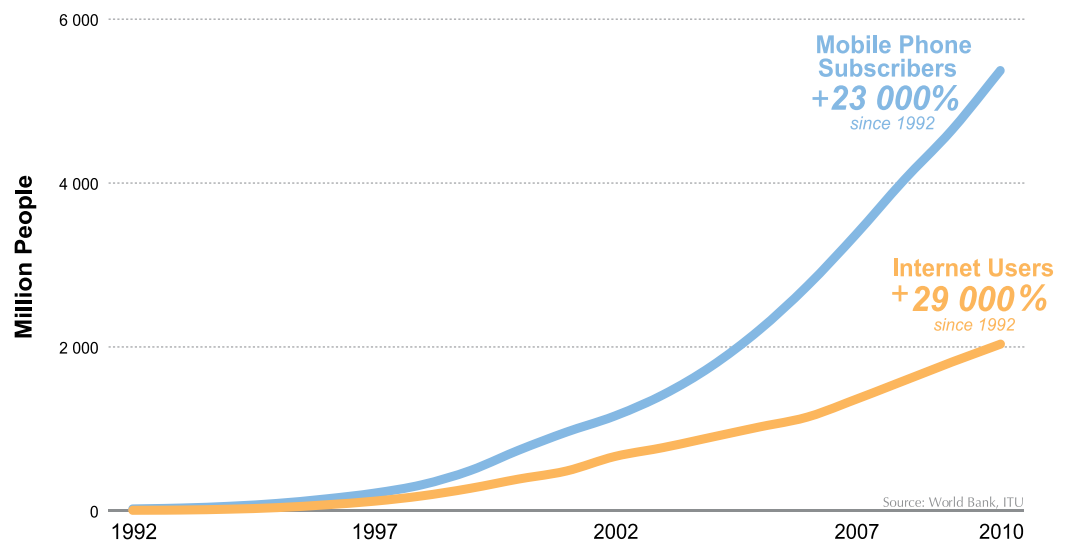


Use of the Internet and mobile phones has skyrocketed in the last 15 years, revolutionising global interconnectedness and opening up a true notion of “global commons” for nearly all of the world. The popularisation (and relatively low cost) of Internet use and mobile phones means that nearly everyone can “stay in touch” and, more importantly, benefit from and contribute to the global discourse. This also has positive implications for the development of so-called “citizens’ science” networks for local and instantaneous monitoring of various phenomena. At the same time, a growing obsolescence of communication and computer devices and other hardware increases the amounts of **electronic waste** (“e-waste”) containing hazardous chemical compounds used in the fabrication process. E-waste causes significant environmental and human health impacts and poses enormous challenges for recycling (UNEP 2005b).

Youth have called for governments to develop waste-to-energy initiatives and related infrastructure, along with zero-waste and zero-landfill policies and strategies, and reduce emissions from existing landfills by capturing methane for use as an energy source through efforts such as the Global Methane

Initiative (GMI, 2012). Furthermore, litter is found in all the world’s oceans because of poor solid waste management and increased use of plastic (UNEP, 2009). It damages wildlife, fisheries, and boats; contaminates coastal areas and presents safety and human health risks (Ryan *et al.*, 2009).

Internet Users & Mobile Phone Subscribers



When nanoparticles and microplastics are dumped into oceans they come together to create plastic soups. Microplastics are created when plastic decomposes in water and it can contain chemicals that build up in aquatic animals and, when we eat fish and seafood, can build up in humans (Ryan *et al.*, 2009; GESAMP, 2010).

A nanoparticle is tiny. If you imagine it as being the size of a football, then a donut would be the size of New Zealand in comparison (see: <http://www.sciencelearn.org.nz/Contexts/Nanoscience/Sci-Media/Images/Nanoparticle-size-comparison>).

Although we know a limited amount about their impact on us, we do know that as we use more plastic and throw it away without treatment, we are increasing the amount of it in the food chain. There are also lots of other types of pollutants about which we currently know little but, will doubtlessly continue to find out.

While many developing countries have ratified the chemicals and waste multilateral environmental agreements (MEAs), these are not always translated into national legislation. If these are implemented we would be much closer to solving the problem – but we cannot forget that things are changing, so policy should as well.

out there. The real solutions may not have been discovered yet. Possible solution won't be discovered if we all think the same. So, question! Explore! Discuss and debate things! It takes different opinions for amazing ideas to happen. And it takes action for them to become a reality.

4. Take action

Don't be afraid to put ideas into action or get involved in existing initiatives near you.

5. Create partnerships to achieve solutions

Partnerships developed with NGOs, private sector representatives, gender-focused groups, youth groups and others will make it easier to achieve your aims and targets as you are mobilizing more people and sharing the work. It's also more fun.

...to **protect**, by strict control, human health and the environment against the adverse effects which may result from the generation and management of hazardous waste and other wastes. – Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.

YOU(th) can make a difference

1. Don't litter

Clean up your community. Think about what happens to your waste. Are the chemicals you use disposed off correctly? Can you think of ways to make them better? Small changes that you make to your life or your families' lives are a big step to helping make us all more sustainable.

2. Make changes to how you think about waste

Can you Reuse? Recycle? Repair? Reinvent?

3. Research and learn about the issues that will affect you

You need to question. It is important that you take ownership of issues, and don't just trust what you read. There are so many different perspectives



CHAPTER EIGHT

Global Problems call for Global Solutions



Ask your grandparents or an older person you know what they used to think about the world when they were your age. Did they care about the environment? How much did they know about life in other countries? What plans did they have, and what future did they want?

Maybe you will discover that their stories describe a reality quite different from yours. If your grandparents used to think about environmental issues, their concerns were probably focused on conserving local ▶

GLOBAL PROBLEMS CALL FOR GLOBAL SOLUTIONS

► resources or keeping their own neighbourhood free from visible rubbish.

The understanding of environmental issues as global problems is quite new. Over the past 40 years, the international community has tried to reverse the negative trends of environmental degradation through a wide range of global responses.

Multiple instruments have been set up to manage the environment and to address challenges within the Earth System. This has been happening both on the national and global levels, but the results are not good enough. Much more must be done for effective global solutions.

Globalization is not new, but it has recently become widespread and mainstream. If you check the products available in your local food store, you may find that many of them are imported. The made-in labels on the clothes you wear today are likely to show that they were manufactured in countries far away.

If you connect to the internet, you can quickly read local news from abroad and chat with friends from other continents. That was not possible even when your parents were young.

In the 1960s, the character of environmental problems changed. For example, large areas of forests were dying in Scandinavia and nobody could explain why. Through intense research, scientists found out that the trees suffered because of pollutants that had traveled in the air from other parts of Europe and rained down on them.

With this discovery, it was no longer possible for one country to protect themselves from environmental threats through domestic laws. People started to perceive environmental problems as global, invisible, complex, and life threatening.



DID YOU KNOW?

The word 'Governance' derives from the Greek word for navigation. You can think about global governance as attempts to navigate a path for the planet and steer the world on the right course. This is done through the design and execution of international policy.



GLOBAL RESPONSES TO ENVIRONMENTAL PROBLEMS

When countries recognized the need to solve environmental problems through collaboration across borders, they turned to the United Nations (UN). The UN was created in 1945 to rebuild the world after the World War II, and ensure that such a calamity never happened again.

Since then, the organization had worked on global issues such as peace, security, and economic and social development. The UN had not dealt with environmental issues before, but it was the main existing system that could address issues through global governance.

When member states met for the UN General Assembly in 1968, they formally accepted the need to put environment on the UN's agenda.



They decided that a UN Conference on the Human Environment would be held within a few years. The famous conference then took place in Stockholm, Sweden in 1972. An important result was the creation of a new body – the United Nations Environment Programme (UNEP). UNEP got the mandate to promote and coordinate environmental activities within the whole UN system.

Over the 40 years since 1972, the global environmental governance system has continued to evolve. The Stockholm conference was followed by further world summits in Rio de Janeiro, Brazil, in 1992, then Johannesburg, South Africa, in 2002, and in Rio again in 2012.

A wide range of instruments have been created to govern the environment on a global level. These include international soft laws and institutions, science

processes, inter-agency bodies and funds. At least 500 multilateral environmental agreements (MEAs) have been set up to address different environmental issues, and an increasing number of countries are committing to them (UNEP, 2012).

WHAT ARE MULTILATERAL ENVIRONMENTAL AGREEMENTS?

Multilateral Environmental Agreements (MEAs) are treaties, conventions, protocols and contracts between several states regarding specified environmental problems.

The **UN** was created in 1945 with the purpose to rebuild Europe after the Second World War. Since then, the organization had worked on global issues such as peace, security, and economic and social development.

GLOBAL PROBLEMS CALL FOR GLOBAL SOLUTIONS

Intergenerational Assembly

Imagine you(th), the future leaders and next generation of sustainability champions, interacting with each other and with the current generation of policy makers to ensure that a joint

THE BAD NEWS: global responses are still falling short

As seen in previous chapters, the current state of environmental degradation is posing serious threats to human well-being and survival, especially for poor and vulnerable communities. Despite the good intentions and governance efforts described above, environmental problems have grown over the past decades. This can be explained by the growing global human population, now at seven billion, coupled with unsustainable patterns of production and consumption. These drivers push environmental systems increasingly out of control and make them more difficult to manage.

The way the current global responses have been set up is another reason why they have not been able to address most environmental problems with successful results. Through the many separate multilateral environmental agreements, environmental problems are tackled in isolation most of the time – one issue at a time and one level at a time – despite the links between different environmental problems such as climate change, water resources, biodiversity and air pollution.

Many national responses are falling short because the level at which action is required is on a global scale. For instance, the finance allocated for climate change adaptation and mitigation is way too little compared to what is actually required.

THE GOOD NEWS: reform process underway for a revamped set of global responses

To bring about more efficient and effective global responses, there is an urgent need for reform of the global environmental governance system. Academic researchers are currently debating different options for reform, and policy makers are negotiating options through a reform process at the UN. The global dimensions of



DID YOU KNOW?

When a Multilateral Environmental Agreement (MEA) has been drafted and negotiated in a UN conference, the first step is for member states who agree with the content to sign it. After the conference, delegations return to their home countries and confirm their commitment by signing the agreement once again within their national government. This second signature is called ratification. For most MEAs, it is specified in the text how many countries need to ratify before it enters into force.

environmental problems demand a strong, committed, integrated and coordinated Earth System approach, which would produce effective and sustained results. It is important to make sure that the proposed solutions tackle the root causes of problems rather than just the symptoms.

Based on the current state of the environment and lessons learnt from the currently inadequate global responses, the following six response options were identified by GEO-5:

1. Frame environmental goals within the context of sustainable development: establish Sustainable Development Goals as a revised extension to the Millennium Development Goals, which end in 2015, and that emphasise the crucial role environmental protection plays in development and poverty reduction.
2. Enhance the effectiveness of global institutions: ensure that global institutions, such as the UN, are effective by mainstreaming the sustainable development agenda into their core decision-making processes. This includes recognising the links and bridging the gaps between science, policy, and society.

AT LEAST
500
MULTILATERAL
ENVIRONMENTAL
AGREEMENTS HAVE
BEEN SET UP TO
ADDRESS DIFFERENT
ENVIRONMENTAL
ISSUES, AND AN
INCREASING NUMBER
OF COUNTRIES ARE
COMMITTING TO THEM



UNEP

DID YOU KNOW?

It was not easy for all countries to agree on the outcomes of the Stockholm conference in 1972. Many developing countries feared that international environmental protection would limit their rights to development and poverty eradication. They finally agreed to support the creation of UNEP, but only if the offices were placed in the South. UNEP is located in Nairobi in Kenya, and it is the first UN agency with headquarters in a developing country.



© UNEP



© UNEP

Above: UN Headquarter offices in Nairobi. (Centre) UN Secretary-General Ban Ki-Moon walks with Achim Steiner, Executive Director, UNEP, through the New Office facility Nairobi Kenya.

3. Invest in enhanced capacities for addressing environmental change: building capacities to deal with environmental degradation, especially at the national level using a green economy road map.
4. Support technological innovation and development: support innovation, research and development in all sectors through increased collaboration and knowledge-sharing platforms.
5. Strengthen rights-based approaches and access to justice: recognize the links between human rights and environmental rights, and ensure that these are incorporated at decision-making processes.
6. Deepen and broaden stakeholder engagement: increase the engagement of stakeholders in sustainable development and decision-making processes, mainly through collaboration with the private sector and civil society in the governance reform process. This could include the creation of an inter-generational assembly to give youth a strong voice on the sustainable future we want.

The **UN** was created in 1945 with the purpose to rebuild Europe after the Second World War. Since then, the organization had worked on global issues such as peace, security, and economic and social development.

SECTION 2


THE FUTURE WE WANT!

OUTCOMES OF RIO+20

A nighttime photograph of Rio de Janeiro, Brazil, showing the city's lights and the silhouette of the mountains under a twilight sky. The city lights are concentrated in the valleys and on the slopes of the mountains. The sky is a mix of deep blue and purple, with some light clouds. The overall mood is serene and urban.

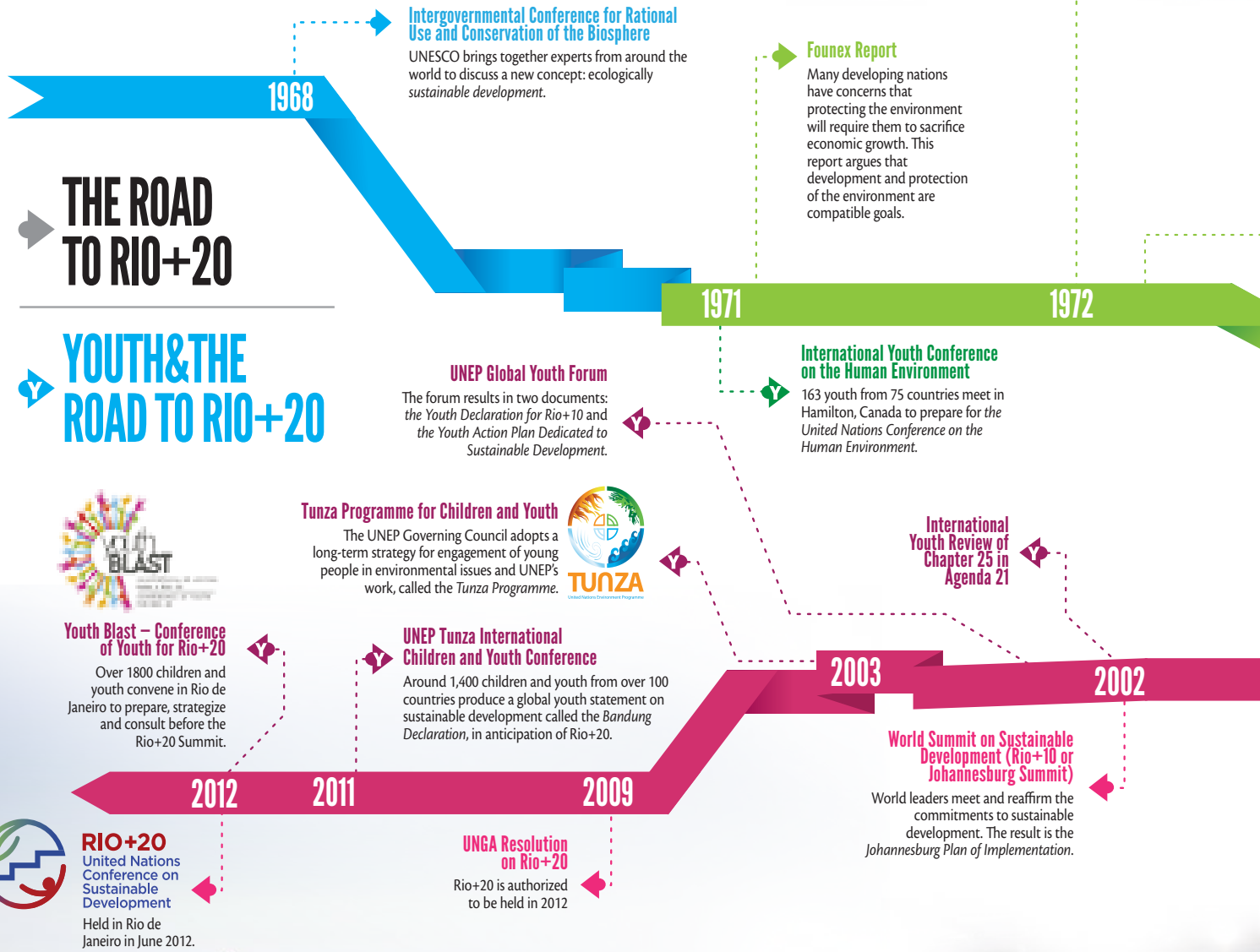
CHAPTER NINE

Rio+20



Children and youth are recognised in *Agenda 21* as key stakeholders in sustainable development processes. We will inherit this planet – whether we like it or not. Youth are not only the future generation but also the current generation.

We are facing global challenges and each of us has a responsibility to set in motion a shift that leads to all of us adopting sustainable lifestyles. These are crucial times and the decisions made now will impact all our futures – or whether we will even have one. ▶



THE ROAD TO RIO+20

YOUTH & THE ROAD TO RIO+20



United Nations Conference on the Human Environment (Stockholm Conference)

Is the first UN conference on the environment. Over 113 governments are joined by other organizations to discuss human activities in relation to the environment. An outcome was the *Stockholm Declaration and Action Plan* which is the foundation for many international environmental laws and national protection agencies as well as UNEP.

United Nations Environment Programme (UNEP)

Established as the first multilateral environmental organization and the voice for the environment within the UN by the GA.

World Conservation Strategy

The World Conservation Strategy is launched by UNEP, WWF, and the IUCN to try encourage governments around the world to implement conservation in their long-term planning. However, much of the final language comes to focus on the term "sustainable development".

World Commission on Environment and Development

The Brundtland Commission is created by the UN to conduct hearings on global environmental and development issues.

International Youth Year

UNEP starts its work with young people.

The Brundtland Commission Report: "Our Common Future"

This report focuses on the notion and definition of "sustainable development", and popularizes it.

International Youth Conference on Environment and Development

Around 400 youth from 98 countries gather in Costa Rica in March, ahead of the 1992 Earth Summit. A *Youth Declaration and a Plan of Action* are agreed upon.

UN Summit for Children

One of the largest gatherings of world leaders is held to recognise the impact of the environment on future generations.

UNEP Youth Advisory Council

UNEP forms a Youth Advisory Council with members from around the world to represent young people within UNEP.

2000

UN Millennium Development Goals (MDGs) to be achieved by 2015

United Nations Commission on Sustainable Development (UNCSD)

Begin cycles of policy implementation and review to implement goals of the Rio Summit.

The United Nations Conference on Environment and Development (Rio Earth Summit)

The first Earth Summit is held in Rio de Janeiro, Brazil. An estimated 10,000 people attend, including 176 governments and over 100 Heads of States. Civil society participation is legitimized in the sustainable development process in the *Rio Declaration and Agenda 21*. It marks the 20 years anniversary of the Stockholm



RIO+20

Rio+20 marked the end of a negotiating process that began in 2010 and involved a lot of diverse opinions, negotiations and resulted in a final text called “the future we want”.

► Have you thought about your future? What do you want to do? Or be? Have you thought about what this world will look like in your future? Do you want to live in a world where the dry areas are drier and the wet areas are wetter? Where do you not have choices because of how we have treated our planet?

The previous section of this book highlighted the problems. This section wants to focus on the current discussions for ways forward. Its aim is to get you to think about what solutions are needed for creating a sustainable future for all and how your actions can impact it. What are your dreams, your family's and your community's? What would our lives look like if you could design your future?

In June 2012, Rio+20 – the UN Conference on Sustainable Development or UNCSD marked twenty years from the 1992 Earth Summit. It tried to answer the question of what future we want. Thousands of people met in Brazil to discuss progress, gaps, and what had been done. It was an opportunity to discuss the issues that we are starting to face and make sure that

we are doing something to tackle them. It was hoped that Rio+20 would be an event where world leaders would renew political commitment to sustainable development. Rio+20 marked the end of a negotiating process that began in 2010 and involved a lot of diverse opinions, negotiations and resulted in a final text called ‘the future we want’.

The original negotiating document was based on a compilation of 677 contributions submitted in late 2011. An exciting part of this process is that 73 per cent of the contributions were not from governments but from civil society. This shows that many people care and there is hope for our future – but that there is a lack of political will.

The Major Group of Children and Youth (MGCY) is one of the nine groupings of civil society recognized by *Agenda 21*. It acts as a neutral umbrella that incorporates all young people under 30 years of age. It also includes child and youth led organizations as part of the official Rio+20 process and other sustainable development processes.



73%

(493 ZERO DRAFTS) OF THE CONTRIBUTIONS WERE FROM CIVIL SOCIETY – NON GOVERNMENTS. THIS SHOWS THAT MANY PEOPLE CARE AND THERE IS HOPE FOR OUR FUTURES.



The MGCY drafted a contribution by building consensus among thousands of child and youth led organizations, networks and groups representing millions of young people. There were online drafting sessions, surveys and regional meetings open to every interested young person, and perspectives from all these processes were incorporated.

This included the perspectives from the Bandung Declaration which was a collaborative effort written by the 1,400 young delegates, representing 118 countries, at the Tunza international conference in Bandung, Indonesia. Tunza is UNEP's programme for children and youth, aimed at creating environmental awareness, building capacity and youth participation in decision-making processes. Under the Tunza umbrella, six regional and sub-regional conferences were organized to work towards Rio+20. They collaborated with the MGCY at Rio+20 to promote and push for the implementation of sustainable development solutions.

While the MGCY was predominantly involved in policy development, it also recognized that the achievement of sustainable living is driven largely by local action; small-scale activities in local communities across the planet embracing sustainable-living practices. The MGCY used a variety of social media platforms to gather knowledge, make decisions and take action in preparation for Rio+20.

The preparations of young people culminated in the Youth Blast – Conference of Youth that was held just before Rio+20. This event was co-organized by the MGCY and the Brazilian National Youth Secretary in partnership with the Government of Brazil, the Brazilian Ministry of Foreign Affairs (Agência Brasileira de Cooperação), the National Youth Council (CONJUVE), the UN Interagency for Youth and UN-HABITAT.



THE MAJOR GROUP FOR CHILDREN AND YOUTH (MGCY) IS ONE OF THE

9

GROUPINGS OF CIVIL SOCIETY RECOGNIZED BY AGENDA 21

RIO+20

At the Youth Blast, young people worked together to plan, strategize, prepare and build capacity before the Rio+20 conference. Those interested in policy lobbying worked with activists to make banners with slogans that backed up their lobby points to create a powerful message for governments. The Youth Blast created a social media buzz online and became the third trending topic globally on Twitter and number one in Brazil.

DOES RIO+20 MATTER?

The UN Conference on Sustainable Development (Rio+20) was attended by more than 100 governments – participants included 57 heads of state, 8 vice-presidents, 31 heads of government and 9 deputy prime ministers. Additionally, 487 ministers attended, together with an estimated 5,000 young people. But what actually happened there? And did young people have any impact?

There is a mixture of opinions about Rio+20. Young people definitely had an impact on proceedings but there was also a lot of frustration about the lack of urgency. Young people at Rio+20 tried to remind governments what was at stake – they had lobby points for each of the thematic areas of the conference, tracked the negotiations and lobbied for their points.

Young people also performed visual actions on the conference premises to catch the attention of delegates, as long as these were registered with the MGCY to follow the basic UN procedure and had been approved by the Secretariat and UN Security. These creative actions supported the young people's lobby points and made their voice even stronger.

You can read on about some of the key actions and reasons behind the lobby points. If this is something you want to know more about or get involved with, you can contact MGCY to see what is going on at the moment.

Ombudsperson for future generations

There are many ideas about how we can protect our forests and oceans while making sure that everyone has a good chance of decent work and a happy life. One of these is to establish a high commissioner or ombudsperson for future generations. The idea concentrates on making sure that those who have power in both governments and companies make wise decisions about how our planet is used both for our generation and future generations that will inherit the planet but have not yet been born.

At the moment leaders from around the world tend to focus on short-term efforts and solutions. But we know now that the effects of doing this causes many problems for future generations who will have fewer and fewer of the things we currently have.

During Rio+20, the MGCY called for a collective commitment on the establishment of a high commissioner or ombudsperson for future generations at the international, national and regional level.

The first draft of the Rio+20 outcome document, contained weak text proposing to further consider an ombudsperson or high commissioner for future generations, and only at the international level. The European Union (EU) proposed an alternative, a high level representative for sustainable development and future generations sitting within an UN existing institution.

Through the EU's alternative proposal, combined with the MGCY lobbying efforts and co-ordination with national civil society and supportive governments, youth raised awareness for this proposal, addressed concerns of the governments opposing it, and



gained increasing support. As negotiations proceeded, delegations eventually arrived in Rio with the high level representative still in the negotiating text. However, in the final edits prior to the conference, all the controversial sections were removed, including this proposal.

The MGCY staged a protest and supportive governments forced the proposal back into the negotiations, but it was rejected by some sceptical countries. The end result, in paragraph 86, was for the UN Secretary-General Ban Ki-moon to be invited to present a report on 'the need for promoting intergenerational solidarity for the achievement of sustainable development, taking into account the needs of future generations'.

The MGCY worked very hard, together with supportive governments, NGOs and other major groups. Together they did a great job inspiring and informing the delegates on the need to protect future generations, and there is now a lot more support for this idea than before Rio.

While the final deal did not present our ideal, it gives us plenty to work with, such as ensuring that the UN Secretary-General's report contains meaningful recommendations, such as calling for an ombudsperson for future generations!

Things are happening around us all the time on national and regional levels: an



environmental ombudsperson has just been appointed in the Philippines to handle all cases involving violations of environmental law or concerning environmental protection. Illegal logging, mining and pollution cases are likely to be high on the agenda. A lot of youth will continue the struggle energetically for a better and more just world.

Interview with an official youth delegate



Sandhya Sameera Savarala,
26, USA

What was your role at Rio+20?

I was the official youth delegate on the US delegation. In this capacity, I served as a youth advisor to the US delegation. I also helped organize the SustainUS delegation, as well as all American youth at the conference.

What was it like being an official youth delegate for the US?

Definitely eye-opening. I had the opportunity to get to know the US delegation and understand the reasoning behind policy decisions. I learned the value of governments actively consulting with civil society. I was able to meet negotiators and provide a bridge between the US government and US youth at Rio+20.

Please tell us about your experience at Rio+20? What were the successes? What were the disappointments?

Rio+20, for me, was not as inspiring as I hoped. I learned a lot about the political motivations behind international negotiations and the red lines or barriers to progress. The final outcome document seemed more like a long reiteration, with little change, than a powerful

guide to moving forward. A major success, however, was the opportunity to work with other youth from across the globe to find common goals and ways to achieve these goals. I was inspired by so many young people who are committed to protecting the environment and promoting social justice.

Why was it important for youth from their country to be there?

It was really important for US youth to be at Rio. The US delegation often had their hands tied by Congress and other political powers. Our youth, however, were able to push their government to make better decisions. We provided a positive face for the US – one that highlighted the country's progressive, democratic nature and ability to work with all countries. We also worked to educate our families and peers at home through social media and outreach.

What is the role of youth in sustainable development?

Youth's role in sustainable development is to hold governments accountable and build energy and momentum towards a sustainable future through action, education and empowerment. It is also important for young people to get involved in the policy development process by not only engaging but participating in the political process.

In your opinion, what is the way forward post Rio +20?

To move forward, we must focus on holding governments accountable for their decisions and actions. There must be real action. We must continue to work hard to make sure special interests do not affect public policy in an unjust way. We must keep the discussion on sustainable development alive, giving special attention to the Sustainable Development Goals. And we should push the message of sustainable development so that it is in the media and the minds of people.

In one sentence, what is the future you want?

The future I want is one in which all people value the conservation of natural resources and understand the importance of inalienable human rights.

What is your message to the world?

We may not always agree, but we must take the time to listen to each other and find common ground. Only then can we move forward towards a truly sustainable future.

Youth's role in sustainable development is to hold governments accountable and build energy and momentum towards a **sustainable future** through action, education and empowerment.





NON-FORMAL EDUCATION A success story

Who said that young people cannot impact negotiations and policies – after lobbying efforts, young people managed to introduce a new paragraph on non-formal education in the outcome document of Rio+20 – Paragraph 231. Non-formal education includes a variety of educational programmes and activities outside the classrooms. It promotes, amongst others, the concept of lifelong learning and provides wide access to information. It can also empower vulnerable groups, especially in cases where access to the formal education system is limited.

The MGCY has been actively advocating non-formal education for years. Non-formal education was mentioned in the text during the initial part of negotiation process. However, it was removed in the last version of the co-chairs suggested text, prior to the final days of negotiation. In response to this omission, young people worked together, both over the internet and on-site, on amendments they could propose, as well as strategies to lobby for its inclusion in the text.

Most of the existing paragraphs in the section on education had already been agreed, so it seemed impossible to introduce the concept of non-formal education anywhere.

The MGCY was informed a new paragraph could be inserted only if all delegations gave a written agreement in favour of proposing a new paragraph. What followed was a lot of hard work by young people to mobilize themselves, talk to the negotiators in the corridors and convince them to support the proposal.

[[Photo: Non-formal education: Dropbox Rio+20 section]]

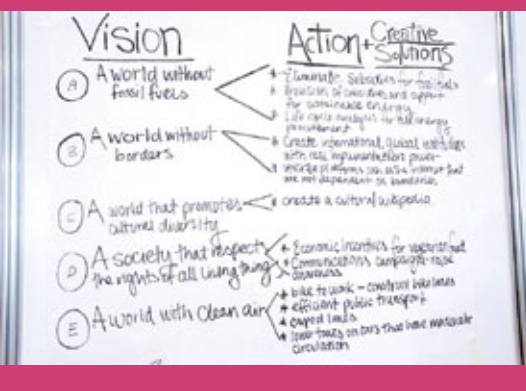
The Swiss delegation agreed to support the young people’s proposal, sharing it with other delegations. After more than 20 hours of very intensive work, the paragraph on non-formal education was announced as approved, and underlined as being a youth initiative. The story ended with applause and a feeling satisfaction in all who had contributed. This story also highlights the importance of the presence of young people in international negotiations and their ability to impact policies.

Rio+20 was certainly big, but it is not meant to be an “end”. It is rather meant to kick start change and to define pathways towards a sustainable future for us and for future generations.

Sustainable development needs peace

At Rio+20, members of the MGCY rallied around the message ‘SD Needs Peace’ to emphasize the fundamental necessity of peace and non-violence for sustainable development, while urging member states to address the impacts of violence and armed conflict.

The SD Needs Peace campaign grew out of concern among youth over the lack of attention being paid to these issues in the Rio+20 negotiations. Indeed, neither the zero draft nor the conference’s seven critical issues made reference to peace or armed conflict. Yet just ten years earlier, at the World Summit on Sustainable Development, member states had insisted that peace and security were ‘essential for achieving sustainable development and ensuring that sustainable development benefits all’ (JPOI, Paragraph 5). Governments



RIO+20



Thousands of young people have become involved in **sustainability issues**, and realised that the time for action is now and that we can make a difference.

then further pledged to give armed conflict 'particular focus' and 'priority attention' as a 'severe threat' to sustainable development (Johannesburg Declaration, Paragraph 19).

To hold member states accountable for their past commitments and highlight MGCY proposals for the conference text, youth organized three SD Needs Peace actions at Rio+20. Two involved youth standing in a row outside of the negotiations, holding SD Needs Peace signs and sharing their text proposals with conference participants as they passed. A third was held in silence, with youth sitting together in a circle, with SD Needs Peace signs at their backs.

The actions were covered by national news media such as Globo TV and Agência Brasil, and hundreds of conference participants wore SD Needs Peace stickers to show their support. The Rio+20 negotiations concluded with two direct references to peace and armed conflict in *The Future We Want*. Unfortunately, however, the final text did not deliver the kinds of bold, action-oriented commitments that youth were seeking.



Brazil showed great leadership at Rio+20 to push for an agreement to be made. This marked an improvement compared to 19th session of the UN Commission on Sustainable Development where the final text reached no agreement. During Rio+20, young people stated their red lines and the minimums we were prepared to accept. But did we get the future we want? Or even the future we need?

There was a lot of discussion before and during Rio+20 that negotiations were going backwards compared to 1992 and were in danger of being nicknamed Rio-20, but an agreement was reached in the end. The final text of Rio+20 is called *The Future we want* and is 53 pages long.

At the Earth Summit twenty years ago, youth said:

“ We want you to imagine a generation that has been damned, Imagine a world where children live amidst endless war, A community where human beings are slaves to fellow human beings, where disease and hunger are the order of the day.’



This was the future young people warned of in 1992 – 20 years later they pointed out that that future is today.

At Rio+20, the MGCY stated:

“ If these sheets of paper are our common future, then you have sold our fate and subsidised our common destruction. Where was our voice, the voice of our children and grandchildren in this? We have one planet. Our being, our thinking, and our action should not be constrained by national boundaries but by planetary ones. You failed to liberate yourself from national and corporate self-interest and recognise our need to respect a greater more transcendental set of boundaries.’

A strengthened global youth movement for sustainable development is a promising unofficial outcome of Rio+20. Thousands of young people have become involved in sustainability issues, and realised that the time for action is now and that we can make a difference.

Rio+20 was certainly big, but it is not meant to be an end. Rather, it is meant to kick start change and to define pathways towards a sustainable future for us and for future generations. It was an opportunity for the world to take a realistic look at where we are and where we need to be.

In June 2012, young people told the world’s governments ‘if you are unable to stand up, then you must be unwilling to move forward. So we will move forward for you’. Although the outcome document wasn’t as strong as hoped for or as clear as decisions in the past, it does provide some potential for concrete change.

Whether the 283 paragraphs can form a basis for the future we actually want is up to you and me, and only time will show. The future we want is actually being decided by every single one of us in our homes, schools, communities and offices – every single day. Join the global youth movement and create the future you want!

OUTCOMES OF RIO+20



“I am convinced that this Conference will have the effect of bringing about sweeping change,” said the Brazilian President Dilma Rousseff as the conference ended

Apart from the final document, it is impossible to accurately predict what will actually come out of Rio+20. However, it is currently a time of rapid global change and governments are also growing aware of their interconnectedness. In 2015, the Millennium Development Goals (MDGs) will expire and discussions about what will happen next have already started.

It is important for us to ask whether we want something similar. Or do we want something else? Should we evaluate the challenges and problems that the MDGs have highlighted and work to improve on them? Or do we need a completely different system?

Youth perspectives on what happens post Rio+20

“The way forward is people coming together more and more. By this I mean mostly youth from all over the world coming together in their projects and causes, for one goal: A BETTER WORLD. The future I want

is a future in which youth can be youth. We must live one day at a time, think about our attitudes, what we’re doing with each other, we need to respect ourselves and others, we need to live today!”

Ariadyne, 17, Brazil

“At the moment, youth has a role to act as the conscience of older policy makers – to show them where they went wrong, so that they can remedy it or leave the floor open for others – us. Then, youth also have to insist on their right to inherit a planet which has the same opportunities as those which decision makers had before us.”

“Finally, we have to ensure we inspire others to lead sustainable lifestyles – and lead by example. I think it’s about time we stop thinking that what doesn’t happen right in front of our eyes, does not concern us.”

“Fossil fuel subsidies account for almost a US\$1 trillion annually – we need to stop funding climate change and making the fossil fuel industry richer. If fossil fuel subsidies were removed, we’d be liberating this money to be better invested in clean energy, start pathways towards a green economy or even invest it in other sectors such as health and education.”

“Small islands are disappearing, it’s a fact. We do not want to lose our homes, our identity, our everything. So stop destroying this planet and making us the first victims to be kicked off its face.”

Barkha, 22, Mauritius

“The way forward is working within or outside our fields to make sustainable development a core concept and variable rather than an external parameter. I think we all need to keep working on developing and applying new

paradigms and approaches to our current economic, corporate and institutional structures along with very seriously assessing and reflecting about what we actually mean by growth, progress, development and wellbeing.”

“We actually need to create, piece by piece, the new world we all so eagerly desire. It is the only chance we have for a worthwhile future, not just for some interest groups but for our entire species. We are and will continue to face successes along with resistance and failures so be prepared, be determined and preserve your sense of humour and humility”

“We are all in this together; it’s not just policy wonks, super scientific or nerdy types’ role. We all must, we all should and we all need to keep working on creating a world that enhances our wellbeing and respects the finite nature of our planet. And we can all do this right now in all our roles in society.”

Aashish, 25, India

“Much is already being done. What’s needed is greater coordination among all stakeholders – the private sector, governments, civil society. Often, there’s a tendency to create divisions between different stakeholders, and to stovepipe issues. In some cases, the issue is not a lack of capacity, but a failure to leverage existing capacity. Networking is very important in that regard.”

Wen Hoe, 20, Singapore

SDGS – THE POST-2015 AGENDA?

At Rio+20, Sustainable Development Goals (SDGs) were proposed as part of the post-2015 process in an attempt to integrate concern for environment and poverty.

The SDGs would address the shortcomings and challenges of the MDGs and promise to provide the foundation for a global green economy. There has been a lot of discussion on whether the SDGs could be a way of measuring our progress towards achieving sustainable development.

The opportunity exists to integrate SDGs into a comprehensive, forward-looking development agenda, perhaps in a way that redefines the MDGs rather than being a continuation of them. A stronger framework is needed which addresses the lessons learnt from the weaknesses of the MDGs and builds on their strengths. Sustainable Development Goals could help policy makers tackle connected problems simultaneously.

There is an opportunity to inject ambition into this debate by focusing on the development and design of the SDGs that are:

- ▶ action-orientated;
- ▶ address emerging issues;
- ▶ focus on creating change;
- ▶ stop or reverse negative trends.

In addition, they should be:

- ▶ holistic;
- ▶ regulated;
- ▶ monitored;
- ▶ reported on;
- ▶ binding;

Can you think of anything else you would like them to include?

YOU(th) can make a difference

1. Discuss and create our shared vision together.
2. We must continue to educate ourselves and others.
3. Consume sustainably.
4. Build our cultures with respect for diversity.

For more information on how to get involved, visit: www.un.org/en/sustainablefuture/conversation.shtml



SECTION 3

COUNTDOWN TO CHANGE

GREEN ECONOMY



CHAPTER TEN

Green Economy



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CHANGE IS COMING

It will either be forced on us because we run out of time procrastinating, or we can seize the day and dare to change things now! It does not take a lot of time. Small things can make a significant impact. To show how you can shift to change in your everyday life, think about the concepts of green economy and education for sustainable development. ▶

GREEN ECONOMY

“The transition to the green economy will require an improved notion of wellbeing [...] that takes into account the limits of our planetary and social boundaries”

MGCY input to the Rio+20
Compilation Document

GREEN ECONOMY

The global economy has quadrupled during the last 25 years (IMF, 2006), but 60 per cent of the world's major ecosystem goods and services that underpin livelihoods have been degraded or used unsustainably (MA, 2005a). This means that traditional economic growth cannot be the foundation of sustainable development. A new paradigm is needed – one that is focused on improving human welfare and social equity, and reducing environmental risks and ecological scarcities.

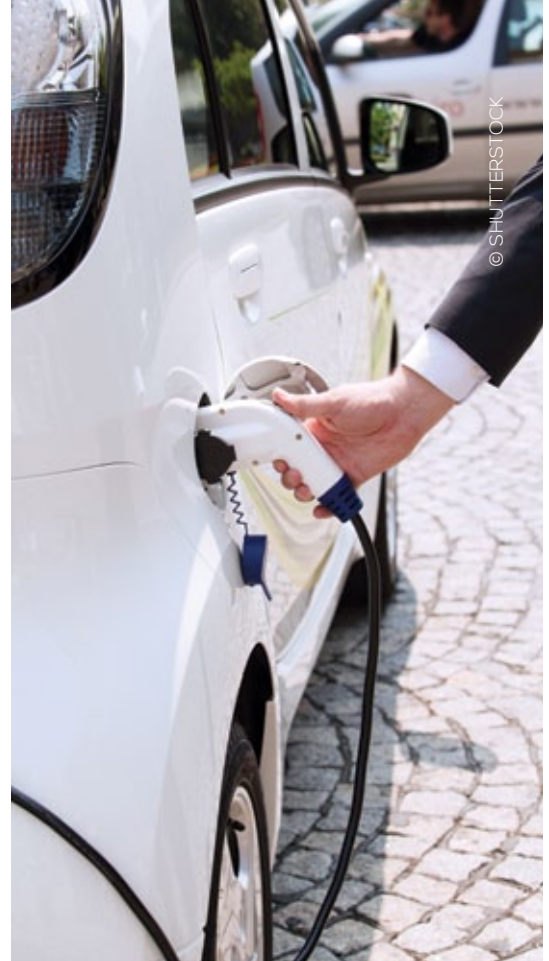
One such approach, the green economy was proposed by UNEP in 2010. It includes:

1. the valuation of natural resources and environmental assets;
2. pricing policies and 10 regulatory mechanisms that translate these values into market and non-market incentives; and
3. measures of economic welfare which are responsive to the use, degradation, and loss of ecosystem goods and services (UNEP, 2011b).

The transition from traditional economic growth to green economy will require changes to national regulations, policies, subsidies, incentives, and accounting systems, as well as development of a global legal and market infrastructure, an appropriate international trade structure, and targeted development aid.

There is no agreed definition of what a green economy is. Those in favour of a green economy focus primarily on the intersection between environment and economy. There are often trade-offs between economic and environmental goals, but with the green economy, decision-makers seek to recognise and strengthen the synergies between both.

Those opposing a green economy see it as an ideal that is a luxury that we cannot afford. Although the green economy was one of the central themes of Rio+20, the outcome was very vague, referring to it as one of the possible tools that could provide a way forward. But green economy isn't about completely



changing the things that you do, but doing them in a more sustainable or efficient way.

You are going to be making important decisions soon. These include what you want to study, what career you are going to follow and where you are going to work. You can make a choice to take a green job or to make your job green or even to create a business that considers the environment. You could also suggest changes at work that might save money but also save the planet. Change starts with you!

INDIVIDUAL CHANGE!

We are now in the 21st century and fact remains that environmental degradation is happening at an unprecedented rate. But our weakness of a growing population could be turned into a core strength: 7 billion people can be seen as 7 billion opportunities to save our planet. It also implies that we are now in a desperate need of environmentally conscious citizens who will commit to leading sustainable lifestyles. This doesn't mean that everyone must become vegan or never buy anything new again, but it does mean challenging yourself to make some changes.

**OUR WEAKNESS
OF A GROWING
POPULATION CAN BE
TURNED INTO A CORE
STRENGTH:**

7 BILLION

**PEOPLE CAN BE
SEEN AS 7 BILLION
OPPORTUNITIES TO
SAVE OUR PLANET.**

Our challenge

- ▶ **Reach out and share information on an individual basis:** sufficient information on the current environmental crisis and possible solutions is easily available. But not everyone has access to it. Millions of people worldwide still live in underprivileged conditions where tools such as the internet or access to library is a luxury. Billions of people do not see why they should care or how this impacts them. You are the missing link and it's up to all of us to say something and raise awareness. No one else is going to do it if you don't.
- ▶ **Convince people to move towards sustainable development:** how can we convince individuals, organizations and governments to make right choices to ensure a sustainable future for us all?
- ▶ **Behavioural change:** once we have convinced people, how do we ensure that words are converted into action? Science, technological inventions and policies alone will not save us; changing behaviour is as vital, but is difficult to achieve.

Education for sustainable development

What if every person benefited from an education promoting development that is environmentally sound, socially equitable, culturally sensitive and economically just? What if education systems prepared us to enter the workforce, handle a crisis, be resilient, become responsible citizens, adapt to change, recognize and solve local problems that have global roots, meet other cultures with respect, and create a peaceful and sustainable society?

Sustainable development is the answer to environmental degradation. In turn, education is the answer to sustainable development. Education is transformative. Education for sustainable development (ESD) is not simply about giving people information, but also ensuring that education, specifically through

schools, re-orientates our society towards sustainable practices.

For example, a manufacturer can provide us with a variety of environmentally sound consumer products to choose from or our government can provide us with recycling bins, but whether we purchase or use them depends on us.

Education for sustainable development takes the following into consideration:

- ▶ Behavioural change is a slow but necessary process to tackle environmental issues. However, behavioural change is much more feasible when started from a young age. Young children are more receptive to information and to developing good habits. Instilling environmental awareness will in turn instil a sustainability-based culture.
- ▶ The ideal platform to educate and engage young people in environmental issues is through their school curriculums. Primary education is compulsory in almost every country of the world and is in line with the Millennium Development Goal 2 – achieving universal primary education.
- ▶ Scientists, engineers and policy makers do not have the answer to all environmental problems.

“A vision without action is just a dream; an action without a vision just passes time; a vision with an action changes the world.”

Nelson Mandela



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GREEN ECONOMY

“ Everyone wants to change the world but no one wants to change themselves.”

Leo Tolstoy

Education for sustainable development aims to increase the capability of all individuals to participate in decision-making processes and provide solutions.

- ▶ Currently, not many students are interested in environmental subjects. This is not because most institutions do not provide environmental subjects, but rather because these subjects are seen as being unimportant and do not directly lead to jobs. Education for sustainable development will ensure that more students develop an interest in environmental research and education, giving us more future scientists, innovators, engineers and advocates of the environment;
- ▶ What policy makers base their decisions on or how a corporate CEO decides on their corporation's environmental sustainability will depend on the values they hold. Education for sustainable development will provide our society with well-informed and environmentally conscious citizens who will later implement sustainable practices not just in their personal lives and homes, but also within governments and corporations. Where our world leaders are failing now, the future generation of world leaders may succeed.

60%

OF THE WORLD'S MAJOR ECOSYSTEM GOODS AND SERVICES THAT UNDERPIN LIVELIHOODS HAVE BEEN DEGRADED OR USED UNSUSTAINABLY

(MA2005A)

How can YOU(th) help?

In 2002, the United Nations General Assembly declared 2005–2014 the United Nations Decade on Education for Sustainable Development. Although this has helped emphasize that education is an indispensable element for achieving sustainable development, the decade will soon come to a close, leaving us with the question of what lies ahead.

As youth, you can lobby with your government and education ministers to make education for sustainable development compulsory right from the start of primary school. But building a sustainability generation will require both formal and informal education, so ensure to do your bit in educating others.

ACTION FOR CHANGE



Everyone can do things to make sure that the beauty and diversity of our planet is not destroyed. There are many different solutions for each local community or habitat. We hope that you will take time to look around and think about what needs to be done and then do it!

Here is our one-one list....what is yours!?!?
Tweet yours @GEOforYouth

1 second

- ✓ Turn off the light when you leave a room.
- ✓ Unplug things if they are not being used.
- ✓ Turn off your computer at night.
- ✓ Use recycled paper.
- ✓ Use rechargeable batteries instead of disposable batteries.
- ✓ Don't use pesticides, herbicides, or chemicals.





1 minute

- ✓ When your roommate is brushing teeth while leaving the water running, run like a superhero and turn the off.
- ✓ Buy local. Buy responsibly. Check the labels on what you buy. Think about what you buy and where it's come from. Don't buy over-packed goods. Never buy products made of tropical hardwoods.
- ✓ Try to avoid buying plastic. Use strong, long lasting shopping bags instead of plastic bags.
- ✓ Tweet your one-one action to inspire.



11 minutes

- ✓ Take a quick shower at a lower temperature rather than a long hot one.
- ✓ Talk to people about why it matters to change.
- ✓ Repair the hole in your favourite trousers instead of buying new ones.
- ✓ Put timers on lamps that will turn them off at the same time every day.
- ✓ Switch to compact florescent or LED light bulbs.



1 hour

- ✓ Do something to create some moss graffiti, but ask permission first if it's not on your property(<http://www.wikihow.com/Make-Moss-Graffiti>).

- ✓ Use public transport. Go for a walk or cycle ride with your friends.
- ✓ Write a blog.
- ✓ Paint some colourful posters with environmental tips and stick them up on public announcement boards.
- ✓ Make your gifts instead of buying them.
- ✓ Be your local tree guardian – protect the trees of your neighbourhood.



1 Day

- ✓ Spend the day in a forest and make a list of all the rare species you find. Explore the outdoors or go hiking. Connect with nature – go camping or on holiday somewhere that doesn't require an airplane ticket.
- ✓ Celebrate Earth Day on 22 April or World Environment Day on 5 June.
- ✓ Start an environment club.
- ✓ Found a fanzine with creative do-it-yourself ideas.
- ✓ Start a weekly or monthly community clean-up. Get the whole neighbourhood involved! Try and get the community involved with the projects, and even do a public park clean-up; this is everyone's home.
- ✓ Write an article about the importance of environmental protection and send it to your local newspaper.
- ✓ Create a YouTube video about your one-one's.






1 week

- ✓ Challenge yourself to try life without plastic or buy nothing for a week – and get your friends involved.
- ✓ Read a book that gives you information about environmental issues.
- ✓ Start a project at your school or university.
- ✓ See how much you can fundraise for a good cause.
- ✓ Encourage your government representatives to support environmental issues and renewable energy.

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1 month

- ✓ Volunteer in a national park.
- ✓ Travel around using public transport and give workshops in all towns you get to.
- ✓ Translate GEO-5 for Youth into your native language.
- ✓ Write an eco-play with some friends, rehearse it and put on a performance.
- ✓ Knit a sweater for someone you know.
- ✓ Champion your neighbourhood. Make your neighbourhood a great example to others and the city/town.
- ✓ Rehabilitate a local reservation, park or public green space.

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1 year

- ✓ Start a new NGO and mobilize others to join it.
- ✓ Set up and run a sustainable enterprise that puts environmental goals higher than maximum profit.
- ✓ Get involved with a campaign.
- ✓ Reduce your own or your community's carbon footprint.
- ✓ Grow your own vegetables,
- ✓ Use renewable and cleaner energy sources. Save lots of money in just a year by installing solar panels now.

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1 decade

- ✓ Change your lifestyle and transform the values of people around you.
- ✓ Increase willingness, capacity and understanding to unlock the potential for sustainable development.
- ✓ Develop your career into something that benefits your planet.
- ✓ Stay true to your vision by devoting your life to sustainable development.
- ✓ Make your mark on history by leaving this planet in a better shape than when you got here.

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ACRONYMS AND ABBREVIATIONS

3Rs	reduce, reuse, recycle	JPOI	Johannesburg Plan of Implementation
4Rs	reduce, reuse, recycle and re-think	MDG	Millennium Development Goal
ABC	atmospheric brown cloud	MEA	multilateral environmental agreement
ACC	adaptation to climate change	N₂O	nitrous oxide
AMAP	Arctic Monitoring and Assessment Programme	NPP	net primary productivity
AMCs	advanced market commitments	NGO	non-governmental organization
BC	black carbon	NH₃	ammonia
BPA	bisphenol-A	NH_x	ammonia and ammonium
BRIC	Brazil, Russia, India and China	NO₂	nitrogen dioxide
CAP	Common Agricultural Policy of the EU	NOX	nitrogen oxides
CBD	Convention on Biological Diversity (UN)	O₃	ozone
CFC	chlorofluorocarbon	ODS	ozone-depleting substance
CH₄	methane	OECD	Organisation for Economic Co-operation and Development
CO	carbon monoxide	PES	payment for ecosystem services
CO₂	carbon dioxide	POPs	persistent organic pollutants
COP	conference of the parties	PPCDAm	Action Plan for Protection and Control of Deforestation in the Amazon
CSD	Commission on Sustainable Development	REDD(+)	Reducing Emissions from Deforestation and Forest Degradation
CSO	civil society organisation	SIDS	small island developing states
DDT	dichlorodiphenyltrichloroethane	TBNRM	transboundary natural resources management
DESA	Department of Economic and Social Affairs (UN)	UN	United Nations
DEWA	(1) Division of Early Warning and Assessment (UNEP),	UNCCD	United Nations Convention to Combat Desertification
DPSIR	drivers, pressures, state, impacts, responses	UNCED	United Nations Conference on Environment and Development
EU	European Union	UNCSD	United Nations Commission on Sustainable Development or United Nations Conference on Sustainable Development (Rio+20)
ES	Earth System	UNCTAD	United Nations Conference on Trade and Development
EU	European Union	UNDG	United Nations Development Group
FAO	Food and Agriculture Organization of the United Nations	UNDP	United Nations Development Programme
G8	Group of Eight (Canada, France, Germany, Italy, Japan, Russian Federation, United Kingdom, United States)	UNEP	United Nations Environment Programme
GDP	gross domestic product	UNESCO	United Nations Educational, Scientific and Cultural Organization
GEO	Global Environment Outlook	UNFCCC	United Nations Framework Convention on Climate Change
GHG	greenhouse gas	UNICEF	United Nations Children's Fund
GNP	gross national product	UNIDO	United Nations Industrial Development Organization
GPA	Global Programme of Action for the Protection of the Marine Environment from Land-based Activities	UNITAR	United Nations Institute for Training and Research
HCFC	hydrochlorofluorocarbon	UN-REDD	United Nations collaborative initiative on Reducing Emissions from Deforestation and forest Degradation in Developing Countries
HCH	hexachlorocyclohexane	USA	United States of America
HFC	hydrofluorocarbon	US EPA	United States Environmental Protection Agency
ICT	information and communication technology	UV	ultraviolet (A and B)
IFAD	International Fund for Agricultural Development	vPvB	very persistent and very bioaccumulative
IISD	International Institute for Sustainable Development	WHO	World Health Organization
ILO	International Labour Organization		
IMO	International Maritime Organization		
IMO-MARPOL	IMO International Convention for the Prevention of Pollution from Ships		

GLOSSARY

TERM	DEFINITION
Acidification	Change in natural chemical balance caused by an increase in the concentration of acidic elements.
Adaptation	Adjustment in natural or human systems to a new or changing environment, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation.
Adaptive capacity	The potential or ability of a system, region or community to adapt to the effects or impacts of a particular set of changes. Enhancement of adaptive capacity is a practical means of coping with changes and uncertainties, reducing vulnerabilities and promoting sustainable development.
Aerosols	A collection of airborne solid or liquid particles, with a typical size between 0.01 and 10 µm, that reside in the atmosphere for at least several hours. Aerosols may be of either natural or anthropogenic origin.
Afforestation	Establishment of forest plantations on land that is not classified as forest.
Aquatic ecosystem	Basic ecological unit composed of living and non-living elements interacting in water.
Arable land	Land under temporary crops (double-cropped areas are counted only once), temporary meadows for mowing or pasture, land under market and kitchen gardens, and land temporarily fallow (less than five years). The abandoned land resulting from shifting cultivation is not included in this category.
Anthropocene	A term used by scientists to name a new geologic epoch (following the most recent Holocene) characterized by significant changes in the Earth's atmosphere, biosphere and hydrosphere due primarily to human activities.
Anthropocene epoch	A geologic chronological period that serves to mark the evidence and extent of human activities that have had a significant global impact on the Earth's ecosystems
Anthroposphere	The total human presence throughout the Earth system including its culture, technology, built environment, and activities associated with these. The anthroposphere complements the term Anthropocene.
Billion	10 ⁹ (1 000 000 000)
Bioaccumulation	The increase in concentration of a chemical in organisms. Also used to describe the progressive increase in the amount of a chemical in an organism resulting from rates of absorption of a substance in excess of its metabolism and excretion.
Biocapacity	The capacity of ecosystems to produce useful biological materials and to absorb waste materials generated by humans, using current management schemes and extraction technologies. The biocapacity of an area is calculated by multiplying the actual physical area by the yield factor and the appropriate equivalence factor. Biocapacity is usually expressed in units of global hectares.
Biodiversity (a contraction of biological diversity)	The variety of life on Earth, including diversity at the genetic level, among species and among ecosystems and habitats. It includes diversity in abundance, distribution and behaviour. Biodiversity also incorporates human cultural diversity, which can both be affected by the same drivers as biodiversity, and itself has impacts on the diversity of genes, other species and ecosystems.
Biofuel	Fuel produced from dry organic matter or combustible oils from plants, such as alcohol from fermented sugar or maize, and oils derived from oil palm, rapeseed or soybeans.

Biome	The largest unit of ecosystem classification that is convenient to recognize below the global level. Terrestrial biomes are typically based on dominant vegetation structure (such as forest or grassland). Ecosystems within a biome function in a broadly similar way, although they may have very different species composition. For example, all forests share certain properties regarding nutrient cycling, disturbance and biomass that are different from the properties of grasslands.
Black carbon	Operationally defined aerosol based on measurement of light absorption and chemical reactivity and/or thermal stability. Black carbon is formed through the incomplete combustion of fossil fuels, biofuel and biomass, and is emitted as part of anthropogenic and naturally occurring soot. It consists of pure carbon in several linked forms. Black carbon warms the Earth 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.
Blue water	In the context of water footprint analysis, the volume of freshwater taken from the global blue water resources (surface water and groundwater) to produce the goods and services consumed by an individual or community.
Carbon dioxide equivalent (CO₂-equivalent or CO₂e)	The universal unit of measurement used to indicate the global warming potential of the different greenhouse gases. Carbon dioxide – a naturally occurring gas that is a by-product of burning fossil fuels and biomass, land-use changes and other industrial processes – is the reference against which other greenhouse gases are measured.
Carbon sequestration	The process of increasing the carbon content of a reservoir other than the atmosphere.
Carbon stock	The quantity of carbon contained in a “pool”, meaning a reservoir or system which has the capacity to accumulate or release carbon.
Catchment (area)	The area of land bounded by watersheds draining into a river, basin or reservoir. See also Drainage basin.
Civil society	The aggregate of non-governmental organizations and institutions representing the interests and will of citizens.
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.”
Climate proofing	A shorthand term for identifying risks to a development project, or any other specified natural or human asset, as a consequence of climate variability and change, and ensuring that those risks are reduced to acceptable levels through long-lasting and environmentally sound, economically viable, and socially acceptable changes implemented at one or more of the following stages in the project cycle: planning, design, construction, operation, and decommissioning.
Chlorofluorocarbons (CFCs)	A group of chemicals, consisting of chlorine, fluorine and carbon, highly volatile and of low toxicity, widely used in the past as refrigerants, solvents, propellants and foaming agents. Chlorofluorocarbons have both ozone depletion and global warming potential.
Cross-cutting issue	An issue that cannot be adequately understood or explained without reference to the interactions of several of its dimensions that are usually defined separately.
DDT(dichlorodiphenyltrichloroethane)	A synthetic organochlorine insecticide, one of the persistent organic pollutants listed for control under the Stockholm Convention on Persistent Organic Pollutants.

GLOSSARY

Dead zone	A part of a water body so low in oxygen that normal life cannot survive. The low-oxygen conditions usually result from eutrophication caused by fertilizer run-off from land.
Deforestation	Conversion of forested land to non-forest areas.
Desertification	Land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities. It involves crossing thresholds beyond which the underpinning ecosystem cannot restore itself, but requires ever-greater external resources for recovery.
Disaster risk reduction	The conceptual framework of elements intended to minimize vulnerability to disasters throughout a society, to avoid (prevention) or limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development.
Drainage basin (also called watershed, river basin or catchment)	Land area where precipitation runs off into streams, rivers, lakes and reservoirs. It is a land feature that can be identified by tracing a line along the highest elevations between different areas on a map, often a ridge.
Driver	The overarching socio-economic forces that exert pressures on the state of the environment.
Drylands	Areas characterized by lack of water, which constrain two major, linked ecosystem services: primary production and nutrient cycling. Four dryland sub-types are widely recognized: dry sub-humid, semi-arid, arid and hyper-arid, showing an increasing level of aridity or moisture deficit.
Early warning	The provision of timely and effective information, through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare an effective response.
Earth System	A collection of component parts that interact with one another within a defined/chosen boundary. 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 life on it.
Ecological footprint	A measure of the area of biologically productive land and water an individual, population or activity uses to produce all the resources it consumes and to absorb the corresponding waste (such as carbon dioxide emissions from fossil fuel use), using prevailing technology and resource management practices. The ecological footprint is usually measured in global hectares.
Ecosystem	A dynamic complex of plant, animal and micro-organism communities and their non-living environment, interacting as a functional unit.
Ecosystem services	The benefits of ecosystems. These 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. Sometimes called ecosystem goods and services.
Endangered species	A species is endangered when the best available evidence indicates that it meets any of the criteria A to E specified for the endangered category of the IUCN Red List, and is therefore considered to be facing a very high risk of extinction in the wild.
Equity	Fairness of rights, distribution and access. Depending on context, this can refer to access to resources, services or power.

Eutrophication	The degradation of water or land quality due to enrichment by nutrients, primarily nitrogen and phosphorous, which results in excessive plant (principally algae) growth and decay. Eutrophication of a lake normally contributes to its slow evolution into a bog or marsh and ultimately to dry land. Eutrophication may be accelerated by human activities that speed up the ageing process.
Evapotranspiration	Combined loss of water by evaporation from the soil or surface water, and transpiration from plants and animals.
E-waste (electronic waste)	A generic term encompassing various forms of electrical and electronic equipment that has ceased to be considered of value and is disposed of.
Fossil fuel	Coal, natural gas and petroleum products (such as oil) formed from the decayed bodies of animals and plants that died millions of years ago.
Global commons	Natural un-owned assets such as the atmosphere, oceans, outer space and the Antarctic.
Global warming	Increase in surface air temperature, referred to as the global temperature, induced by emissions of greenhouse gases into the air.
Globalization	The increasing integration of economies and societies around the world, particularly through trade and financial flows, and the transfer of culture and technology.
Governance	The act, process, or power of governing for the organization of society/ies. For example, there is governance through the state, the market, or through civil society groups and local organizations. Governance is exercised through institutions: laws, property rights systems and forms of social organization.
Greenhouse effect	The greenhouse effect is a process by which thermal radiation from a planetary surface is absorbed by atmospheric <u>greenhouse gases</u> , and is re-radiated in all directions. Since part of this re-radiation is back towards the surface and the lower atmosphere, it results in an elevation of the average surface temperature above what it would be in the absence of the gases.
Greenhouse gases (GHGs)	Gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit thermal radiation. This property causes the greenhouse effect. Water vapour (H ₂ O), carbon dioxide (CO ₂), nitrous oxide (N ₂ O), methane (CH ₄) and ozone (O ₃) are the primary greenhouse gases in the Earth's atmosphere. There are human-made greenhouse gases in the atmosphere, such as halocarbons and other chlorine- and bromine-containing substances. Beside CO ₂ , N ₂ O and CH ₄ , the Kyoto Protocol deals with sulphur hexafluoride (SF ₆), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and nitrogen trifluoride (NF ₃).
Green water	1) In the context of water footprint analysis, the volume of water taken from the global green water resources (rainwater stored in the soil as soil moisture). 2) Water stored in the soil which can be taken up by vegetation but cannot be diverted for other uses.
Grey water	In the context of water footprint analysis, the volume of polluted water that is associated with the production of goods and services for the individual or community.
Groundwater	Water that flows or seeps downward and saturates soil or rock, supplying springs and wells. The upper surface of the saturate zone is called the water table.
Habitat	(1) The place or type of site where an organism or population occurs naturally. (2) Terrestrial or aquatic areas distinguished by geographic, living and non-living features, whether entirely natural or semi-natural.

GLOSSARY

Hazardous waste	A used or discarded material that can damage human health and the environment. Hazardous wastes may include heavy metals, toxic chemicals, medical wastes or radioactive material.
Heavy metals	A subset of elements that exhibit metallic properties, including transitional metals and semi-metals (metalloids), such as arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc, that have been associated with contamination and potential toxicity.
Hydrochlorofluorocarbons (HCFCs)	Organic and human-made substances composed of hydrogen, chlorine, fluorine and carbon atoms. As the ozone-depleting potential of HCFCs is much lower than that of CFCs, HCFCs were considered acceptable interim substitutes for CFCs.
Hydrological cycle	Succession of stages undergone by water in its passage from the atmosphere to the Earth's surface and its return to the atmosphere. The stages include evaporation from land, sea or inland water, condensation to form clouds, precipitation, accumulation in the soil or in water bodies, and re-evaporation.
Hydrosphere	All of the Earth's water, including surface water (water in oceans, lakes and rivers), groundwater (water in soil and beneath the Earth's surface), snow, ice and water in the atmosphere, including water vapour.
Institutions	Regularized patterns of interaction by which society organizes itself: the rules, practices and conventions that structure human interaction. The term is wide and encompassing, and could be taken to include law, social relationships, property rights and tenurial systems, norms, beliefs, customs and codes of conduct as much as multilateral environmental agreements, international conventions and financing mechanisms. Institutions could be formal (explicit, written, often having the sanction of the state) or informal (unwritten, implied, tacit, mutually agreed and accepted). Formal institutions include law, international environmental agreements, bylaws and memoranda of understanding. Informal institutions include unwritten rules, codes of conduct and value systems. The term "institutions" should be distinguished from organizations.
Kyoto Protocol	A protocol to the 1992 United Nations Framework Convention on Climate Change (UNFCCC) adopted at the Third Session of the Conference of the Parties to the UNFCCC in 1997 in Kyoto, Japan. It contains legally binding commitments in addition to those included in the UNFCCC. Countries included in Annex B of the protocol (most OECD countries and countries with economies in transition) agreed to control their national anthropogenic emissions of greenhouse gases (CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆ and NF ₃) so that the total emissions from these countries would be at least 5 per cent below 1990 levels in the commitment period, 2008 to 2012.
Land cover	The physical coverage of land, usually expressed in terms of vegetation cover or lack of it. Influenced by but not synonymous with land use.
Land degradation	The loss of biological or economic productivity and complexity in croplands, pastures and woodlands. It is mainly due to climate variability and unsustainable human activity.
Land use	The functional dimension of land for different human purposes or economic activities. Examples of land use categories include agriculture, industrial use, transport and protected areas.
Legitimacy	Measure of political acceptability or perceived fairness. State law has its legitimacy in the state; local law and practices work on a system of social sanction, in that they derive their legitimacy from a system of social organization and relationships.
Life-cycle analysis	A technique to assess the environmental impacts associated with all the stages of the life of a product – from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling (cradle-to-grave).

Millennium Development Goals (MDGs)	The eight Millennium Development Goals – which range from halving extreme poverty to halting the spread of HIV/AIDS and providing universal primary education, all by the target date of 2015 – form a blueprint agreed to by all the world's countries and all the world's leading development institutions.
Mega-cities	Urban areas with more than 10 million inhabitants.
Multilateral environmental agreements (MEAs)	Treaties, conventions, protocols and contracts between several states regarding specified environmental problems.
Nanomaterial	A natural, incidental or manufactured material containing particles, in an unbound state, as an aggregate or as an agglomerate and where, for 50 per cent or more of the particles in the number size distribution, one or more external dimension is in the size range 1–100 nanometres (a nanometre is one one billionth of a metre). Such particles/materials are generally termed as nanoparticles (NPs), nanochemicals or nanomaterials (NMs).
Natural capital	Natural assets in their role of providing natural resource inputs and environmental services for economic production. Natural capital includes land, minerals and fossil fuels, solar energy, water, living organisms, and the services provided by the interactions of all these elements in ecological systems.
Nitrogen deposition	The input of reactive nitrogen, mainly derived from nitrogen oxides and ammonia emissions, from the atmosphere into the biosphere.
Non-state actors	Non-state actors are categorized as entities that (i) participate or act in the sphere of <u>international relations</u> ; organizations with sufficient power to influence and cause change in politics which (ii) do not belong to or exist as a state-structure or established institution of a <u>state</u> ; do not have the characteristics of this, these being legal sovereignty and some measure of control over a country's people and territories.
Nutrients	The approximately 20 chemical elements known to be essential for the growth of living organisms, including nitrogen, sulphur, phosphorous and carbon.
Oil sands	A complex mixture of sand, water and clay trapping very heavy oil, known as bitumen.
Organic agriculture	A production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of synthetic inputs with adverse effects.
Organic carbon (OC)	Organic carbon, as used in climate research, usually refers to the carbon fraction of the aerosol that is not black. This term is an oversimplification because organic carbon may contain hundreds or thousands of different organic compounds with varying atmospheric behaviour. It is the quantity that results from thermal analysis of carbon aerosols.
Organic life forms	Relating to foodstuff grown or raised without synthetic fertilizers or pesticides or hormones e.g. "organic eggs"; "organic vegetables"; "organic chicken" etc
Organizations	Bodies of individuals with a specified common objective. Organizations could be political organizations, political parties, governments and ministries; economic organizations, federations of industry; social organizations (non-governmental organizations (NGOs) and self-help groups) or religious organizations (church and religious trusts). The term organizations should be distinguished from institutions.
Overexploitation	The excessive use of raw materials without considering the long-term ecological impacts of such use.
Ozone layer	A region of the atmosphere situated at an altitude of 10-50 km above the Earth's surface (called the stratosphere) and which contains diluted ozone.

GLOSSARY

Permafrost	Soil, silt and rock located in perpetually cold areas, and that remains frozen year-round for two or more years.
Persistent organic pollutants (POPs)	Chemical substances that persist in the environment, bioaccumulate through the food web, and pose a risk of causing adverse effects to human health and the environment.
Planetary boundaries	A framework designed to define a safe operating space for humanity for the international community, including governments at all levels, international organizations, civil society, the scientific community and the private sector, as a precondition for sustainable development.
Policy	Any form of intervention or societal response. This includes not only statements of intent, but also other forms of intervention, such as the use of economic instruments, market creation, subsidies, institutional reform, legal reform, decentralization and institutional development. Policy can be seen as a tool for the exercise of governance. When such an intervention is enforced by the state, it is called public policy.
Pollutant	Any substance that causes harm to the environment when it mixes with soil, water or air.
Pollution	The presence of minerals, chemicals or physical properties at levels that exceed the values deemed to define a boundary between good or acceptable and poor or unacceptable quality, which is a function of the specific pollutant.
Poverty	The state of one who lacks a defined amount of material possessions or money. <u>Absolute poverty</u> refers to a state of lacking <u>basic human needs</u> , which commonly include <u>clean and fresh water, nutrition, health care, education, clothing and shelter</u> .
Precautionary approach/ principle	The precautionary approach or precautionary principle states that if an action or policy has a suspected risk of causing harm to the public or to the environment, in the absence of scientific consensus that the action or policy is harmful, the burden of proof that it is not harmful falls on those taking the action.
Public-private partnership	A contractual agreement between a public agency (federal, state or local) and a private sector entity. Through such an agreement, the skills and assets of each sector (public and private) are shared in delivering a service or facility.
REDD/REDD+	Reducing Emissions from Deforestation and Forest Degradation in Developing Countries. REDD+ involves enhancing existing forests and increasing forest cover. In order to meet these objectives, policies need to address enhancement of carbon stocks by providing funding and investments in these areas.
Renewable energy source	An energy source that does not rely on finite stocks of fuels. The most widely known renewable source is hydropower; other renewable sources are biomass, solar, tidal, wave and wind.
Resilience	The capacity of a system, community or society potentially exposed to hazards to adapt by resisting or changing in order to reach and maintain an acceptable level of functioning and structure.
Run-off	A portion of rainfall, melted snow or irrigation water that flows across the ground's surface and is eventually returned to streams. Run-off can pick up pollutants from air or land and carry them to receiving waters.
Security	Relates to personal and environmental security. It includes access to natural and other resources, and freedom from violence, crime and war, as well as security from natural and human-caused disasters
Sediment	Solid material that originates mostly from disintegrated rocks and is transported by, suspended in or deposited from water, wind, ice and other organic agents

Sedimentation	Strictly, the act or process of depositing sediment from suspension in water or ice. Broadly, all the processes whereby particles of rock material are accumulated to form sedimentary deposits. Sedimentation, as commonly used, involves transport by water, wind, ice and organic agents.
Short-lived climate forcers	Substances such as methane, black carbon, tropospheric ozone, and many hydrofluorocarbons, which have a significant impact on climate change, and a relatively short lifespan in the atmosphere compared to carbon dioxide and other longer-lived gases.
Species (biology)	An interbreeding group of organisms that is reproductively isolated from all other organisms, although there are many partial exceptions to this rule. A generally agreed fundamental taxonomic unit that, once described and accepted, is associated with a unique scientific name.
Species diversity	Biodiversity at the species level, often combining aspects of species richness, their relative abundance and their dissimilarity.
Strategic environmental assessment (SEA)	A range of analytical and participatory approaches that aim to integrate environmental considerations into policies, plans and programmes and evaluate the links with economic and social considerations. An SEA is undertaken for plans, programmes and policies. It helps decision makers reach a better understanding of how environmental, social and economic considerations fit together.
Surface water	All water naturally open to the atmosphere, including rivers, lakes, reservoirs, streams, impoundments, seas and estuaries. The term also covers springs, wells or other collectors of water that are directly influenced by surface waters.
Sustainability	A characteristic or state whereby the needs of the present population can be met without compromising the ability of future generations or populations in other locations to meet their needs.
Sustainable development	Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.
Synergies	These 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.
System	A system is a collection of component parts that interact with one another within some boundary.
Tectonic Movements	Movements in the earth's crust, which result in such structural features as the folding or faulting of rocks and the uplift or sinking of part of the earth's surface.
Threshold	The level of magnitude of a system process at which sudden or rapid change occurs. A point or level at which new properties emerge in an ecological, economic or other system, invalidating predictions based on mathematical relationships that apply at lower levels.
Tipping point	The critical point in an evolving situation that leads to a new and sometimes irreversible development.
Tokenism	The policy or practice of making only a symbolic effort.
Toxic pollutants	Pollutants that cause death, disease or <u>birth defects</u> in <u>organisms</u> that ingest or absorb them.
Urbanisation	An increase in the proportion of the population living in urban areas.
Virtual water trade	The idea that when goods and services are traded, the water needed to produce them (embedded) is traded as well.

GLOSSARY

Vulnerability	An intrinsic feature of people at risk. It is a function of exposure, sensitivity to impacts of the specific unit exposed (such as a watershed, island, household, village, city or country), and the ability or inability to cope or adapt. It is multi-dimensional, multi-disciplinary, multi-sectoral and dynamic. The exposure is to hazards such as drought, conflict or extreme price fluctuations, and also to underlying socio-economic, institutional and environmental conditions.
Water conflict	A confrontation between countries, states, or groups over water resources.
Water footprint	An indicator of water use that looks at both direct and indirect water use of a consumer or producer. The water footprint of an individual, community, nation or business is defined as the total volume of freshwater that is used to produce the goods and services consumed by the individual, community or nation, or produced by the business.
Water scarcity	Occurs when annual water supplies drop below 1 000 m ³ per person, or when more than 40 per cent of available water is used.
Water security	A term that broadly refers to the sustainable use and protection of water systems, the protection against water related hazards (floods and droughts), the sustainable development of water resources and the safeguarding of (access to) water functions and services for humans and the environment.
Wetland	Area of marsh, fen, peatland, bog or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water to a depth, at low tide, that does not exceed 6 metres.

This glossary is compiled from citations in different chapters, and draws from glossaries and other resources available on the websites of the following organizations, networks and projects:

American Meteorological Society; Asian Development Bank; Center for Transportation Excellence (*United States*); Charles Darwin University (*Australia*); Consultative Group on International Agricultural Research; Convention on Wetlands of International Importance especially as Waterfowl Habitat (*Ramsar*); Edwards Aquifer Website (*United States*); Encyclopedia of Earth; Europe's Information Society; European Commission Environment A to Z; European Environment Agency; European Nuclear Society; Food and Agriculture Organization of the United Nations; Foundation for Research, Science and Technology (*New Zealand*); Global Earth Observation System of Systems; Global Footprint Network; GreenFacts Glossary; Illinois Clean Coal Institute (*United States*); Intergovernmental Panel on Climate Change; International Centre for Research in Agroforestry; International Comparison Program; International Federation of Organic Agriculture Movements; International Research Institute for Climate and Society at Columbia University (*United States*); International Strategy for Disaster Reduction; Lyme Disease Foundation (*United States*); Millennium Ecosystem Assessment; Ministerial Conference on the Protection of Forests in Europe; National Safety Council (*United States*); Natsource (*United States*); Organization for Economic Co-operation and Development; Professional Development for Livelihoods (*United Kingdom*); Redefining Progress (*United States*); SafariX eTextbooks Online; TheFreeDictionary.com; United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa; United Nations Development Programme; United Nations Educational, Scientific and Cultural Organization; United Nations Framework Convention on Climate Change; United Nations Industrial Development Organization; United Nations Statistics Division; US Department of Agriculture; US Department of the Interior; US Department of Transportation; US Energy Information Administration; US Environmental Protection Agency; US Geological Survey; USLegal.com; Water Quality Association (*United States*); Wikipedia; World Bank; World Health Organization and World Intellectual Property Organization.

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