A brochure series with accompanying materials on development cooperation
for the UN Decade of Education for Sustainable Development

SUSTAINABILITY HAS MANY FACES

Nature and Mankind facing Climate Change

One planet with many people – what's the future?

Contributions from around the world and the international wilderness camp

Completely revised second edition

gtz

On behalf of
Federal Ministry
for Economic Cooperation
and Development

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Preface to the series

The major inequalities between rich and poor, the awareness of the finite nature of natural resources, and the increasing threat to the ecological bases of humanity's social and economic development prompted political leaders from 178 countries, in 1992, to develop a new set of solutions. At the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, world leaders signed three international treaties – the United Nations Framework Convention on Climate Change (UNFCCC) (followed by the Kyoto Protocol in 1997), the Convention on Biological Diversity (CBD) and the Convention to Combat Desertification (UNCCD) – which pursue one common goal: sustainable human development. All three Conventions are of equal status in terms of their relevance to the preservation of our natural life-support systems, poverty reduction, and achieving more global justice.

In 2000, the United Nations adopted the Millennium Development Goals, thereby committing to halve global poverty, improve the protection of the environment and achieve equitable development within 15 years. Within the Agenda 2015 framework, Germany too has defined its contribution to supporting the developing countries' efforts to achieve the Millennium Development Goals. Protecting the environment and preserving natural resources are key elements here. We can only achieve sustainable improvements in living conditions for all the world's people if we conserve these resources. Developing countries are particularly hard hit by the impacts of climate change and the growing overexploitation and destruction of natural resources and biodiversity. The German government has therefore substantially expanded its climate-related development programmes and its contribution to protecting biological diversity in recent years. At the same time, sustainable development strategies which incorporate environmental and climate elements have steadily moved up the policy agenda. The Federal Ministry for Economic Cooperation and Development (BMZ) is scaling up its activities to protect the climate, the environment and natural resources as key sectors of development policy. Thereby, development cooperation is becoming less about searching for straightforward technical solutions and more about providing support and guidance for people and organisations and empowering them to manage challenging economic and social transformation processes.

Young people often have a strong sense of justice and are keen to understand how our actions here in Germany relate to what is happening elsewhere in the world. They actively seek fundamental, long-term solutions. The United Nations has emphasised the great importance of education for peaceful and equitable global development and has proclaimed the years from 2005 to 2014 the United Nations 'Decade of Education for Sustainable Developmen'. The 'Sustainability Has Many Faces' brochure series is a contribution to this Decade and is therefore primarily aimed at teachers and multipliers working in non-school environmental and development education. It shows how people in countries with which we are, perhaps, less familiar, are finding ways of improving their conditions of life while developing a more sustainable approach to their natural environment. The 'faces' of sustainability portrayed are as diverse and creative as the people behind them. They encourage us to change our perspectives and take new approaches. As part of a global learning process, we can respond to their ideas and initiatives by looking at ourselves and our actions in a fresh light, and sharpening our focus on future challenges. In this way, sustainability becomes a learning experience.

Heiko Warnken

Head of Department 316 Environment and Sustainable Resource Usage

Federal Ministry for Economic Cooperation and Development (BMZ)

Foreword to the brochure Nature and Mankind facing Climate Change

The impacts of climate change are already being felt in many countries, and endanger some of the progress made so far in development – particularly in poorer countries. Existing difficult living conditions of millions of disadvantaged people today are threatening to get a whole lot worse in the future. Against this backdrop, it will be increasingly challenging to achieve the UN Millennium Development Goal to halve the number of people living in hunger and poverty by 2015.

What is more, climate change threatens biological diversity (biodiversity) around the world, while for example the loss of large forests and peatlands is generating significant greenhouse gas emissions. This is a vicious circle: The more habitats, animal and plant species and genes disappear, the less able ecosystems will be to provide the goods and services we humans need to survive; food, water, medicines and oxygen. Thus climate change and the loss of biodiversity compound one another while opportunities to adapt and develop are being lost to present and future generations.

Since the 1992 UN Conference on Environment and Development, the German government, through the Federal Ministry for Economic Cooperation and Development (BMZ) and the Federal Environment Ministry (BMU), has supported partner countries in their implementation of both the United Nations Framework Convention on Climate Change (UNFCCC), with its Kyoto Protocol on reducing greenhouse gas emissions, and the Convention on Biological Diversity (CBD). The interdependence of climate change and biodiversity is increasingly important in international development cooperation. This brochure therefore emphasises the conservation and sustainable use of biodiversity as a core element of strategies to adapt to and mitigate climate change, and to combat poverty.

In order to illustrate these complex interactions and help us understand them, the Bavarian Forest National Park created the 'International Wilderness Camp' in 2007, with assistance from the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ). The Camp is a global village, where a variety of dwellings have been built in the traditions of the National Park's project regions and partner protected areas. These provide a forum for tackling the complicated subject of climate change in a digestible way, bringing the issues to life for young people in particular. The various countries that contain the Park's participating partner protected areas are examples to this brochure, helping to shed light on the effects climate change has there. The brochure also shows how individual countries often act with great pragmatism at local level to combat climate change.

By offering young people and other readers a chance to make personal connections, this brochure assists with the 'global learning' which the United Nations is promoting as part of the Decade of Education for Sustainable Development. Indeed, local approaches implemented by some countries in 'the South' could provide valuable inspiration for us in 'the North' when we need to tackle a global problem together.

A lot has happened in the brief period since early 2009 when the first edition of this brochure appeared and all copies were quickly snapped up. The Copenhagen Climate Conference in December 2009 failed to reach a binding agreement on greenhouse gas reduction, which would take over from the Kyoto Protocol when it expires in 2012. Yet integrating these two most crucial global environmental issues, climate protection and biodiversity conservation, is increasingly important to international development cooperation. Here, then, is our contribution: a fully updated and revised second edition of the booklet.

Stephan Paulus

Director 'Environment and Climate Change' at the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH

Part 1
Introduction and structure of the brochure

When I walk by the peasants' woods which I have saved from cutting down, or when I hear the rustling of the young copse planted by my own hands, I realise that the climate is to some extent in my power, and that if in a thousand years man is to be happy I too shall have had some small hand in it.

Anton Chekov (Russian writer 1860–1904)

Global climate change has become real and tangible, affecting people's lives all over the Earth. It is becoming warmer, rainfall is more erratic, polar ice caps and glaciers are melting, the sea level is rising and extreme weather events such as hurricanes are becoming more frequent and more intense. Climatic changes also have an impact on the existence of many species of fauna and flora, and on the ability of ecosystems – for example forests, coral reefs or grasslands – to function properly; in short, they affect the diversity of life on Earth.

Biological diversity, commonly referred to as biodiversity, is vitally important for every sphere of human existence and provides us with a vast range of services: people need food, fertile soils, clean water, fuel and construction materials, healing plants to make medicines and, not least, clean air to breathe. In particular, the 1.4 billion poorest people in developing countries heavily rely on the direct use of natural resources and thus depend on the conservation of this biodiversity.

Global climate change that is currently taking place is largely the result of greenhouse gas emissions caused by human activity. Its impacts add to the pressure on biodiversity caused by pre-existing problems such as increasing population growth and overexploitation of natural resources.

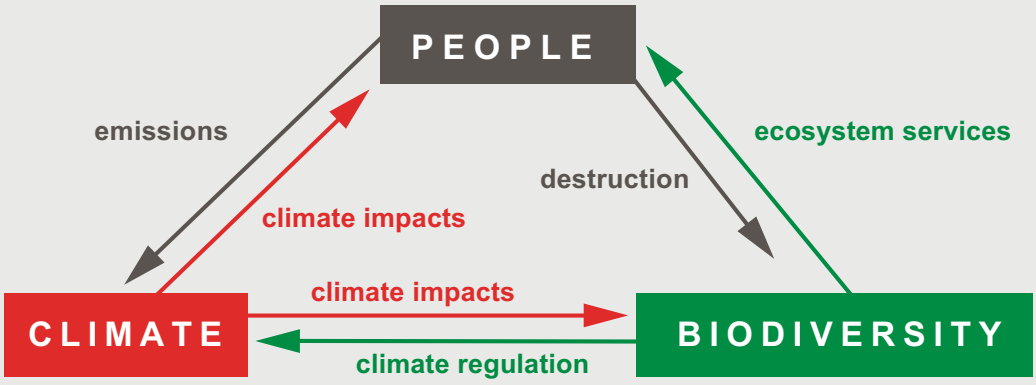
The climatic changes taking place today are compromising the ability of ecosystems to function properly.

The conservation of forests contributes significantly to global climate protection.

Biodiversity loss is a serious matter: extinct species and devastated ecosystems cannot be recreated; they are lost to us and to our descendents forever. Many of the most species-rich ecosystems are located in developing countries. Degradation or loss of these ecosystems deprives low-income population groups of their natural resource base, exacerbating global poverty and possibly resulting in conflicts. Moreover, many developing countries have neither the capability nor the financial means to adapt to the economic and social consequences of climate change. Climate change also accelerates the loss of traditional knowledge relating to the uses of medicinal plants, to wild or domesticated animals and to cultural elements reflected in song, literature or dance. This 'biocultural' loss too increases pauperisation.

The conservation and sustainable use of biodiversity offer us a chance to mitigate climate change and develop ways of adapting to its impacts. Thus, biodiversity is a vital capital asset for our future and the resource base for survival of the human race – in both the developing and the industrialised world. Biodiversity supports climate-regulating functions at local, regional and global level. Intact ecosystems such as forests and peatlands absorb and bind a significant proportion of anthropogenic greenhouse gas emissions by storing carbon in their vegetation and soil. Tropical rainforests regulate the water balance of vast regions in the Amazon and Congo basins, while mangroves provide a natural barrier against floods and coastal erosion. Agricultural biodiversity in particular harbours potential to breed new crop plants that are better adapted, for example to drier conditions or periodic flooding, or which can be used to develop drugs to help combat infectious diseases that might occur due to the higher temperatures.

Conservation and sustainable use of biodiversity are firmly enshrined in Germany's 'Programme of Action 2015' to combat poverty,



Source: adapted from The Royal Society, 2007

Climate and biodiversity are not only impacting each other and changing from human impacts – changes in both also have effects on people worldwide.

Chi Tran
Park-Ranger
Climate Witness from Viet Nam
„Họ rất quan tâm đến vấn đề này bởi nó ảnh hưởng nghiêm trọng trực tiếp đến đời sống của họ. Họ đang ngày càng quan tâm đến vấn đề biến đổi khí hậu và mất đa dạng sinh học, những vấn đề có ảnh hưởng xấu đến canh tác nông nghiệp và sinh kế."
„People are very worried because their daily lives are under serious threat. They are becoming more aware of climate change and biodiversity loss because they are experiencing a deterioration in agriculture and their living conditions."

the national programme implementing the United Nations Millennium Development Goals (MDGs). Likewise, in Germany's development cooperation efforts undertaken by the Federal Ministry for Economic Cooperation and Development (BMZ) and its implementing agencies such as Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), the development bank KfW and other federal agencies, biodiversity conservation is increasingly acknowledged to be a key strategic tool for mitigating climate change and adapting to its impacts. In 2008, for example, the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) launched its International Climate Initiative (ICI). This initiative is funded out of the revenue gained from auctioning European emissions trading certificates, and explicitly promotes the conservation of the sort of biodiversity that contributes to mitigating greenhouse gases and fosters adaptation to climate change.

Numerous GTZ projects focus on the conservation and sustainable use of biodiversity. In times of climate change, many initiatives aimed at protecting forests can at the same time contribute to climate protection. In many instances, forest conservation programmes also represent the most financially sound strategy for climate change mitigation. In the light of this, Germany and other donor countries have been helping a number of partner countries in recent years to designate and manage extensive tracts of land as protected areas, for example the Brazilian government in the Amazon basin.

Important tools for the success of conservation on the ground are educational programmes and public relations campaigns. However, it is vital to raise awareness in Germany too, of the connections between biodiversity, climate change and complex topics such as global justice, worldwide consumption of resources and poverty reduction. As part of this effort, GTZ works in close cooperation with the Bavarian Forest National Park on a project promoting education and communication for sustainable development entitled 'Man and Wilderness'. Ideas and approaches for this drew on partnerships established around the globe between development projects and protected areas. In 2007, with the collaboration of participating partner protected areas, a series of typical dwellings used by traditional inhabitants of nature reserves around the world were constructed in the Bavarian Forest National Park. The construction work involved groups of young people from Africa, Asia and South America and their German and Czech partners. The "International Wilderness Camp" project has already received two awards from UNESCO in the context of the United Nations International Decade of Education for Sustainable Development (2005–2014). Groups of young people and school pupils can spend a week in traditional dwellings from Amazonia, Benin, Chile, the Czech Republic, Mongolia, Siberia, Venezuela, Viet Nam or the USA, taking a rich and colourful journey offering hands-on insight into the cultures of these countries.

Educational work in the camp is based on the principle of 'global learning'. The emphasis is on experiencing nature at first hand and gaining

Sperm whales as climate protectors

Sperm whales are among the largest mammals in the world, and they help to protect the climate. Scientists from Flinders University in the Australian city of Adelaide have discovered that, depending on their diet, the excreta of sperm whales contain significant quantities of iron. An individual sperm whale excretes around fifty tonnes of iron annually into the sea. Iron is the preferred 'food' of phytoplankton in the ocean's upper waters. These tiny algae, meanwhile, absorb carbon dioxide as they grow. When the algae die, their remains, including their carbon content, are deposited on the sea floor. By means of this fertilising effect, the sperm whale population in the Antarctic Ocean alone helps break down twice as much carbon dioxide every year as they themselves exhale. The balance is 200,000 tonnes of CO_2, which, according to US environment agency (EPA) figures, is equivalent to the average annual greenhouse gas emissions of 40,000 cars.

Research and discuss:

Some researchers had the idea to use iron fertilisation of the nutrient-poor seas around Antarctica as a means to combat climate change. They assumed that the plankton would increase and thus absorb more carbon. The idea was a highly controversial one, however. What were the pros and cons? An experiment took place in 2009 – what are its results? Could it be more effective to protect whales, thereby enhancing 'natural fertilisation'? And how big do you think might the overall contribution of whales to climate protection be?

Source: www.bbc.co.uk/news/10323987

Agrobiodiversity offers many opportunities for adaptation to climate change: e.g the development of drought resistant crops or medicines against infectious diseases occurring more often at warmer temperatures.

awareness of the living conditions of people in other parts of the world. For the duration of their stay in the country huts, groups are given a thematic topic to work on, for example biodiversity, the ecological footprint, or global climate change. Youngsters work on their given topic by researching the background and attempting to approach the subject from the viewpoint of their respective 'host country', in other words the country of origin of the traditional dwelling they are staying in. This method imparts a capacity for solidarity and engenders in the youngsters a willingness to take action. They reflect on their own lifestyle and the pattern of consumption inherent in it, and develop creative skills as well as structural competence.

Maitté Flores
journalist and student of disaster and risk management
Climate Witness from Venezuela

"Uno de los casos más impactantes ocurridos en mi país producto del cambio climático, es la disminución del número de glaciares en la Sierra Nevada de Mérida: de los 10 que existían y que cubrían cerca de 10 km², 4 desaparecieron, cinco redujeron sus tamaños y del último apenas quedan manchas."

„One of the most dramatic examples of climate change in my country is the melting of the glacier in the Sierra Nevada de Mérida: out of 10 glaciers which once covered nearly 10 km², 4 have now disappeared, 5 have shrunk, and all that is left of the tenth are a few patches of ice."

Structure of the brochure

The present brochure focuses on the interdependencies of ecological and climatic factors and the role of biodiversity in times of climate change. Biodiversity conservation – for example through worldwide expansion of protected areas – enhances the possibilities for humans to mitigate climate change impacts and adapt to the consequences. A comparison of eleven countries from four continents illustrates clearly that both climate change and biodiversity loss are a challenge not only for poor sections of the population in developing countries, but also for those of us living in industrialised countries.

These interlinkages are illustrated by statements from young people from around the world who participated in the International Youth Summit Go 4 BioDiv in May 2008. Most of the so-called "Climate Witnesses" live within or near the protected areas that are partner parks of the International Wilderness Camp. They describe how climate change and other environmental changes affect their home countries and the living conditions of their families. Their statements, included in text boxes with an orange frame, accompany the reader throughout the brochure.

A number of educational elements gives us a glimpse into the educational week devised for the Wilderness Camp on the theme of climate change. The suggestions and ideas for activities at the end of each section of the present brochure provide material for students to engage with the issues in more depth. A selection of worksheets and specific information sheets are available on the enclosed CD and online as downloadable files.

Following the **Introduction** (**Part 1**), **Part 2** examines **how climate change and biodiversity affect each other**, based on the example of two ecosystems: tropical forests and coral reefs. The threats to biodiversity and the ways in which biodiversity helps to mitigate climate change and facilitates adaptation to its consequences are explored in detail, along with the effects of current climate protection measures on biodiversity.

Part 3 gives the reader an insight into the ways in which **international** instruments and regimes such as the Framework Convention on Climate Change, the Kyoto Protocol and the Convention on Biological Diversity operate. It outlines how

the international community and Germany in particular are tackling present and future challenges in this field.

Part 4 takes the reader across a broad arc from the international to the **national** level. The countries presented in the brochure may also be seen as representatives of other industrialised and developing countries and their ecological and climatic situations. The content of this section focuses on initiatives aimed at responding to the consequences of climate change in a pragmatic way in the partner countries of the Wilderness Camp and on the highly species-rich island of Madagascar, but also in Germany and in its neighbouring country, the Czech Republic. Particular emphasis is placed on the interrelationships between global and national climate policy. This section also presents some of the conservation and environmental education projects that are run by the German Technical Cooperation in various countries. These projects are aimed at tackling the dual issues of climate change and biodiversity conservation.

Part 5 investigates the impacts of climate change on people and nature in concrete, **local** terms in the partner regions, and looks at the role and potential of protected areas in this context. The German Technical Cooperation supports, for example, the partner countries Benin and Viet Nam in implementing measures focused on biodiversity conservation in conjunction with sustainable resource use at a local level, in order to improve the living conditions of the local population.

Part 6 takes a look on necessary steps for the future: it presents ideas for effective ways of combating climate change that each and every individual can easily put into practice. However, decisive and prompt action on the part of the international community which interlinks the existing UN environment conventions is needed if we are to deal with the impacts of global climate change that are already in evidence.

The background information in **Part 7** gives a two-page summary covering climate, biological diversity, nature conservation strategies and national climate policy for each of the eleven countries. In addition, the enclosed CD contains detailed country profiles from the first edition of this brochure.

The Appendix (**Part 8**) contains a glossary and list of abbreviations, as well as links and ideas for further reading on the partner countries and on issues relating to development cooperation, biodiversity and climate change.

The brochure is aimed at teachers in the senior years of secondary school, at universities, and at multipliers in extra-curricular education working on issues related to the environment and development policy. As well as providing resources for further work on the core topics addressed, it also highlights links to related issues in the spirit of 'Education for sustainable development'. Most of the material is in English, and the statements of the Climate Witnesses are available in the language spoken in each country (including French, Spanish and Portuguese). The brochure provides material for teaching in traditional disciplines such as geography, biology, physics, community and social studies, ethics, politics. However, it is ideally suited for trans-sectoral approaches like 'global studies' or interdisciplinary projects.

In recent years, news on collapsing ice shelf – giant sheets of ice formerly connected to glaciers on land and now floating on the oceans - are becoming ever more frequent.

Part 2
Biological diversity: victim of climate change or part of the solution?

Oceans can absorb large quantities of carbon dioxide. Without them, the concentration of greenhouse gases in the atmosphere would be much higher.

Anthropogenic, in other words human-induced climate change began with industrialisation and the use of fossil fuels, which has increased enormously since the middle of the18th century. By burning coal, oil and gas, the carbon stocks taken out of the atmosphere many millions of years ago by ecosystems have been released into the atmosphere again over a very short period. Emissions from agriculture are adding to this: methane gas is generated especially by paddy rice cultivation and cattle farming. Land-use changes such as the conversion of forests and peatlands – which store large quantities of organic material that has not yet decomposed – to agricultural land, produces additional emissions of greenhouse gases.

In the period from 1970 to 2004, global anthropogenic greenhouse gas emissions increased by 70%, while CO_2 emissions rose by as much as 80%. The rate of increase has accelerated in the past ten years. The present-day level of greenhouse gases, around 430ppm (=parts per million), is markedly higher than the natural level has been during the past 650,000 years. Up to now, the oceans have stored around one third of the carbon dioxide released by the burning of fossil fuels - about 50 times more than the atmosphere and 20 times more than the terrestrial biosphere and soils. Had this not been the case, atmospheric carbon dioxide content would be another 55ppm higher than it is at present. Climatic changes

What is climate?

The concept of climate derives from the Greek word klimatos (= inclination) – referring to the inclination of the Earth's axis with respect to the plane of its orbit round the sun. Climate is defined as the combination of weather phenomena that is typical for the average condition of the atmosphere in a given location or in a given region. This is usually determined on the basis of measurements taken over a sufficiently long period, normally 30 years. In this respect climate differs fundamentally from weather, which simply refers to short-term, local phenomena such as a storm or a cold winter's day.

Source: UK Met Office: www.metoffice.gov.uk

What is biodiversity?

Biological diversity, or 'biodiversity', refers to three overlapping levels of diversity: diversity of ecosystems or habitats, species diversity (including micro-organisms and fungi, which are neither plants nor animals), and diversity of the genetic information contained in the different species.

Source: Website of the Convention on Biological Diversity, www.cbd.int/2010/biodiversity/

Sources and additional information:

- www.unep.org/climatechange/
- IPCC (2007): 4th Assessment Report.
- WBGU (2006): The Future Oceans – Warming Up, Rising High, Turning Sour. www.wbgu.de/wbgu_sn2006_en.html
- http://news.bbc.co.uk/weather/hi/climate/default.stm

ErShan Chen, student of forest resources conservation & recreation

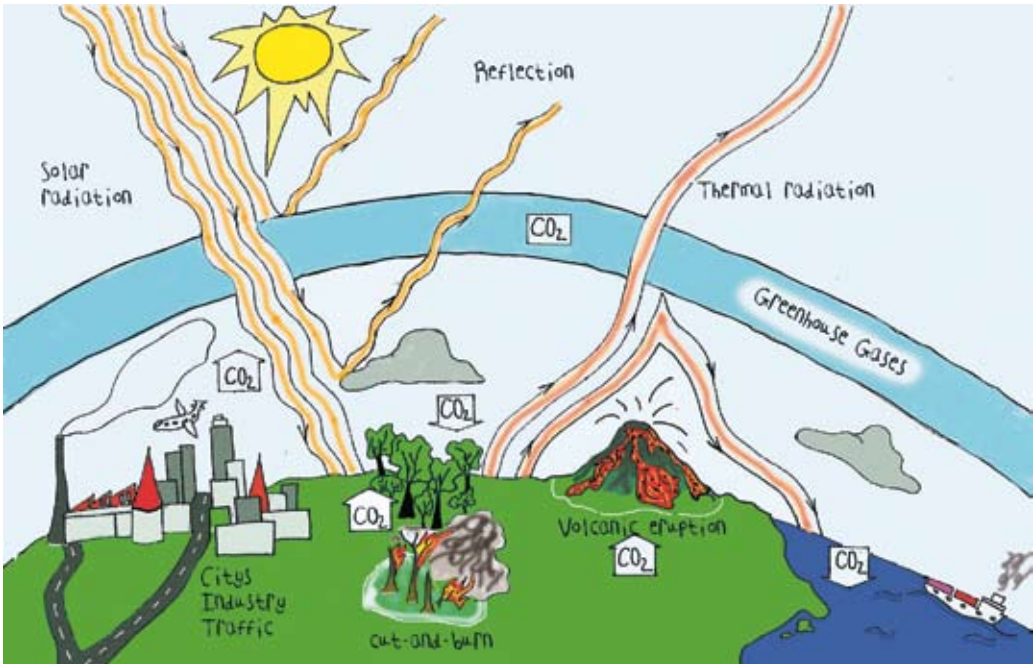
Climate Witness from China

"我大学所在的城市被称作中国的“雨城”，这里的年降水量大概是1732mm.但是我听到一些当地人抱怨现在“干燥”“炎热”的天气。这里又一种说法“雅（雅安）无三日晴”，但是我都经历过超过一周的晴天。"

"In China the city of Ya'an, where I go to university, is called 'City of Rain'– annual precipitation here is 1732 mm. However, some of the people who live here are complaining at the moment about the 'hot and dry' weather. In China there is a traditional saying, that 'in Ya'an the sun never shines for more than three days'. Since I have been here, there have been times when the sun has been in the sky for more than a week."

The greenhouse effect

Similar to what happens in a greenhouse, short-wave solar radiation strikes the Earth and some of it is radiated back as long-wave thermal radiation. Some of the gases in the atmosphere, referred to as greenhouse gases (for example water vapour, methane, carbon dioxide), are impermeable to these long waves, and so the Earth heats up. This mechanism makes the climate on Earth pleasant, with an average temperature of +15°C. However, because greenhouse gases are constantly on the increase due to human activities, temperatures are also rising continuously.



Source: Antje Enke / OroVerde (2007)

not driven by the CO_2 concentration alone have occurred many times in course of the Earth's history, but according to the United Nations' Intergovernmental Panel on Climate Change (IPCC), the 0.74°C average global temperature rise that took place during the twentieth century is largely due to the additional greenhouse effect brought about by human activity.

The scientists' forecasts

Climate researchers recommend that the international community should do everything in its power to prevent the global average temperature from rising by more than 2°C relative to the pre-industrial era. This can only be achieved, in all likelihood, if the greenhouse gas concentration can be stabilised at 450-550ppm CO_2 equivalents (the current concentration is in the region of 430ppm). If the 2°C threshold is exceeded, irreversible climate change endangering human life and many species of flora and fauna will be inevitable. Small island states even demand a stabilisation of 350ppm in view of existence-threatening impact of climate change and sea-level rise.

Given that the Copenhagen climate negotiations of December 2009 failed to reach an agreement on binding measures, this goal is becoming increasingly difficult to achieve (see p. 42). If one adds up all the national – at the moment non-binding – greenhouse gas reduction targets announced up to June 2010, it is clear that the world is very likely heading for warming in excess of 2°C, or possibly over 3°C by the end of the century. At the same time, there are signs that climate change has progressed much further than the IPCC scientists had so far assumed. Since the report was published in 2007, many new studies have been undertaken and observations made of climatic changes already under way.

The Intergovernmental Panel on Climate Change – IPCC

The Intergovernmental Panel on Climate Change (IPCC) was set up in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO). The primary task of this body, which is attached to the United Nations Framework Convention on Climate Change (UNFCCC), is to assess the risks of global warming and to develop mitigation strategies. The IPCC does not itself carry out scientific research, but it collates research findings.

The IPCC's reports are produced by more than 100 researchers organised in three Working Groups and must be accepted by the Panel in plenary session:

1. Working group I – The Physical Science Basis of Climate and Climate Change
2. Working group II – Climate Change Impacts, Adaptation and Vulnerability
3. Working group III – Mitigation of Climate Change

The latest findings of the three Working Groups were published in the IPCC Fourth Assessment Report 2007. This report forms the basis of all current scientific and policy debate on global warming.

Sources: www.ipcc.ch

An international biodiversity panel – IPBES?

To improve the way in which available knowledge on conservation and valorisation of biodiversity is used, this knowledge needs to be organised and tailored to policy-makers' demand for advisory support. The founding of an international scientific panel, the Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES) like the IPCC, is aimed at bringing scientists, policy-makers and non-governmental organisations around the table.

Initial official government consultations on the establishment of IPBES took place in November 2008. The German government expressly supports the establishment of IPBES. The Conference of the Parties to the International Convention on Biological Diversity (COP 10) in autumn 2010 includes a resolution on its establishment.

Sources: www.ipbes.net, www.bmu.de

The Summary for Policymakers of the 'Climate Change 2007' Synthesis Report can be found in pdf format on the CD accompanying this brochure.

The Climate Action Tracker system developed by Climate Analytics, Ecofys and the Potsdam Institute for Climate Impact Research provides regularly updated assessments of each country's proposed reduction commitments. These data are used as the basis for calculating probable global warming.
www.climateactiontracker.org

The retreat of the glaciers in the Arctic – clearly revealed in this picture by the deep lateral moraines and vast mounds of debris – sounds an early warning of climate change.

These studies indicate that:

- rainfall is already changing to a greater extent than predicted,
- ocean acidification is greater than previously assumed,
- ocean warming is already twice that predicted in the IPCC report,
- sea levels could rise by between half a metre and two metres by the end of the century,
- permafrost soils are thawing more rapidly than was previously thought,
- many ecosystems are already reacting to global climatic changes,
- worldwide emissions of greenhouse gases are increasing more rapidly than previously assumed, and that,
- extreme weather events are on the increase worldwide.

This means that the world, and developing countries particularly, will in all probability have to deal with much more dramatic impacts of climate change than previously anticipated. It is all the more urgent, therefore, to promote prompt and resolute action on the part of the international community to reduce greenhouse gases in order to prevent climate change of dangerous proportions.

Biodiversity as a whole plays an important role in regulating climate at local, regional and global level. Terrestrial and marine ecosystems store a significant proportion of greenhouse gas emissions generated by the burning of fossil fuels. However, they also release CO_2 – every living creature that breathes and plants that slowly decompose to form compost, convert carbon into the greenhouse gas carbon dioxide. Biodiversity also influences climate by way of the water cycle (evaporation and cloud formation) and by way of the Earth's radiation budget (areas covered by vegetation have low reflectivity).

The impact of global climate change on biodiversity is best illustrated using concrete examples. Before going on to discuss the fundamental threat to biodiversity posed by climate change in more detail in the next section, we will first of all explore the connections between them by looking at the example of the two most species-rich ecosystems on our planet: tropical rainforests and coral reefs.

Sources:

- PEW Center (2009): Key Scientific Developments Since the IPCC Fourth Assessment Report.
- University of Copenhagen (2009): Synthesis Report from 'Climate Change: Global Risks, Challenges & Decisions.'
- WRI (2009): Climate Science 2008 Major New Discoveries.

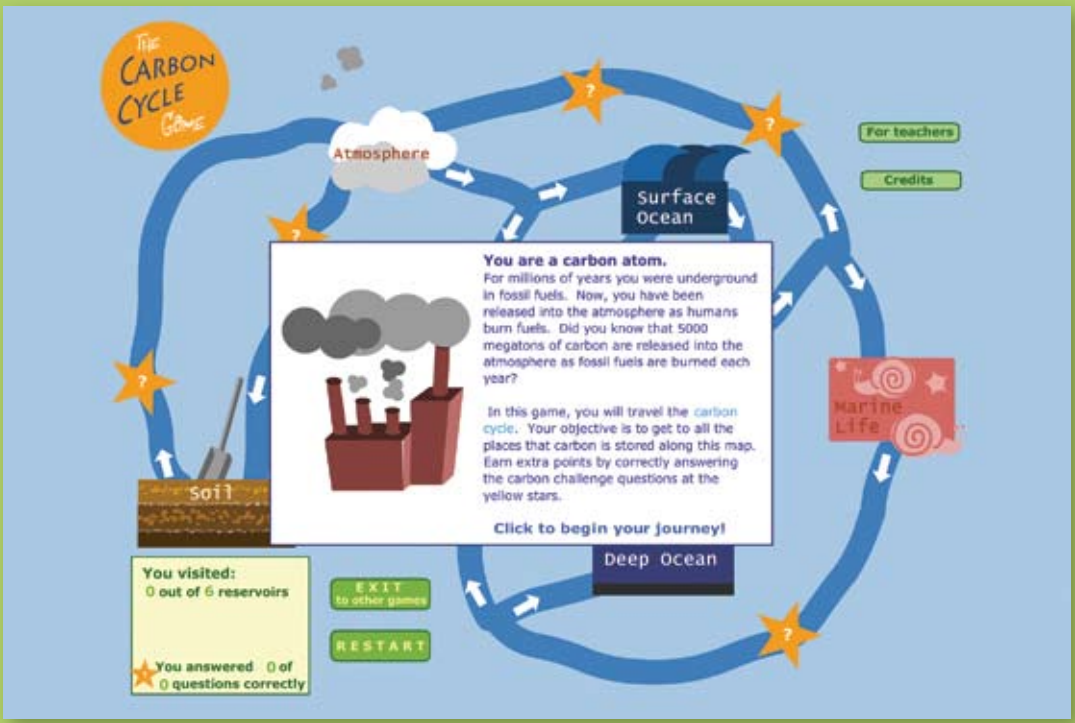
How far will the sea level rise?

New studies by climate researchers have enhanced our understanding of the melting processes of large inland ice masses. We now know, for example, that when large areas of the Antarctic ice shelf collapse, the inland glaciers behind them can flow more rapidly into the sea and hence contribute to rising sea levels. Rapid melting processes of this sort have already been observed in Greenland and Antarctica. Moreover, scientists assume that between 2030 and 2080 Arctic waters will be ice-free in summer. There is already speculation about new shipping routes through the famous Northwest Passage. As well as having dramatic consequences for polar bear populations, an ice-free Arctic would further accelerate climate change, because bright areas of ice reflect sunlight, while large dark areas of sea absorb most of the solar radiation and its warmth (this is referred to as a 'feedback effect'). On the basis of these new findings, many climate researchers now forecast a sea-level rise of between half a metre and two metres by the year 2100. In the event that Greenland's inland ice also melts, the rise in sea level could be as much as several metres.

Discuss:

Follow the link http://flood.firetree.net to see a simulation of sea-level rises of up to seven metres on a map of the world. The maps are based on altitude differences and do not take into account any adaptation measures such as dykes or natural retention areas. Imagine how the map would look if measures like these were taken into account. Where, in such a case, would fewer land masses be affected?

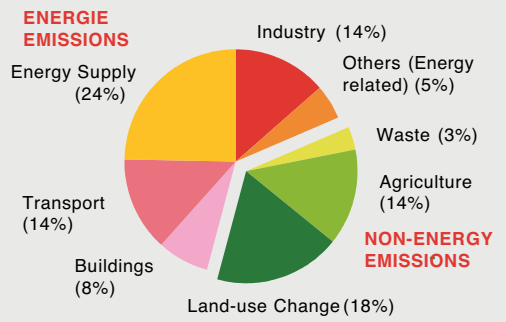
If you would like to find out more about the carbon cycle, take a look at the interactive website of Project BudBurst, and take an interesting journey online as a carbon atom.



Source: www.windows.ucar.edu/earth/climate/carbon_cycle.html

Tropical rainforests

The forests and forest soils of our planet represent a constant store of around 2,300 gigatonnes of carbon – significantly more than the 597 gigatonnes found in the atmosphere in the form of carbon dioxide. If these forests are cleared or converted to fields for cultivation or pasture, this bound carbon escapes into the atmosphere. Deforestation and changes in land use currently account for nearly 20% of all carbon dioxide emissions resulting from human activities. Deforestation and conversion of land to agricultural use in the Amazon Rainforest are single-handedly responsible for between 5 and 10% of all worldwide carbon dioxide emissions.



Source: Stern, Nicholas (2007): The Economics of Climate Change. The Stern Review, @ Cambridge University Press

In autumn 2008, the Eliasch Review commissioned by the British government concluded that in the absence of any mitigation measures, atmospheric greenhouse gas emissions levels resulting from progressive forest loss will increase by 30ppm by 2020. This alone would take us to the 2°C global warming threshold. The researchers therefore recommend that the rate of deforestation be halved by 2020 and reduced to zero by 2030.

Why, then, do tropical rainforests occupy such a key position in terms of biodiversity and climate protection? Prior to human influence, rainforest ecosystems covered around 12% of the Earth's land mass. Today, they occupy less than half of this area, representing a decline from around 15 million km^2 to roughly 7.5 million km^2 – which is more than 20 times the total surface area of Germany.

These forests nevertheless remain home to at least 50% of all known species of terrestrial flora and fauna in the world. Scientists take the view that the majority of terrestrial species not yet

The Eliasch Review on Climate Change and Financing of Global Forests was commissioned by the British government and published in autumn 2008. The report can be downloaded at: www.occ.gov.uk/activities/eliasch.htm

In the year 2000, 18% of all greenhouse gas emissions were caused by deforestation and changes in land use.

An intact rainforest is not only important for biodiversity conservation – it stores climate- damaging greenhouse gases, stabilises the local climate, prevents soil erosion and provides a resource base for the local population.

Due to changes in the natural vegetation cover, the total tropical rainforest area worldwide has been reduced by almost half.

discovered or described are to be found in tropical forests. The reason why tropical forests are so extraordinarily species-rich lies in the combination of particular conditions found there: a very humid, warm climate accelerates biological processes and hence also evolution. In addition, during past ice ages, these animals and plants – unlike those in higher latitudes – were able to continue developing relatively undisturbed. In contrast to forests in more temperate latitudes, moreover, the characteristic layered structure of vegetation in the tropical rainforests, along with year-round availability of fruit and leaves, provides additional habitats (so-called niches) for many organisms.

In many regions of the humid tropics, the local population, dependent on the forest and its products, exerts pressure on the remaining natural resources: areas of intact forest decline while the number of users remains the same or even increases due to population growth.

As a result of climate change, pressure on endangered tropical rainforests increases even further: in Latin America especially, periods of dry weather are expected to increase, potentially posing a major threat to the existence of the Amazon rainforests. Long periods of dry weather weaken the rainforests and make them more vulnerable to forest fires and pests. As a result of increased atmospheric CO_2 content, the stomata on the leaves of trees remain partially closed and so less water is released through transpiration – which in turn causes further heating of the atmosphere and affects local hydrological cycles. If these processes intensify and are accompanied by reduced rainfall and increased incidence of fires and larger areas of open pasture and land under cultivation, degradation of tropical rainforests may reach the point where savanna-type vegetation takes their place. As a result, a region such as the Amazon Rainforest, which up to now has locked up an enormous quantity of carbon, could release vast amounts of CO_2.

The international community has now recognised, that biodiversity conservation in tropical rainforests and climate protection must go hand in hand. Important instruments in this regard include designating protected areas, linking the existing protected areas via ecological corridors, and promoting good practices for sustainable use of resources. Reforestation of degraded areas or

Further information can be found in the book: Tropical Rainforest Responses to Climatic Change (2007) by John Flenley and Mark Bush.

Discuss: Our contribution to the conservation of rainforest and biodiversity and to climate protection

In countries that import tropical timber and other products, decisions about consumption and behaviour can make an important contribution to rainforest biodiversity conservation and climate protection. Cycling, saving energy, using green electricity – steps that you can take in your everyday life. When you go shopping you can make decisions that also have an impact on the climate, such as buying certified products from sustainably managed forests, or buying locally produced or fair-trade products, or eating less meat.

Focusing on your daily life and the choices you make as a consumer, think about how you could make a difference to climate protection at home. Imagine also, you were living in a developing country – where would you see potentials for change? For tips and suggestions follow the links below:

- Act on CO_2: http://actonco2.direct.gov.uk/home.html
- European Commission: Change.How can you control climate change: http://ec.europa.eu/environment/climat/campaign/index_en.htm
- www.greenpeace.org/international/en/campaigns/climate-change/solutions/individual-action/
- Forest Stewardship Council (FSC) for responsible forest management: www.fsc.org
- Fairtrade: www.transfair.org/bot/fairtrade-in-english.html

reafforestation of areas without forest cover using native tree species takes carbon dioxide out of the atmosphere and thereby mitigates climate change. The local population can derive additional benefits from the sustainable use of forest resources.

Generating economic value from biodiversity by means of innovative financial instruments can also play a decisive role in future. Financial recompense should be given for ecosystem services, for example those provided by tropical rainforests, that enhance general public welfare (e.g. storing climate-damaging greenhouse gases, regulating local climate or providing drinking water), thereby creating new economic incentives for forest conservation.

If we succeed in conserving large areas of intact tropical forest by protecting them and using them sustainably, not only will we have helped reduce greenhouse gas emissions, we will

Antoine Nagassi
student
Climate Witness from Benin

„Le rayonnement de soleil et la chaleur augmentent. En conséquence, la fertilité des sols a réduit et certaines espèces de la faune et de la flore ont disparu. La réduction des pluies mais aussi des saisons sèches de plus en plus brefs rendent difficile la réussite de l'agriculture. Le manque d'eau empêche aussi le développement d'autres activités humaines telles que la pisciculture et l'horticulture."

"Solar radiation and heat are increasing. Soil fertility has already declined as a result, and some animal and plant species have disappeared. Diminishing rainfall and periods of drought are making farming increasingly difficult in our region. Shortage of water is also preventing the development of other human activities such as fish farming or market gardening."

350.org is an international campaign building a movement to unite the world around solutions to the climate crisis. On October 10 it is mobilising people from around the world to contribute with creative actions to the world climate day. More information at: www.350.org

also make it easier to adapt to the consequences of climate change: the local water balance will stabilise and the local climate improve. Water evaporation from vegetation (evapotranspiration) leads to higher humidity and cooler temperatures. Moreover, the risk of soil erosion (e.g. after heavy rain) is considerably lower in forested areas than non-forested areas.

Development cooperation supports partner countries in their efforts to conserve their tropical rainforests, for example by assisting with management of protected areas, sustainable use of natural resources or identifying compensation measures.

Coral reefs

Although coral reefs account for a mere 0.1% of the marine and coastal area, they provide a habitat for almost a quarter of all marine flora and fauna. Around 100 million people are economically dependent on these ecosystems (either through direct use of the resources like fishing or through indirect use, like tourism). The economic value generated annually by coral reefs worldwide is estimated at USD 30 billion.

Due to their narrow range of tolerance for environmental conditions, corals exist only where particular light, temperature and calcium carbonate levels prevail. They live in symbiosis with single-celled algae that provide the corals with a supply of carbohydrates. If the corals are exposed to stress (e.g. increased temperatures), the algae are expelled from the coral tissue. The living tissue of the coral is transparent in the absence of the algae cells, so the whitish calcium skeleton shows through – hence the term 'coral bleaching'. This phenomenon is partially reversible, because algae cells can be taken up into the tissues of the coral again. However, if the bleaching persists, the corals die.

There is another process that is contributing to the decline of the coral reefs: a substantial proportion of the carbon dioxide emitted by humans does not remain in the atmosphere; it is taken up by the oceans. If this did not take place, the climate would change even more rapidly. Carbon dioxide is an acidic gas, however, and has the effect of lowering the pH of the upper water strata – a process referred to as ocean acidification. The consequence is a CO_2-driven slowing of the calcification rate, which impedes coral reef expansion in cooler marine areas.

Sources:
- WBGU (2006): The Future Oceans – Warming Up, Rising High, Turning Sour. www.wbgu.de/wbgu_sn2006_en.html
- www.zmt-bremen.de

An estimated 100 million people depend economically on coral reefs. Increased water temperatures and a rise in the CO_2 concentration in the oceans are contributors to the destruction of these fragile ecosystems.

According to current knowledge, both higher temperatures and raised CO_2 concentrations are combining with other stress factors such as pollution, overfishing and destructive fishing practices (e.g. dynamite fishing), to produce a drastic reduction in the natural range of coral reefs today. Many new studies suggest that most areas of the oceans will be inhospitable to corals by 2050 and 80% of the current reefs will have died within the next four decades. A significant decline in calcification rate has already been observed in some coral species.

For humans this has dramatic consequences: coral reefs provide important products such as fish (reefs serve as 'nurseries' for young fish) or construction materials (blocks made of coral limestone). They offer protection from coastal erosion, from floods triggered by tidal waves in the event of submarine earthquakes (tsunamis) and from tropical storms. Because of their glorious colours and diversity of shapes, and the fact that they are home to innumerable species of exotic fish, coral reefs and the attractive white coral beaches are a significant source of income for local communities, for example from international diving tourism. The cultural identity of coastal dwellers is usually closely linked to the existence of the reefs, which is reflected in many traditional festivals. The dying back of these ecosystems therefore leads to manifold consequences: diminished income from fishing and tourism, a deterioration in the food situation, poorer coastal protection, and broad cultural impacts.

In times of climate change, and because adapting to its consequences is a necessity, it is therefore crucial to protect coral reefs with all their functions. Integrated coastal area management, environmental education and information dissemination measures, along with the designation and improved management of marine protected areas, all play a major role in preventing stresses that are life-threatening to vulnerable ecosystems. In doing so it is vital to engage all stakeholders in planning approaches to solve the problems. In the past a number of promising projects were carried out with the support of German Technical Cooperation (e.g. in the Philippines and in Indonesia). Sadly, however, most politicians and planners fail to prioritise marine and coastal areas in the way that they deserve.

Biodiversity is endangered by climate change

Loss of biodiversity is caused by a combination of many different factors. These include changes in land use (for example clearing rainforest for agricultural use or to open up new areas for construction), destruction of natural habitats, and overexploitation of natural resources. Introduction of or colonisation by invasive alien species and air and water pollution also play their part in weakening ecosystems.

In addition to the manifold direct impacts of human activities, climate change poses a threat to biodiversity. Temporal and spatial shifts in temperature and rainfall patterns, extreme weather events and rising sea levels all have an impact on the lives of many animal and plant species and magnify the effects of the factors mentioned above. They can result in major habitat displacements for many organisms at higher altitudes or closer to the colder polar regions. Impacts can also be observed in terms of species composition, ecosystem structure, growth and reproduction rates or the timing of seasonal events (e.g. earlier appearance of leaf shoots or earlier flowering, movements of migratory bird species). As a result, the stability and proper functioning of ecosystems and ecosystem services can change significantly. Potentially this could even lead to current carbon reservoirs turning into carbon sources, and this in turn would further fuel the increase in CO_2 levels.

In its Fourth Assessment Report in 2007 the Intergovernmental Panel on Climate Change (IPCC) drew attention to the dramatic consequences of climate change for biodiversity: if temperatures rise by 2 to 3°C overall, it is likely that between 20 and 30% of all animal and plant species will be threatened with extinction; if the increase in temperature exceeds 4°C, then as many as 40 to 70% of all known species on our planet could disappear. Since this report was published, many other studies have been conducted scientifically documenting the climatic changes already taking place. The results corroborate the statements put forward in the IPCC Report, and in some cases actually go further. Even today a decline in population density can already be observed among many species of fauna that have particularly small ecological niches closely coupled

For information on the GTZ coastal protection project in the Philippine island of Leyte, see: www.gtz.de/de/presse/25499.htm

to climatic conditions, for example the polar bear and the Adélie penguin. Ecosystems regarded as especially vulnerable, in other words ecosystems that are endangered (by climate change) include freshwater habitats, wetlands, mangroves and coral reefs, arctic and alpine ecosystems and cloud forests. Loss of regions that are extremely rich in biodiversity terms (referred to as biodiversity hotspots) is considered particularly grievous.

Major climatic fluctuations have occurred in Earth's history – but these changes generally took place over much longer periods of time, so that most species had sufficient time to adapt to the altered living conditions. In addition to the short timescales of the present changes, there is often considerable fragmentation of habitats and ecosystems, hampering adaptation to the impacts of climate change. Settlements, roads and land used intensively for agricultural purposes impede

The fragmentation of habitats – which is happening here in the Brazilian Amazon – makes it more difficult for species to adapt to altered climatic conditions.

Christina Erkelenz
MSc Environmental Technology and Management
Climate Witness from Germany

„Meine Oma hat oft am Fenster gesessen und den ganzen Tag ihren Garten im Blick gehabt. So konnte sie beobachten, dass die Vögel bereits seit einigen Jahren immer früher im Jahr mit dem Singen beginnen und bestimmte Pflanzen nun zu anderen Zeiten im Jahr blühen."

"My gran often used to sit in her window looking out at her garden all day. She observed over a period of several years that birds had started to sing earlier in the year and certain plants were flowering earlier than before."

Coastal regions – such as Venezuela's coastal montane cloud forest, pictured here – are particularly at risk, and the same goes for tropical rainforests, desert edges, mountain regions and savannas.

climate-driven migration of animals and gradual shifts in plant cover.

Our knowledge about how species and ecosystems will potentially react to climatic changes is still very limited, due to the complexity of interrelated impacts in biological ecosystems. New studies and reports nevertheless suggest that climate change and its impact on the composition of habitats will be much more drastic than we would previously have assumed.

What function does biodiversity have for humans in times of climate change?

The Earth's ecosystems are severely endangered by the climatic changes currently taking place. At the same time, biodiversity takes on functions that can mitigate climate change and support adaptation to altered environmental conditions. Some examples of these functions are outlined below.

Biodiversity as a buffer

Intact ecosystems are better able to withstand the effects of climate change than those already struggling to cope with other stress factors such as pollution or overuse. They have greater resilience. They serve as a kind of buffer against the impacts of climate change: intact wetlands, for example, act as natural water reservoirs in times of drought, and as retention areas in the context of an ecological flood protection scheme, protecting the area from inundation. Mangrove forests provide a buffer against extreme events such as typhoons and hurricanes, which are becoming increasingly frequent, while montane forests can help prevent landslides following heavy rainfall.

At the 13th Conference of the Parties to the Framework Convention on Climate Change (COP 13), a side event was held on the topic of 'Biodiversity – climate interactions: adaptation, mitigation and human livelihoods'. By following the link here you will find presentations on the topic, amply illustrated with figures: http://regserver.unfccc.int/seors/reports/archive.html?session_id=COP13

Intact wetlands serve as retention areas in extreme weather events and as natural reservoirs in periods of drought.

Intact mangrove forests can act as a buffer against extreme events like typhoons and hurricanes.

The availability of highly diverse crop varieties acts as a kind of insurance policy against the risks posed by climatic changes.

You can find out more on the topic of agrobiodiversity in the brochure 'Mountain gods and wild rice. Agrobiodiversity as the Basis of Livelihood. Contributions from China), in the series 'Sustainability Has Many Faces' (forthcoming).

Biodiversity as insurance for food security

For adapting to altered climatic conditions, agrobiodiversity – in other words the genetic variability of agricultural crop plants and livestock species – plays a crucial role. Where there is a broad range of local species and varieties, crops can be bred that are better adapted for example to drier conditions. Hence, conserving the broadest possible genetic diversity is a kind of insurance again the risk posed by climatic changes. This means that we must also protect areas where original wild varieties exist in order to preserve the gene pool and foster exchange for selective breeding aimed at adaptation, as well as safeguarding and promoting evolutionary processes and traditional knowledge relating to the use of these plants.

Biodiversity as carbon reservoirs and sinks

Marine and terrestrial ecosystems play a key role in the global carbon cycle. As they store many times more carbon than the atmosphere (see Tropical Rainforests, p. 19), ecosystems take on a vital function as carbon reservoirs and sinks. Carbon reservoirs absorb important quantities of CO_2, They need to be maintained. But since their potential is already saturated, scientists describe

Four functions of biodiversity that mitigate climate change and aid adaptation to its consequences (Source: Britta Heine, unpublished manuscript).

Storage Prevent loss of carbon present in vegetation and soils.	**Sink** Sequester additional carbon from the atmosphere in ecosystems.
Buffer Preserve intact ecosystems to protect local climate and buffer against increasingly frequent extreme weather events like storms, droughts and sea-level rise.	**Insurance** Preserve ecosystem services, aiding adaptation to changes in the water balance and to new diseases, protecting fish stocks and agricultural production.

People in developing countries particularly benefit from agrobiodiversity conservation as this diversity provides them with cost-efficient means of adapting to altered climatic and living conditions.

Gabriela Gemio
student of ecology and environmental engineering
Climate Witness from Bolivia

„Cuando yo era niña viajaba al nevado del Chacaltaya, a 32 kilómetros de la ciudad de La Paz, para jugar con la nieve. Ahora, por efecto del cambio climático el Chacaltaya casi no tiene nada de nieve."

"When I was little we used to go to the Chacaltaya Glacier, 32 km from La Paz, to play in the snow. As a result of climate change there is barely any snow left on the glacier."

them as 'static'. Carbon sinks, in contrast, are 'dynamic' – they are stores that have the potential to grow and bind additional quantities of CO_2, for example as a result of reforestation measures.

Experts estimate that around 15% of terrestrial carbon is stored in protected areas alone. This is why protecting forests and wetlands, such as peatlands, fosters the reciprocal effect and positive interaction between biodiversity conservation and climate change mitigation. In terms of their capacity to store CO_2 in their vegetation and soil, moorlands and peatlands are the most effective land-based ecosystems. Although they occupy only 3% of the Earth's surface, they contain twice as much carbon as all the forests on Earth put together. If these landscapes are drained for economic purposes or dry out because of higher temperatures, thereby exposing them to intense drought stress, the carbon they contain is released into the atmosphere.

Measures under discussion in this context centre on schemes to bind carbon dioxide by means of afforestation and reafforestation (referred to as creating carbon sinks in previously deforested or non-forested areas) and global compensation payments for conservation of forest ecosystems as carbon reservoirs (for more detailed discussion see p. 35). Re-wetting of moorlands can also create carbon

Further reading on climate and biodiversity:
- Nigel Dudley et.al. (2009): Natural Solutions.
- CBD 2009: Connecting Biodiversity and Climate Change Mitigation and Adaptation

These texts are available as pdf files on the CD accompanying this brochure

Knut and Flocke – the last of their kind?

Is it a coincidence that in 2007 two lumbering polar bear cubs from German zoos became worldwide media stars? Or did the rapturous public response to Knut, a young male polar bear from Berlin Zoo, personally adopted by none other than former German environment minister Sigmar Gabriel, and the female cub Flocke from Nuremberg Zoo perhaps come about as a result of people's increasing awareness of the threat posed to polar bears by climate change? Could it be that in a matter of decades polar bears will only be found in zoos because their natural habitat, the Arctic, will no longer offer a viable environment for their survival? Even now, photos of an emaciated polar bear leaping from one melting ice floe to another are being circulated around the world. There are around 20,000 to 25,000 polar bears currently living in the Arctic region. Their natural resource is the pack ice. It represents protection and mobility, and it serves as a den for the birth and rearing of cubs, as well as a hunting ground where, especially in winter, the bears will be on the lookout for seals, their primary prey. When the ice melts in the spring, a long period of fasting begins for the polar bears, and their survival through this time depends on their ability to lay down massive reserves of fat during the hunting season. The earlier the ice breaks up, the less food the polar bears are able to obtain before they enter into their period of fasting. Their physical condition deteriorates; birth rates decline and fewer cubs survive. In the event of the Arctic Ocean remaining ice-free for longer periods of time, it is likely that polar bears, at least in the southern regions, will starve and die out in certain areas. As polar bears only breed every three years, giving birth to a litter of one to three cubs at most, it is unlikely that these creatures will be able to adapt to the rapidly changing environmental conditions. The ringed seal, which makes up most of the polar bears' diet, is also under threat from climate change. Because the polar bear is at the top of the Arctic Ocean food chain, it is particularly vulnerable. Why should it come as a surprise, then, that the white giants of the Arctic Ocean are becoming icons of climate change?

Source: WWF (2007): Artensterben im Treibhaus
www.wwf.de/fileadmin/fm-wwf/pdf_neu/Klimawandel_Artenschutz.pdf

Former German Minister for Environment and his 'godson' Knut.

Discuss

- What would happen if Jane or Joe Bloggs adopted the polar bears? It might be a bit less exciting than when a country's environment minister does it. What do you think of the idea of making politics with symbols, as in the case of adopting polar bears?
- Why could this kind of politics be positive? What is it unable to achieve? And when might it even be counterproductive? Do you believe that the adoption of Knut the polar bear cub was successful in raising awareness of the negative impacts of climate change, and in preparing the way for new directions in policy?

sinks in the medium term as the roots of the mosses and grasses do not rot in the absence of oxygen, but instead are slowly deposited as peat. Intact soil ecosystems are not only a precondition for ensuring rich, CO_2-storing vegetation; they themselves have the ability to store large quantities of carbon.

Measures to combat climate change and its impacts on biodiversity

Even if all anthropogenic greenhouse gas emissions were halted immediately, temperatures would still rise by a further 0.6°C according to estimates of the IPCC experts because of the time lag in the climate impacts (the inertia of the climate system), and this would have consequences for life over at least the next thousand years. Experts no longer focus their forecasts on whether or not climate change is actually taking place, but on the proportions climate change is likely to assume in future. For us humans and our descendents, mitigating climate change and adapting to its impacts is a question of survival.

But what does mitigating climate change and adapting to its impacts actually mean? And how will mitigating the causes of climate change and adaptation measures affect biodiversity conservation and thereby also our resource base? These questions will be explored below.

Learning to deal with uncertainties instead of doing nothing

Scientists are developing climate scenarios using complex, complicated models. These models deliver propositions relating to possible impacts of climate change; they are not, however, exact predictions. Indeed, exact predictions are something that climate scientists will never be able to make, because the progression of global warming and hence also its impacts depend primarily on our behaviour - for example, on the extent and speed of global population growth, or how soon we manage to convert to renewable energies and reduce greenhouse gases. Climate scenarios thus only reveal possible impacts, which may not necessarily come about exactly as set out. This 'uncertainty' in climate scenarios should not, however, be taken as an excuse for doing nothing! In our daily lives we too make decisions without always having adequate or sound information to hand. For example, we get married without being able to predict the precise outcome of the marriage. Adapting to climate change is exactly like this. Instead of not getting active due to uncertainties or lack of information, it is important to learn to deal with the uncertainties and take control of them.
Can you think of other examples of situations in which we have to deal with uncertainties? Think about strategies that you could use to manage uncertainties.

Information about the impacts of climate change is often unavailable, not easily accessible, or difficult for lay people to understand. GTZ has therefore published a manual for dealing with climate information: Climate Change Information for Effective Adaptation. It can be found here: www2.gtz.de/dokumente/bib/gtz2009-0175en-climate-change-information.pdf

Measures to adapt to the impacts of climate change

Concrete measures to adapt to climate change often relate to: management of water catchment areas to conserve water resources, safeguarding agricultural production, energy supply, reinforcing disaster prevention mechanisms, health care and protecting coastal zones and human settlements. All these measures can have a positive or negative effect on biodiversity: taking a technological approach to flood control by building dykes or dams, for example, can have a negative impact on natural sequences or evolutionary processes within ecosystems. In contrast, the intelligent and proactive use of biological functions and processes can help to conserve biodiversity. These sorts of measures are referred to collectively as 'ecosystem-based adaptation', and are often cheaper and easier for local communities to implement than infrastructure or other technological measures.

Examples of ecosystem-based adaptation measures are:

- Conservation and restoration of mangrove forests and other natural retention areas for protection against storm surges, rising sea levels and floods,

Adapting ecosystems to climate change: what steps need to be taken?

GTZ is currently working with the Frankfurt-based Biodiversity and Climate Research Centre (BiK-F) in Peru and Tunisia to develop a method of conducting analyses in collaboration with the partner countries to assess ecosystem vulnerability and identify appropriate adaptation measures. Availability of reliable data and climate scenarios presents a particular challenge in this context. The method consists of four steps:

1. To be able to identify appropriate measures for adapting to climate change, the first step that needs to be taken is to analyse the effects of climatic changes on an ecosystem and its services: for example, how are declining rainfall and higher temperatures affecting the Amazon Rainforest in Peru? To understand this, the climate trends in a given region are first of all identified and any visible changes analysed and documented.
2. Based on the information, scientists set out propositions regarding the vulnerability (sensitivity) of the ecosystem: for example, what will be the economic consequences of the decline in water availability in the Amazon region?
3. The third step entails discussion of these results with resource users and decision-makers, also taking into consideration other possible reasons for the loss of biodiversity.
4. To conserve ecosystems and their services for humankind in the long term, the final step in the process is to jointly identify and prioritise appropriate adaptation measures, such as improving management of water catchment areas.

For more information on the Biodiversity and Climate Research Centre (BiK-F) in Frankfurt, see: www.bik-f.de/root/index.php?page_id=57&PHPSESSID=6e2cbklip5nqmumocf80d8uk78tu9ro7

Martin Starý
student of forestry and wood science
Climate Witness from Czech Republic

„Pocházím ze střední Evropy, ve které nejsou důsledky globální změny klimatu tolik zřejmé jako v jiných regionech. Globální otepluování může být potenciálně nebezpečné pro lesnictví, které je dzaloženo na pěstování smrku ztepilého (Picea abies). Lesnická vědecká veřejnost mluví o nahrazení dominance tohoto druhu za druhy jako například jedle bělokorá (Abies alba) nebo douglaska tisolistá (Pseudotsuga menziesii).“

"I come from central Europe. The impacts of climate change are less palpable here than in other regions. Global warming can, however, jeopardise the forestry industry, traditionally based on spruce (Picea abies). Scientists are therefore talking about switching over from spruce to other species such as European silver fir (Abies alba) or Douglas fir (Pseudotsuga menziesii) in the Czech forests."

Discuss:
What role can ecosystems play in times of climate change?
Is climate protection the same as biodiversity conservation?

The figure below shows how ecosystems and biodiversity can contribute to mitigating climate change and facilitate adaptation to its consequences (green box). Examples are also given that go beyond this (blue box). For example, you could discuss the pros and cons of (natural) ecosystem-based adaptation to climate change versus construction of (artificial) infrastructure measures for dealing with climate change-driven extreme weather events.

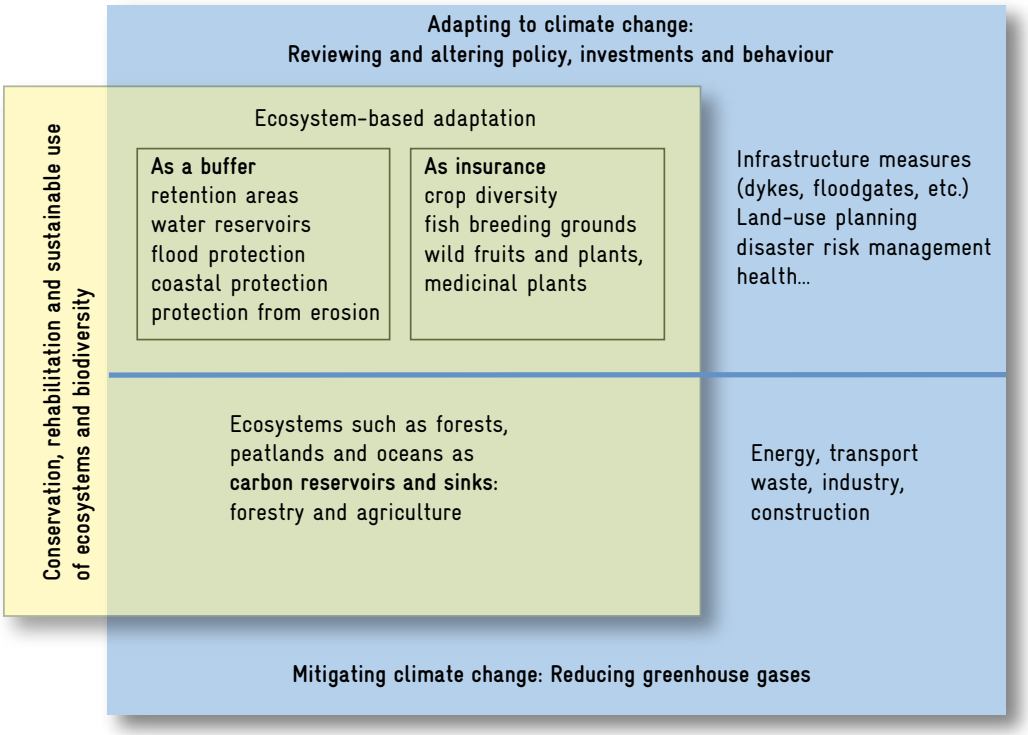


Figure: Britta Heine, unpublished manuscript

The publication „Mountainous Regions: Laboratories for Adaptation" (2008) presents possible adaptation options in mountainous regions with case studies from Africa, Latin America and Asia. www.indiaenvironment-portal.org.in/files/Climate%20Change%20Adaptation.pdf

- Forest conservation and sustainable forest management to conserve water and food cycles and prevent landslides,
- Protection of agrobiodiversity to facilitate adaptation of arable crops and livestock to changing environmental conditions,
- Conservation of traditional medicinal plants used by local and indigenous communities to facilitate adaptation to the health impacts of climate change,
- Maintenance of large areas of forest to promote genetic exchange and foster continuation of evolutionary processes.

To contribute to ecosystem-based adaptation, Germany's federal government is supporting the protection and restoration of mangroves as a natural form of coastal protection in some areas of the world, including the world's largest mangrove forest, the Sundarbans in Bangladesh, several provinces in the Mekong Delta (see brief country profile of Viet Nam on p. 100) and on the southern Pacific islands of Fiji, Vanuatu, the Solomon Islands, Samoa and Tonga.

Even ecosystem-based adaptation measures can have negative impacts on biodiversity, however, as the goals of biodiversity conservation and climate change adaptation are not always the same. For example, using coastal wetlands for coastal protection encourages sediment deposition and hence the stabilisation of the land. This could

have a negative impact on micro-organisms, as their wetland habitat becomes silted up, and on fish species whose flat, protected breeding grounds would dry out. Ecosystem-based adaptation measures are most effective when they are part of a more comprehensive, integrated adaptation strategy at national or regional level. Conventional tools such as risk analyses, scenario development and strategic environmental assessment can all be drawn upon in this context to estimate how effective various measures might be – but also to assess their potential impact on biodiversity. This can then be used as a basis for deciding on the most appropriate type of measures to put in place. Adaptive management, in other words continuous monitoring of activities with regard to their impact on the environment, allows 'adaptation of adaptation'. This can make a major contribution to prevent adaptation measures from having a negative impact on biodiversity.

Measures to mitigate climate change

Any activity in the energy, buildings, transport, waste management, land or forest management sectors that reduces or prevents emissions of climate-damaging gases is a measure to mitigate climate change. This includes for example enhancing technological energy efficiency or encouraging energy-saving consumer behaviour.

Renewable commodities are being extensively promoted as a substitute for fossil fuels, partly to reduce dependence on traditional fuels such as mineral oil and gas, but also to satisfy the world's growing and increasingly energy-hungry population. Soya, oil palms, rapeseed and maize account for a large share of the surface area given over to these. For example in Brazil the 'agrofuels' (or 'biofuel') produced from these crops already occupy a large share of the market. Under Brazilian law, blending biofuel with conventional fuel is mandatory, and the current level is set at 23%. Mainly in the name of climate protection, ever larger areas of natural or semi-natural land around the world are being converted to monoculture production of renewable resources. Certainly, there has been criticism from environmentalists

Indirect climate killers – biofuel and beefsteak

The global economy is a (co-)driver of deforestation. Every time the price of soya beans on the world market rises, the deforestation rate in the Amazon also increases. On the one hand soya beans serve as animal feed (due to the high demand for meat and the ban on feeding livestock meat and bone meal), which is shipped to Europe on a massive scale. On the other hand they serve as a raw material for production of 'biofuel'. Processes such as these are often – deliberately or accidently – driven by European policy. For climate protection, the percentage of agrofuels to be used as mandatory blending quota in Europe is supposed to increase to 5.75% by 2010. This percentage can only be achieved by importing agrofuels from developing countries. In Brazil, this has resulted in generous government subsidies for energy crops cultivated for agrofuel production, and these subsidies have been a decisive factor in the sudden surge in large-scale deforestation. The economic incentive for Brazilian farmers to continue clearing areas of forest to create yet more vast soya bean plantations and pasture for beef cattle is enormous. The result: deforestation pressure rises. This is how unilateral measures to reduce emissions by a few European countries can bring about a shift towards more emissions-intensive activities in other countries.

Source: Phillips, Tom (2008): Amazon's rescue reversed

More and more natural and semi-natural land is being converted to monoculture cultivation of renewable resources to produce 'biofuel'.

Material for a shoulder angel – shoulder devil dispute

Shoulder angel: „Don't eat so much meat – you'll destroy the rainforests!"

Shoulder devil: „That's not my fault" (or: "So I'm not allowed to eat meat at all now, am I?")

Shoulder angel: (...)

Shoulder angel: „:Biofuel is awesome. I'm using biodiesel in my car now, too. The EU is promoting it, so it doesn't even cost a lot."

Shoulder devil: „Er, hello! What do you mean awesome? That means you are also to blame for deforestation of the Amazon!"

Shoulder angel: (...)

Perhaps you can think of even more arguments for the shoulder angel and devil? – But make sure they both stick to the topic!
The arguments are not necessarily as black-and-white as shoulder angel and shoulder devil paint them. What do you think? Do you think it is possible for supranational communities like the EU to adopt decisions that have no negative impacts at all? How should such decisions be framed in order to increase the chances of this happening?

Forests are considered to be a cost-efficient way of mitigating climate change.

Climate protection – a cost factor and an impediment to economic development?

The warming of the Earth's atmosphere risks inflicting greater economic damage on the international community than the damage it suffered as a result of both world wars in the twentieth century put together. A report (the 'Stern Review') produced by the British government's climate policy advisor and former World Bank chief economist Sir Nicholas Stern estimates the potential costs of climate change at around EUR 5.48 billion. Stern is concerned that not taking action (the 'business as usual' scenario) could trigger a new global economic crisis. The total cost of climate change in this event would be equivalent to a long-term annual loss of up to 20% of the global gross domestic product. In contrast, the cost of taking action – in other words reducing greenhouse gas emissions – would amount to no more than about 1% of the global gross domestic product annually.

In spite of this, climate change and climate protection are only slowly coming into the focus of policy debate in many countries. Poverty reduction and economic development – quite understandably – take top priority. Some industrialised countries continue to take the view that climate protection is an impediment to economic growth.

The world, however, does not have to decide between taking steps to combat climate change and promoting growth and development. In fact, the opposite may be the case: in industrialised countries in particular new and innovative markets can be created for low-carbon, more productive energy technologies, goods and services, thereby decoupling economic growth from greenhouse gas emissions. Employment opportunities in these sectors will expand accordingly. In the case of the Federal Republic of Germany, climate protection will produce barely any setbacks in terms of growth. According to a 2009 study commissioned by the WWF entitled 'Blueprint Germany', a 95-percent reduction in greenhouse gases by 2050 would cost an average of just 0.3% of the gross domestic product (GDP) per year. To achieve this, emissions would need to be cut rigorously where it is most cost-effective to do so as part of an integrated, effective climate policy.

Sources: Stern (2007): The Economics of Climate Change,
World Watch Institute: State of the World 2008, Chapter 6
WWF: Modell Deutschland: Blueprint Germany.
A strategy for a climate safe 2050 (German Language)
www.wwf.de/presse/details/news/
modell_deutschland_ausweg_aus_dem_treibhaus/

Research, analyse and discuss

- Are you surprised by these statements from the Stern Review? These statements may be grist to the mill for some people – in other words they stand to benefit. Who are they? For others they could be bad news – who do you think might potentially raise their voice in protest against the statements in the report?
- To what extent can climate protection be an obstacle to economic growth (think of the motor vehicle industry, for example)? In what ways could it in fact create more growth in some of the affected industries? Do you know of any examples in Germany or elsewhere in the world where investment in climate protection has created jobs? Which branches of industry have been able to expand, and have any new industries perhaps emerged?
- Do you think that the key message of the Stern Review (i.e. that not taking action is more costly than taking action) has been grasped everywhere? What do you think would help to make more people aware of the figures that Nicholas Stern has arrived at? Is this the way to persuade industrialised and developing countries to increase climate protection? What is the role played by the fact that parliamentary terms mostly only last four or five years? How do people around you react to the idea of doing more to protect the climate?
- How do political parties in Germany (or in your home country) that in the past have been less focused on addressing 'green' issues react to urgent questions relating to climate protection?
- What parallels can be drawn between the worldwide financial crisis from 2008/2009 and climate change, and what are the differences that give particular cause for concern? What can we learn from the current crisis?
- In case you speak German and want to do a little more reading you can find interesting thoughts to this topic from Felix Christian Matthes of the Freiburg-based Institute for Applied Ecology (Öko-Institut): www.badische-zeitung.de/eine-demonstration-von-lernunfaehigkeit

and social scientists alike: agrofuels and the resources needed to produce them (arable land, water, etc.) compete with food production – and the consequent rise in food prices exacerbates poverty. Moreover, biodiversity is being seriously threatened in some regions by deforestation aimed at making new areas available for cultivation, by more intensive farming and by the use of pesticides and fertilisers. In addition, the greenhouse gas balance for agrofuels varies greatly depending on the raw material used to start with. This is particularly true if the calculation includes not only the complete production cycle of an energy crop right up to the processing stage, but also the conversion of natural forests, as mentioned above. Whether cultivation of renewable resources for agrofuel production is beneficial for biodiversity and whether it is an appropriate measure for mitigating greenhouse gas emissions depends largely on the previous use of the land and the method of farming.

Another possible way of preventing carbon dioxide emissions is to combat deforestation of the world's remaining forests. International debate in this context focuses on the idea of 'avoided deforestation' (= forest conservation), often referred to under the acronym REDD (Reducing Emissions from Deforestation and Forest Degradation). According to this concept, forests and their potential for carbon storage need to be recognised and assessed. Owners and users of existing forests would be 'rewarded' for halting deforestation, in other words for conserving the forests, in the form of compensation payments.

In developing and newly industrialised countries, where progressive deforestation is the primary contributor to greenhouse gas emissions (e.g. Brazil), REDD is not just a cost-effective investment in climate protection; it is hoped that it will also bring many other positive effects in terms of biodiversity conservation, protection of

The economic value of biodiversity – the TEEB Study

Human life depends heavily on ecosystem services – the services provided to us by nature at no cost: clean water, air purification, regeneration of forest resources and fish stocks. Although no monetary value has (as yet) been given to these ecosystem services, they are exploited and their resources consumed. In the long run this lack of appreciation of the monetary value of ecosystem services contributes to overuse of the ecosystem and loss of biodiversity.

Inspired by Sir Nicholas Stern's report (see text box p. 34), the then incumbent German Environment Minister Sigmar Gabriel and EU Commissioner for the Environment Stavros Dimas decided in March 2007 to draw up a similar study on the economic impact of biodiversity loss. In 2008, timed to coincide with the UN Conference of the Parties to the Convention on Biodiversity (COP 9) in Bonn, Pavan Sukhdev, head of the Global Markets division of Deutsche Bank, and a team of researchers led by him published an interim report on the first phase of the study, scheduled to conclude in late 2010.

The report, entitled The Economics of Ecosystems and Biodiversity (TEEB) shows that the decline in biodiversity and the loss of ecosystem services are progressing at an alarming rate and in some cases will even accelerate unless we set the right policy steps in motion. Concrete estimates of economic consequences are not yet included in this initial interim report. It is already clear, however, that investment in natural capital is worthwhile and that prevention is definitely better than cure. Another task assigned to the researchers is to increase awareness of the significance of biodiversity for the economic and social development of humankind. They are working to develop instruments for policy makers and the economy that will take biodiversity conservation into account when undertaking assessments and planning on strategic issues.

In some countries, policy approaches are being tried out that show much promise and could potentially be reproduced at the global level. One such approach is an instrument referred to as 'Payments for Ecosystem Services' (PES). GTZ provides advice on this in several countries including Viet Nam, Peru, Brazil, Colombia and Ecuador. The primary aims are to create positive incentives for the protection and sustainable use of biodiversity and to establish appropriate remuneration for activities that conserve ecosystems and ecosystem services.

For more detailed information on TEEB see: www.teebweb.org

You can find further information on REDD and REDD-plus here:

- www.worldwildlife.org/what/globalmarkets/forests/item3577.html
- Survival International (2009): The most inconvenient truth of all: climate change and indigenous people. http://assets.survivalinternational.org/documents/132/survival_climate_change_report_english.pdf

water catchment areas and safeguarding the living space of indigenous peoples.

Consideration of the rights of indigenous peoples and local communities is, however, one of the most controversial aspects of the REDD mechanism. A large proportion of the world's forests that would be included in the REDD plans are originally indigenous areas. Introduction of REDD could make it more difficult for these traditional forest dwellers to have their land rights recognised. Similarly, rights that have already been recognised could potentially be undermined by REDD projects. For this reason representatives of many indigenous peoples, together with representatives from non-governmental organisations have denounced the lack of consideration given to their rights in the draft texts of the REDD agreement.

A new variation that has been under discussion recently, 'REDD-plus', takes up this issue as well as that of biodiversity conservation. The 'plus' in this case stands for expanding the instrument to include conservation and sustainable management of forests and enhancement of carbon stocks. It is no longer just a matter of reducing deforestation rates in forests in immediate danger of clearing; forests that are already protected would also be included in the mechanism. The aim of this is to boost biodiversity conservation and indigenous peoples' rights. For the mechanism to succeed, however, a great many details will need to be clarified and negotiated at international level, including for example the following: How can actual CO_2 sequestration be measured? What needs to be done to ensure meaningful, cost-effective

monitoring of REDD areas? How can the local population participate in the measures? What happens with the funds that are received via REDD? How can we prevent the weakening of biodiversity conservation in areas with less capacity to store and capture carbon but with high biodiversity values? In order to find answers to these complex questions, REDD is currently being tested in pilot projects with German funding as part of development cooperation work, for example in Laos and Indonesia.

Further educational suggestions and ideas for activities

The following educational suggestions were devised for the climate change week at the International Wilderness Camp at Falkenstein (Bavarian Forest National Park). In this brochure you will find some of them at the end of each section.

Charades

Discover your theatrical talent – but observation is just as important in this game!

The group splits into two teams; let's say Team A and Team B. Each person takes a piece of paper and writes down a term that has something to do with climate change, such as 'global warming' or 'greenhouse gas'. Team A and Team B's papers are collected in separate containers. Team A begins: one of the team members picks a piece of paper out of Team B's collection and looks at the term written on it. S/he then mimes the term to his or her colleagues on Team (A). Miming means without making any sounds (no miaowing!) and without pointing to the objects that are to be represented! Team B may also read the piece of paper that was drawn – and have a good laugh at the guesswork going on …

Past experience shows that even very difficult concepts can be guessed. A time limit of two minutes should be set. This may seem very short, but it is generally more than enough. If no-one guesses the term correctly in the allotted time, then the person who wrote down the term should have a go – but this seldom happens.

As an alternative version you could try representing the terms using drawing or words (but a word of warning: the term being guessed may not be spoken out loud either in whole or in part!).

Further educational resources on the issues of biodiversity and climate change

The German **Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)** published educational resources on the topics of biodiversity, climate protection and climate policy in 2008 (German, Englisch and French Language):

- Worksheets on biodiversity (primary school): the handouts for teachers contain information for linking the topic to the curriculum, ideas for teaching, and tips on methods and practical applications, suggestions for structuring lessons, and clues and solutions to the exercises in the worksheets.
- Educational resources on biodiversity and climate change/climate policy (secondary levels I/II): these resources are based on the teaching

The film 'The Carbon Hunters' explores the consequences of REDD for indigenous groups in the Amazon Rainforest in Brazil: www.pbs.org/frontlineworld/stories/carbonwatch/2010/05/the-carbon-hunters.html

Tipping Point ahead

Leo Murray has produced an animated film on climate change an the so-called 'tipping points': thawing permafrost emitting vast amounts of methane or melting ice caps leaving dark oceans to absorb more heat. The film illustrates the dramatic consequences climate change might take. You can watch the film (11 min., available in 21 languages) at: http://wakeupfreakout.org/index.html

Quiz on climate change

What do you know about climate change? How many points will you score if you put your knowledge to the test? You can try this out with the quiz below. Or you can try it out on your fellow students, your parents, teachers, or people in the street. What questions do many people find difficult to answer, and which are the ones that everyone knows the answer to? Try to form a picture of how concerned the people around you are about the issue of climate change.

- How many years in the past 12 have been among the warmest on record?
  3, 7 or 12 years?

- It is still possible to prevent a rise in the average temperature of the Earth.
  True or false?

- The six greenhouse gases are:
  - ☐ Laughing gas
  - ☐ Giggling gas
  - ☐ Carbon dioxide
  - ☐ Methane
  - ☐ Nitrous oxide
  - ☐ Perforated carboniferates (PCFs)
  - ☐ Perforated carboniferates (PCFs)
  - ☐ Sulphur hexafluoride (SF6)
  - ☐ Hydrofluorocarbons (HFCs)

- Methane is produced by …
  - ☐ Vehicle exhaust fumes
  - ☐ Loud singing in the shower
  - ☐ The digestive system of cattle and camels

- HCFCs (= Hydrochlorofluorocarbons) are no longer used in spray cans today.
  True or false?

- A CO_2 footprint is …
  - ☐ A way of measuring compliance with environmental standards in the manufacture of industrial products
  - ☐ A way of measuring compliance with environmental standards in the manufacture of flip-flops
  - ☐ A way of measuring the CO_2 emitted by a person, a city, or a country in relation to the area that would be required to absorb the greenhouse gases

- Germany's annual CO_2 emissions are 10.5 tonnes per head of population. How many tonnes of CO_2 are generated on a flight from Berlin to New York, calculated on a per passenger basis?
  - ☐ 0.5 t
  - ☐ 2.1 t
  - ☐ 4.6 t

- On average, one European produces as much CO_2 emissions as how many Africans?
  - ☐ 1
  - ☐ 14
  - ☐ 28

- Signatories of the Kyoto Protocol agreed to reduce CO_2 emissions by at least how much on average relative to 1990 levels?
  - ☐ 5%
  - ☐ 15.5%
  - ☐ 20%
  - ☐ 40%

- By 2012, when the 1997 Kyoto Protocol expires, worldwide greenhouse gas emissions will be approximately 40% higher than in 1990, the baseline year to which the agreement refers. True or false?

You are sure to find clues to the correct answers elsewhere in this brochure – and when you have finished the quiz, the answers can be found on the CD accompanying this brochure. But think about it and research it for yourself first!

Climate change stories

To read to yourself, read aloud, or have someone else read to you, or just to pass on ... What do you think of the idea of holding a gathering with the theme of 'Climate Change Stories'? You could, for example, read them out without their titles and get the others to guess who the narrator is. You are sure to be able to think of other good stories yourselves. What does climate change look like from the point of view of a farmer, a president, or a city dweller? Or from the point of view of livestock farmers from Germany / Mongolia / Viet Nam / ...? What does my granny see, what do my parents think, what will my children say – and what do I think about it?

A bird's-eye perspective

One swallow doesn't make a summer? No problem, because I've come with my whole extended family! I tell you, you should be glad. Look at it this way, your summer starts a week earlier than your parents' did. Just a few years ago my parents would have flown here a week later! Sitting in Africa watching the weather forecast for Europe recently, we thought to ourselves: if it's like that, then we might as well get going straight away. So we got ourselves a decent snack and off we went.

The funny thing is: we ran into an acquaintance here that we had met on holiday: a handsome bird, and colourful – with plumage all turquoise, yellow and reddish brown. His name is bee-eater. In Africa I've often seen them around, but they only ever used to fly as far as the Mediterranean. They used to always say that it was too cold for them to live in places like Germany, that there weren't enough steep sandy slopes there, but now they are getting bolder about coming along with us. I like them – even though some of my colleagues have misgivings about them eating all our crunchy midges, mayflies and wasps. To which I say 'Get away, there aren't that many of them.'

materials for teachers and are ideal for use as student workbooks for class teaching.
www.bmu.de/publikationen/bildungsservice/bildungsmaterialien/sekundarstufe/doc/6773.php

The environmental foundation **Allianz Umweltstiftung** has published a variety of brochures and information dossiers on important environmental issues. In 2007 it brought out a dossier with information on climate issues, entitled 'Information on the Topic of "Climate": Fundamentals, History and Projections.' It provide highly educational and very well illustrated slides on the fundamental issues of climate and climate change. For more information see:
www.allianz-umweltstiftung.de/publikationen/wissen/klima_eng/index.html

Atmospheric, Climate & Environment Information Programme

Information Webpage on climate change. Includes comprehensive fact sheets for Great Britain's key stages 2 - 4 on climate change and other related topics.
www.ace.mmu.ac.uk/resources.html

Climate Challenge

Climate Challenge is a single-player game about climate change, playable for free on the BBC website. It is based on real climate change data, where the player can try out different approaches, learn about the issues and have fun at the same time.
www.gamesforchange.org/main/gameprof/677

Friends of the Earth Shout about packs

Shout about is Friends of the Earth's annual activity project for 11 - 13 years olds who want to get active on environmental issues. The last couple of years the weeks focused on climate change. You can download previous activity packs and inspiring stories of what young people achieved in Shout about weeks at:
www.foe.co.uk/learning/educators/resource_index.html#Secondary

Met Office UK

The webseite of the UK Met Offivve contains fact sheets, case studies and quizzes for all ages and for teachers on weather and climate change.
www.metoffice.gov.uk/education

Part 3
The international level: challenges for the world community

The International Institute for Sustainable Development (IISD) provides an independent reporting service on international negotiations on the environment and development. The service covers the major environmental conferences, so interested observers can monitor progress and find out about the decisions taken: www.iisd.ca

There is plenty of evidence that the global climate is changing – and this process is closely linked with the loss of biological diversity. The interrelationships described in Part 2 of this brochure highlight how important it is to mitigate climate change and adapt to its impacts. They also show that conserving biodiversity has a significant role to play here. So what can international political processes and conventions achieve in this context, and how do they work – individually and collectively? How is the international community responding to these challenges, and how can the German government make a contribution, for example through development cooperation?

Political processes and conventions as regulatory mechanisms

The United Nations Framework Convention on Climate Change (UNFCCC)

The main international treaty of relevance to climate protection is the United Nations Framework Convention on Climate Change (UNFCCC), which was adopted at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992 and entered into force in 1994. UNFCCC establishes the framework for the international community's response to the challenges of climate change. The Convention's objective is to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent 'dangerous anthropogenic interference with the climate system'. This should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner (Article 2 UNFCCC). In addition, the industrialised countries which are parties to the UNFCCC are obliged to provide support to developing countries to enable them to implement the provisions of the Convention.

As its title suggests, the Convention has also established the framework for the adoption of supplementary treaties (protocols) containing more far-reaching and binding objectives. Since 1994, the parties to the UNFCCC have met annually at Conferences of the Parties (COPs). The meeting held in the Japanese city of Kyoto in 1997 resulted in the adoption of the Kyoto Protocol, which created the mechanisms for the attainment of the UNFCCC goals. The Protocol, which entered into force in 2005, is the first treaty to introduce binding targets for the reduction of greenhouse gas emissions under international law: the industrialised countries are required to cut their emissions by at least 5% below 1990 levels from 2008 to 2012.

In order to offer countries some flexibility in their efforts to meet their emissions reduction targets, three innovative mechanisms were created:

1. Emissions trading: this regulates the global trade in emissions allowances, i.e. rights to emit greenhouse gases. The underlying concept is to cut emissions wherever this can be achieved at least cost. The Kyoto Protocol therefore introduced a 'cap' – a limit on emissions – for each country. This may apply to specific sectors or even to individual industrial

The story of Cap & Trade: Can emissions trading save the world?

With funny animations and narration by Annie Leonard, the short film 'The Story of Cap & Trade' casts a critical eye at emissions trading. It discusses whether and to what extent trading can genuinely help to reduce greenhouse gas emissions and considers issues such as the allocation of allowances free of charge to major emitters.

This is what happens in the European Union too: emissions allowances are allocated to major energy suppliers at no cost. Think about it: How does this impact on actual greenhouse gas reductions?

The film can be viewed at: www.storyofstuff.com/capandtrade

The story is also available as a pdf file on the accompanying CD.

Justice in the greenhouse – an ethical issue?

Since it was accepted that the climate change taking place today is human-induced, a seemingly endless debate has started at international level about responsibility and the ensuing obligation to reduce greenhouse gas emissions under the Kyoto Protocol.

At the Conference of the Parties in Kyoto back in 1997, Brazil's government issued a provocative statement: it announced that Brazil – a country with by no means insignificant emissions – was dissatisfied with the choice of 1990 as the baseline year for the industrialised countries' reduction targets under the Kyoto Protocol. As carbon dioxide molecules remain in the atmosphere for more than 100 years, the current changes in the global climate are the result of the accumulation of carbon dioxide emitted by the developed countries since industrialisation began. That being the case, their reduction commitments should not be determined by a baseline year but should be calculated according to their historical contribution to climate change since 1840. For that reason, Brazil itself, according to this argument, will not reduce its emissions until the mid 21st century, when the burden of responsibility will rest equally on all countries. Brazil therefore advocated a greater role for burden-sharing with the industrialised countries.

The Brazilian initiative illustrates the important role played by principles of justice in determining reduction targets among countries which are party to the Kyoto Protocol. The following options are being discussed in this context:

- The 'polluter pays' principle, based on historical emissions;
- The 'ability to pay' principle, based on economic capacities;
- The 'principle of need', which takes account of a country's development level and development priorities;
- The 'sovereignty principle', which envisages the allocation of emissions allowances on the basis of current emissions;
- The 'equity principle', which aims to introduce the same per capita emissions budget for everyone.

If the 'polluter pays' and 'ability to pay' principles are accepted, the industrialised countries, due to their higher historical emissions and more powerful economies, have a particular obligation to cut their greenhouse gas emissions dramatically. However, newly industrialised countries, such as China, India, Brazil and Mexico, which together account for around a quarter of current global greenhouse gas emissions and whose share could increase to one third by 2025, must in future be integrated into a binding climate protection regime, even though their per capita emissions will, even then, still be lower than those of the developed countries.

Source: Umweltbundesamt (UBA, the German Federal Environment Agency) (2005), Brazil's Initial Communication to the United Nations Framework Convention on Climate Change (2004)

plants. If emissions are reduced to a lower level than the cap, the unused emissions allowances can be re-allocated or sold. For example, if an industrial enterprise does not need all the allowances issued to it by the state (perhaps because it has cut its emissions or installed effective filters), it can sell its surplus allowances on the free market. Another company can purchase these allowances if, for example, this is cheaper than investing in emissions reduction measures of its own. This economic incentive is intended to contribute to efficient

Think about it!

Each of these principles contains an element of justice. Which countries will benefit or be disadvantaged by the various principles? What would happen if many countries were to follow Brazil's lead? What is your position on the issue of justice – do you support one principle in particular? If not, what do you think is the most sensible compromise?

Further information on emissions trading is available on the following websites:
- http://unfccc.int/kyoto_protocol/mechanisms/emissions_trading/items/2731.php
- http://ec.europa.eu/environment/climat/emission/index_en.htm

More information about the UNFCCC and the Kyoto Protocol is available here:
- www.unfccc.int
- http://unfccc.int/kyoto_protocol/items/2830.php

emissions avoidance. In 2005, the world's first multinational emissions trading system for the industrial sector was established in the European Union. This Emission Trading System (EU ETS) is viewed as a model for a possible global emissions trading system.

2 Joint Implementation (JI) allows an industrialised country or a company based there to generate additional emissions allowances (credits) by investing cost-effectively in climate projects in another industrialised country. No greenhouse gas reduction measures need to be implemented in the home country. In other words, it doesn't matter where the reductions are achieved – the key issue is that emissions are being cut. As well as protecting the climate, the advantages of JI are that the host country can earn revenue from the sale of its emissions allowances while benefiting from technology transfer from the investor country. Originally, the term 'Joint Implementation' was applied to all transnational climate protection measures, including those involving developing countries. However, after additional criteria were introduced for these activities, it was necessary to make a clear distinction, which is now reflected in the terminology used: JI and CDM.

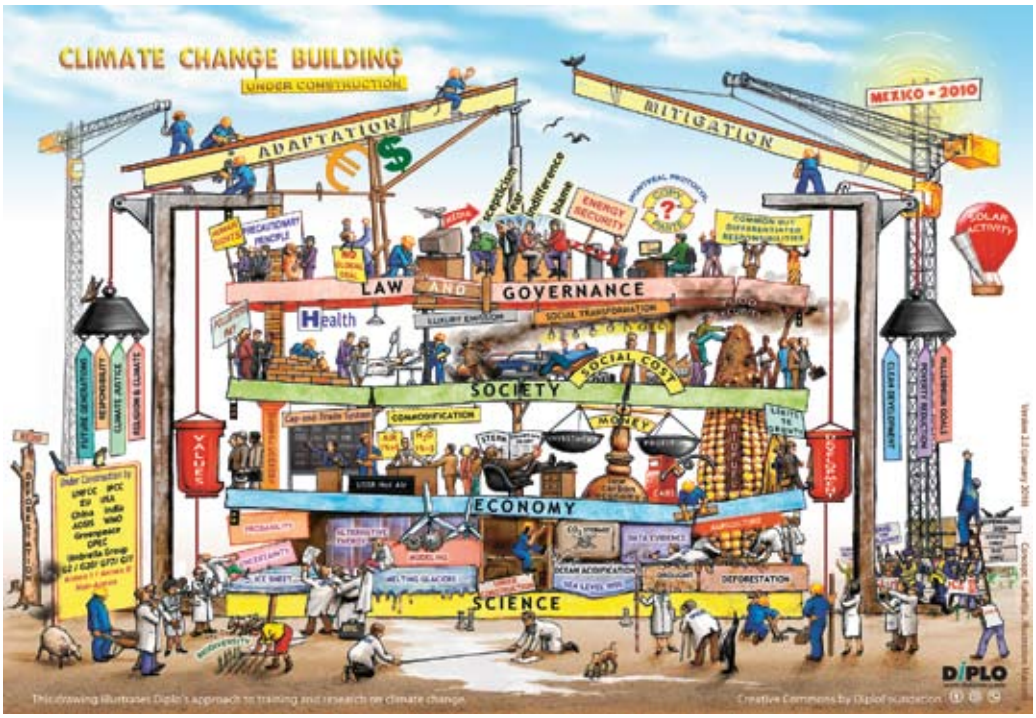
3 The Clean Development Mechanism (CDM) was established specifically for cooperation between industrialised and developing countries. The CDM allows an industrialised country or a company based there to invest in emissions reduction projects in a developing country and thus earn emissions allowances (credits). CDM measures offer major opportunities for the conservation of biodiversity, as reforestation projects are also eligible. However, to prevent species-rich natural forests from being cleared simply so that CDM-eligible replanting can take place on the same site, the designated area must have been unforested for a lengthy and legally defined period. All CDM projects must also undergo a prior environmental impact assessment.

Today, the failure to create a financial incentive at the same time – for example, in order to protect ecologically valuable forest (conservation) areas – is seen as a missed opportunity. In consequence, although they have immense potential for long-term carbon storage, tropical forests and other ecosystems are still being destroyed in pursuit of short-term economic interests. Since the UNFCCC conference in Bali in December 2007, the introduction of the REDD-plus mechanism for the post-Kyoto period from 2012 has been the subject of intense debate at international level (see p. 35). At the – otherwise disappointing – Copenhagen climate conference in December 2009, the countries which signed the outcome document (known as the Copenhagen Accord) succeeded in reaching agreement on a financing mechanism for forest conservation measures in developing countries, which theoretically could be established immediately. The sum of 3.5 billion US dollars was pledged as 'fast-start' financing. However, the modalities for implementing this REDD-plus mechanism in formal terms and the timescale for establishing a functioning instrument at United Nations level are issues which remain unresolved post-Copenhagen. A key task for development cooperation is therefore to continue to support pilot projects which could serve as promising models for the development of the REDD-plus mechanism.

The Copenhagen Climate Conference: Why couldn't we save the climate?

The Copenhagen Climate Conference in December 2009 was supposed to be a milestone in the international climate process, for it was to lay the groundwork for a binding follow-up agreement to the Kyoto Protocol, which will expire in 2012. An unusually large number of preparatory meetings were held in advance of Copenhagen, with a view to clearing the way for binding greenhouse gas emissions reduction targets in order to keep global warming within the 2°C guard rail recommended by scientists. After two weeks of tough negotiations in Copenhagen, however, the outcome was disappointing: the Secretariat of the Conference of the Parties merely took note of the Copenhagen Accord – drafted at the last minute by the US and China, and signed by 26 industrialised and developing countries – which means that the Accord has not been officially

recognised, and no binding reduction targets have been agreed. On the contrary, if the present national reduction targets remain in place, the world is heading for warming well in excess of 2°C (see also the scientists' recommendation on compliance with the 2°C treshold, p. 16).
So how did it come to this? Even before the negotiations began, it was apparent that achieving a binding agreement was likely to be a difficult task. Neither the US nor China – the world's largest emitters – was willing to commit to binding reduction targets. While US President Obama's hands were tied for domestic policy reasons (see also the brief country profile of the US, p. 108), the Chinese were very self-confident but inflexible negotiators. Even the Europeans stuck to their stated intention of cutting emissions by 30% by 2020 compared with the 1990 baseline and failed to inject fresh momentum into the negotiations by increasing their commitment to 40%. Furthermore, the intense mistrust felt by many of the developing countries towards the industrialised world overshadowed the negotiations.
Although the outcome of the negotiations was somewhat meagre, some progress was achieved before and during the conference, and this is reflected in the provisions of the Copenhagen Accord:



Source: Diplo Foundation

Discuss:
Post-Copenhagen – what happens now?

During and after the Copenhagen Summit, DiploFoundation developed illustrations to help navigate through the complex maze of the climate negotiations. You can use them as a basis to discuss the outcome of the conference and the various positions: www.diplomacy.edu/climate/
Is it sensible to pursue the climate process further within the United Nations framework? Would it be preferable for a smaller group of countries, such as the G8 states, to agree binding emissions targets among themselves? What role should civil society play? How can individuals and non-governmental groups be involved in the decision-making process, for example? Some ideas can be found in Policy Paper 6, Climate Policy Post-Copenhagen: A Three-Level Strategy for Success, published by the German Advisory Council on Global Change (WBGU): www.wbgu.de/wbgu_pp2010_en.pdf

If the climate negotiations continue to be as slow as today, the polar bears will be in danger: Their hunting grounds shrink with melting polar ice.

The Climate Game and the World's Poor: Documentary film from inside the COP15 climate-change summit

Jesper Heldgaard and Bo Illum Jorgensen followed and interviewed delegates from developing countries at the climate conference in Copenhagen 2009. The film tells the story on why the conference failed. (Produced and edited by Anders Dencker Christensen)
You can watch the film at:
http://www.iied.org/climate-change/media/climate-gameand-worlds-poordocumentary-film-insidecop15-climate-changesummi

- For the first time, the 2°C treshold has been enshrined in an international agreement based on a global consensus to protect the climate.
- The US and China will participate in the further negotiations on a global agreement, which is the ultimate objective of the Copenhagen Accord.
- The signatories pledged USD 30 billion in 'fast-start financing' for the period 2010-2012, with USD 10.6 billion of this figure to come from the EU. Moreover, the funding is set to increase to USD 100 billion a year by 2020. The funds will be made available for adaptation and mitigation in the developing countries, as well as for technology transfer and capacity-building.

Sources:
- IISD Reporting Service: Summary of the Copenhagen Climate Change Conference: www.iisd.ca/download/pdf/enb12459e.pdf
- Copenhagen Accord. Decision -/CP.15: http://unfccc.int/resource/docs/2009/cop15/eng/l07.pdf

- After intense negotiations, the countries which signed the Accord recognised the need to take appropriate account of the rights of indigenous and local communities and the conservation of biodiversity, and the natural forests in particular, under the REDD-plus mechanism.
- China, India, Brazil and South Africa announced ambitious national climate protection targets during the conference – but were not willing to back these up with international commitments.

So just how valuable will the elements of this legally non-binding Copenhagen Accord be in terms of a future agreement and support for the developing countries' climate policy measures? That remains to be seen – and will become apparent, for example at the next climate conference in the Mexican city of Cancún in December 2010. One thing is certain: the signatory states are already making substantial sums of money available, some of which is being channelled into international development cooperation, for example to support promising pilot projects. The experience gained with these projects can then feed back into the climate process. One criterion for success will be whether the individual states and political leaders actually supply the funds they have promised – and how fast this will be done.

The Age of Stupid: Why didn't we stop climate change when we had the chance?

In the film The Age of Stupid, directed by Franny Armstrong, Oscar-nominated actor Pete Postlethwaite stars as a man living alone in the devastated world of 2055. He looks back at film clips from the year 2008 and asks: 'Why didn't we stop climate change when we had the chance?' The film clips are taken from genuine documentaries from 2008. They tell the stories of British wind-farm developer Piers Guy, Jeh Wadia, an Indian businessman who owns a budget airline, Nigerian medical student Layefa Malemi, French mountain guide Fernand Pareau, two Iraqi refugee children called Jamila and Adnan, and palaeontologist Alvin Duvernay from New Orleans.
Here are some questions which you might like to discuss after the film: How might you present your story? What about your friends and their stories? What is your experience of the impacts of climate change? And what action are you yourselves taking to reduce your carbon footprints?
For more information about the film, visit: www.ageofstupid.net

The Convention on Biological Diversity

Together with the UNFCCC, the Convention on Biological Diversity (CBD) was also adopted at the Earth Summit UNCED in Rio de Janeiro in 1992. The objectives of this Convention are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources (Access and Benefit Sharing, ABS). Ten years after Rio, at the World Summit on Sustainable Development (WSSD) in Johannesburg, the 190 countries which by then were parties to the CBD endorsed the target of achieving, by 2010, a significant reduction of the current rate of biodiversity loss as a key contribution to poverty alleviation. To that end, seven focal areas, with specific goals and sub-targets, were agreed. For example, a global network of well-managed and efficient protected areas should be established by 2010 and the status of endangered species of flora and fauna improved.

As with the UNFCCC, the parties to the CBD meet regularly at Conferences of the Parties (COPs), in this case every two years. The ninth meeting (COP 9) was held in Bonn, Germany, in May 2008. More than 5,000 delegates met to discuss issues such as biosafety, ABS, forest biodiversity, and the management of protected areas. On the issue of climate change, it was agreed that there should be further and closer cooperation between the various UN conventions, and a clear demand was voiced to UNFCCC negotiators: climate protection measures should not have a negative impact on biodiversity! The key role of protected areas in climate protection was underscored, and the establishment of a global network

As part of the International Year of Biodiversity, the CBD Secretariat has produced 30 factsheets on topics such as Climate Change and Biodiversity, Protected Areas, and Access and Benefit-sharing (ABS): www.cbd.int/2010/prints/?tab=5

The CBD website also provides information about current progress on reducing biodiversity loss: www.cbd.int/2010-target/about.shtml

The 10th Conference on the Convention on Biological Diversity takes place in the city of Nagoya, Japan in autumn 2010. Climate change and biodiversity loss are important topics.

Further information on the Life Web Initiative is available at: www.cbd.int/lifeweb

of marine protected areas initiated. The Life Web Initiative was launched by the German government during COP 9 with a view to supporting the increase of the number of protected areas around the world. Here, the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) acts as a kind of broker between developing countries proposing sites for designation as potential new protected areas and the countries or organisations which would like to make a contribution to the financing of these areas.

In the International Year of Biodiversity 2010 it is becoming apparent that we are falling a long way short of the target of achieving a 'significant reduction' of biodiversity loss. Indeed, the reports produced by the CBD parties show that we are moving in quite another direction: species loss is occurring at unprecedented speed. Nonetheless, some successes have been achieved: the global land area that benefits from protection has doubled to more than 12% over the last 20 years; in the Amazon, the rate of deforestation has been decreasing in recent years (although it remains at a very high level overall); and in Europe, North America, South America and the Caribbean, freshwater quality has steadily improved since 1980. Based on these successes, the tenth Conference of the Parties (COP 10), to be held in Japan in autumn 2010, will jointly assess progress to date and consider how implementation of the Convention can continue to be driven forward. It is hoped, for example, that the years of negotiations to conclude an international regime on access and benefit sharing will result in the adoption of an instrument on ABS. This could offer financial incentives to some biodiversity-rich developing countries and thus provide them with important arguments in support of protected-area conservation within the framework of their national development processes.

Linkages between the conventions

In recognition of the clear linkages between biodiversity and climate change, a Joint Liaison Group (JLG) was set up in 2001, consisting of members of the secretariats of the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD) and the third Rio Convention, the United Nations Convention to Combat Desertification (UNCCD). The Conventions often pursue the same or similar goals, and so in order to generate synergies, more intensive

Information, mechanisms and case studies on mainstreaming climate change within the CBD are available on the Convention Secretariat's website: www.cbd.int/climate

cooperation – especially on cross-cutting issues such as capacity-building, technology transfer, research and financing – is required.
What seems to make sense in theory oftentimes is not so easy to put into practice. The different conventions have different mandates, functions and implementation mechanisms at national and international level. The Joint Liaison Group tries to overcome these obstacles by improving the exchange of information, identifying possible joint activities and improving coordination among the Conventions.
In international development cooperation, growing importance is attached to the connections and interlinkages of intervention strategies that involve biodiversity and climate change aspects (see below).

The role of development cooperation

Climate change has become real and is already threatening to reverse development progress in countries in Africa, Asia and Latin America. The World Bank estimates that around a quarter of all development programmes are exposed to climate risks. At the same time, curbing the emissions of harmful greenhouse gases is becoming increasingly important in developing countries as well. For that reason, many countries and institutions, such as the European Commission and the Organisation for Economic Co-operation and Development (OECD), have begun to take account of the new challenges posed by climate change in their development programmes and processes.

Germany has made climate an integral element of its development policy. Besides implementing specific climate-related projects and programmes, Germany intends to mainstream the issue of climate change systematically in all its activities in the field of development cooperation. A climate assessment (the so-called 'climate check') has been developed specifically for this purpose; this enables implementing organisations working on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) to analyse which particular climate-related risks

their projects and programmes may be exposed to, and shows how they can reduce their carbon footprint. The tool can also be used as part of the advisory services for partners, e.g. in support of their sector policy development (examples being health or education), or can be used in the context of planning and investment.

Besides climate change, the conservation of biodiversity (including sustainable resource use and the fair and equitable sharing of benefits) is a cross-cutting theme in German development cooperation and must be taken into account in all project and programme planning. The interaction between climate change and biodiversity is increasingly being recognised; the conservation of near-natural ecosystems and their services is particularly important in this context in light of their contribution to mitigating climate change, adapting to its impacts and to poverty reduction.

To gain a better understanding of the reactions of species and ecosystems to climate change, so that they can be predicted more accurately, it is essential to scale up international cooperation in the field of research as well.

Further information on mainstreaming climate in development cooperation is available in the following publications:

- UNDP (2010) Screening Tools and Guidelines to Support the Mainstreaming of Climate Change Adaptation into Development Assistance: www.undp.org/climatechange/library.shtml
- OECD (2009): Integrating Climate Change Adaptation into Development Co-operation. Policy Guidance: www.oecd.org/dataoecd/0/9/43652123.pdf

Further information on the ICI and individual projects is available at: www.bmu.de/english/climate_initiative/doc/42001.php

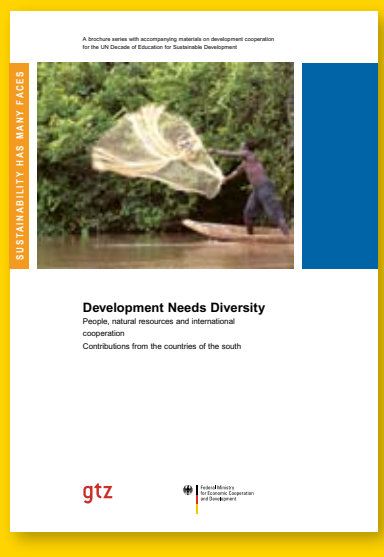
In 2008, the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety launched its International Climate Initiative (ICI). With this initiative, the German government is specifically promoting the conservation of the sort of biodiversity that contributes to mitigating greenhouse gases and fosters adaptation to climate change. This initiative is funded from revenue gained from auctioning European emissions trading certificates (see p. 40). This generated EUR 120 million a year in new funding in both 2008 and 2009. To date, the BMU has launched around 180 projects with its partners worldwide. Great importance is attached to solutions which are transferrable and have an impact beyond the individual project level. Experience gained in individual projects can thus be channelled directly into the international climate process.

At international level, Germany contributes through its payments to the Global Environment Facility (GEF), which is the designated financial mechanism for the implementation of the CBD and the UNFCCC in developing countries, and through its funding of biodiversity conservation and climate projects within the framework of bilateral development cooperation. In the 2009 federal budget, planned commitments for climate protection from the budget of the Federal Ministry for Economic Cooperation and Development (BMZ) alone amounted to around one billion euro. A further sum of EUR 120 million came from the International Climate Initiative (ICI) launched by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) (see above). At the ninth Conference of the Parties (COP 9) in Bonn in 2008, German Chancellor Angela Merkel also pledged EUR 500 million for the period 2009-2012 specifically to support implementation of the Convention goals in developing and newly industrialised countries. These funds will be

All the brochures published in the series 'Sustainability Has Many Faces' can also be downloaded from the website www.conservation-development.net

Development needs Diversity

The first brochure in the series "Sustainability Has Many Faces" elaborates on the basics of conservation and sustainable resource use in development cooperation and on its implementation on the ground. The objectives and functioning of the CBD as well as its three pillars conservation, sustainable resource use and fair access and benefit sharing are explained by illustrating case studies.



Biodiversity in German Development Cooperation

This comprehensive brochure (also as a pdf file on the CD) explains the commitment of German development cooperation for the conservation and sustainable use of biological diversity. Methods and instruments as well as important topics are explained by using many case studies on implementing the CBD on a regional and national level.

increased again from 2013, with EUR 500 million then being available annually. All these additional resources are to be deployed through development cooperation. Thus in 2009 alone, commitments for biodiversity conservation increased by more than EUR 40 million to above EUR 210.

Within the framework of German Technical Cooperation, two supra-regional programmes have been established in the areas of biological diversity and climate change. GTZ's programme for **'Implementing the Biodiversity Convention' (BIODIV)** was set up in 1994. On behalf of the BMZ and in cooperation with KfW Entwicklungsbank, the project aims to promote accelerated implementation of the Convention in the developing countries. It also contributes to the further development of the Convention and its instruments and bodies. The focus is on development-oriented nature conservation, access to genetic resources and equitable benefit sharing (ABS), traditional knowledge, biosafety, and climate change. Fostering appropriate environmental awareness is important for responsible management of biodiversity, which is a valuable asset. The project therefore also supports measures, which aim to develop appropriate instruments and strategies for environmental communication. It also provides advisory services and support for national and transregional projects and programmes implemented within the framework of bilateral development cooperation, such as those involving the Central African Forests Commission (Commission des Forêts d'Afrique Centrale, COMIFAC) and the African Union. By means of smaller pilot models, the BIODIV programme also aims to support the development of methodologies to integrate the 'new' CBD topics (ABS, traditional knowledge, biosafety) into German development cooperation. A further task is to highlight the interdependence of biodiversity and climate change and develop strategies for biodiversity-compatible adaptation to climate change.

German development cooperation supports the development of appropriate instruments and strategies for environmental communication in the partner countries.

Further information: www.gtz.de/biodiversity

The second supra-regional programme is the **Climate Protection Programme for developing countries**, which was launched in 1993. Priorities include the provision of policy advice to ministries and integrating climate protection into practical development cooperation. The experience gained feeds into the international climate negotiations and has made a significant contribution to the development of the environmental impact assessment for the BMZ's implementing organisations. The programme's thematic priorities are:

- Mitigation of climate change,
- Avoidance of deforestation,
- Adaptation to present and future impacts of climate change, and
- Mainstreaming of climate protection in German development cooperation.

Further information: GTZ (2008): Tackling Climate Change (also available as a pdf file on the accompanying CD) and www.gtz.de/climate

In addition, a third supra-regional project, the **Convention Project to Combat Desertification (CCD Project)**, supports measures for adaptation to climate change as well as measures which directly aim to combat desertification. Arid regions are the main focus of attention here.

Further information: www.gtz.de/desertification

Further educational suggestions and ideas for activities

The exercise described on the next two pages will help you put the topic covered by this chapter into practice:

Organising our own international climate conference

The annual UN climate conferences are the main forum for decision-making on global greenhouse gas emissions. Now it's our turn – we're the decision-makers, so we can take the initiative! In this exercise, we are the representatives of various countries. The purpose of the exercise is to present good arguments convincingly and achieve joint agreements on targets – or perhaps to use our negotiating skills effectively to conceal our own guilty conscience!

This is how it works:

- Everyone chooses a role for themselves: as national representatives of Chile, Venezuela, Brazil, Benin, Russia, Mongolia, Viet Nam, Germany, the US, China, Madagascar or the Czech Republic – or as a climate researcher, climate peace activist, moderator or journalist.
- To prevent everything from descending into chaos, an agenda is produced.
- It starts with some brainstorming: How high are my country's greenhouse gas emissions? Taking that into account, what might be my position on policy measures to protect the climate?
- Then we read the – realistic! – positions presented by the national delegations (these are included as climate factsheets on the accompanying CD) and, using the data they contain, we consider the following questions:
  - How high / low are the country's greenhouse gas emissions (are more GHGs being emitted or captured = absorbed?)
  - What are the prospects of reducing emissions (see information on energy sources, population figures, economic outlook ...)
  - What is this country's delegation seeking to achieve (if necessary, consider which other countries might hold similar positions, in order to join forces. Which are the delegations where a more cautious approach is required as they may well have different interests?)

Here we go!

- The moderator leads the process. S/he starts and ends the session and guides participants through the various points to be discussed. S/he can also comment on the various contributions. S/he has the final say!
- The representative of Climate Peace takes the position of the environmental activists and uses attention-grabbing activities to highlight the slow progress being made in negotiations.
- The climate researcher must adopt a neutral position. S/he must follow the debate and present objective arguments. S/he should correct false statements and, if appropriate, underscore the gravity of the situation from a scientific perspective if attempts are made to trivialise the situation.
- The media are represented by the journalist. S/he produces press releases about the stage reached in the negotiations. These may be descriptive summaries, but they may also be provocative or take the form of an ironic commentary.

Each country's delegation can be represented by one or more persons. If there are not enough players for all the positions, some countries can be left out. It is important to ensure that a range of different country groups is represented: for example,

Keep Cool

This board game was developed by the Potsdam Institute for Climate Impact Research (PIK). The aim of the game is for various national groups to drive forward their country's development without adversely affecting the climate.

The challenging board game 'Keep Cool' currently is available only in German. You can find English descriptions here: www.spiel-keep-cool.de

there should be at least one industrialised nation (Germany, US, Japan), one developing or newly industrialised country (Viet Nam, Venezuela, Chile, Mongolia, Brazil), various continents etc. The delegations should make a table sign with the name of their country (or their role as moderator etc.) so that they are clearly identifiable during the sessions and can be invited to speak. Please feel free to wear more formal clothing, such as jackets and ties, or a smart suit, etc.

The following rules apply:

- Courtesy is key! Always – always – always be polite, and never lose your cool. Always be positive about the other participants. For example, if someone's input has been long-winded and extremely complicated and s/he has taken ages to get to the point, you can say: 'As my esteemed colleague described so eloquently ....'
- Everyone apart from the moderator must indicate if s/he wishes to speak.
- Interrupting others when they are speaking is a definite no!

The purpose of staging our own international climate conference is not to replicate the real events as accurately as possible, but to

- develop a feeling for international political processes of climate relevance,
- examine a country's position on climate protection in an entertaining way,
- recognise that climate protection is an issue which affects us all, and which must therefore be addressed effectively at global level as well.

An example of a national delegation's position:

Climate Factsheet: Chile

Data on greenhouse gas emissions:
general: Chile's total greenhouse gas emissions for 1994 amounted to 27 million tonnes (t) CO_2-equivalent, comprising 36% nitrous oxide, 34% carbon dioxide and 30% methane.
CO_2: The main source of CO_2 emissions in Chile was the energy sector, i.e. the burning of fuels in transport and energy production. Although CO_2 emissions were significantly reduced (by 29.7 million t) due to the abandonment of agricultural land, Chile emitted more carbon dioxide than it was able to capture.
CH4/ N2O: Chile's high levels of nitrous oxide and methane emissions were mainly produced by the non-energy sector, with significant shares coming from the following subsectors: agriculture, Land Use, Land-Use Change and Forestry (LULUCF) and waste disposal. Land-use changes include, for example, the conversion of forest into cropland, burning of forests, or the conversion of grassland into built-up areas.

Global comparison:
In 2004, Chile – with 0.3% of the world's population – produced 0.2% of global emissions, averaging 3.9 t CO_2 per capita. This puts Chile above the average for Latin America and the Caribbean.

Background and positions:

- The main energy sources in Chile are hydropower and imported crude oil, as the country has no oil reserves of its own. Timber offers an alternative to the use of oil. Electricity is generated in coal-fired power plants. Only 2% of primary energy consumption is met from renewable sources.
- The contribution of developing countries and newly industrialised countries like Chile to measurable global warming in the past was negligible. These countries are therefore demanding that the industrialised countries should be the ones to act first.
- Chile emphasises that as a newly industrialised country, it must husband its budgetary resources and that although it is well-disposed towards climate protection, costly measures to protect the climate cannot feasibly be carried out without financial assistance. Chile points out that it must therefore confine its activities to measures which entail relatively little or no cost, such as energy-saving or expansion of carbon sinks.

To help you prepare for this 'international climate conference', we have supplied comprehensive learning resources on the accompanying CD. They include:

- Tables with data and information on individual countries' emissions (e.g. oil consumption, number of cattle per 1,000 inhabitants...)
- Suggestions for agenda items for the negotiations
- A table with full data on each country's emissions for the climate researcher

Part 4
The national level: diverse settings, different solutions

At international level, the Framework Convention on Climate Change and the Convention on Biological Diversity are up and running. But how are these frameworks being implemented at national level? How does climate change actually impact on industrialised and developing countries, and how will its challenges be met?

This brochure looks at examples of industrialised and developing countries, and seeks to answer the above questions. The countries chosen are partners of the 'International Wilderness Camp' in the Bavarian Forest National Park.

But what does this initiative, based in Germany, have to do with global climate change?

The International Wilderness Camp is a joint project of the Bavarian Forest National Park and German development cooperation. Former German environment minister Sigmar Gabriel visited it in spring 2007.

The International Wilderness Camp in the Bavarian Forest National Park

The 'Wilderness Camp Falkenstein' grew out of the rising global awareness that education is of vital importance in our changing world. Especially in industrialised societies, a change in attitude, approach and behaviour is critical. The United Nations have declared a global decade of Education for Sustainable Development (2005 to 2014), which considers identifying global connections and links to be a key element of such change. This educational concept focuses on the world's development prospects and problems and covers all aspects of the citizenship curriculum: education for development policy, human rights and sustainability, peace and conflict prevention as well as intercultural cooperation.

At the Wilderness Camp, global learning and environmental education go hand in hand. This part of the park was established in 2002 amidst the forest, at the foot of Falkenstein Mountain. It consists of 'topic huts': meadow bed, house of light, tree house, forest tent, water hut and earth cave. Every hut is a hit, each with different features. Depending which hut you're staying in, you could spend your week sleeping on hay with a view of the stars, sleeping 20 metres up in netting, or a mere metre above a splashing stream – it really fires up the imagination, and allows you to experience the wild. The educational experience

Global learning for a fairer world

Initiatives on global learning for sustainable development highlight worldwide connections in politics, society, the economy and the environment. They consider international themes and include issues of peace and human rights policy, environmental ethics, and learning about intercultural and development policy issues. Global learning requires teaching and learning techniques which are interdisciplinary, interactive, cooperative and focus on activity and experience. Besides knowledge transfer on subjects such as biodiversity preservation, climate protection or combating poverty, global learning fosters skills, perspectives and values. Learners are encouraged to understand and predict the (often invisible) effects which our actions have on other countries or in the future. Global learning is a core component of Education for Sustainable Development.

For further information on the educational concept of global learning for sustainable development, teaching suggestions and resources, visit the following organisations:

- ESD Toolkit: www.esdtoolkit.org/resources/web_esd.htm
- UNESCO Multimedia Teacher Education Programme: www.unesco.org/education/tlsf/

At the International Wilderness Camp, dwellings from foreign lands fit harmoniously into the Bavarian forest: a Chilean ruka, a Cabaña from Venezuela (in the centre of the picture) and three Mongolian yurts.

The 'Man and Wilderness' project

The International Wilderness Camp was established as part of the 'Man and Wilderness' project, implemented by the Bavarian Forest National Park in close collaboration with German development cooperation bodies (GTZ and German Development Service, DED). The main target groups are young people and youth groups in Germany and the Czech Republic living near the cross-border 'International Park Böhmerwald' (comprising the Bavarian Forest and Šumava National Parks). The youngsters are given the opportunity to reflect on their own understanding of nature and question their relationship with the wild. Partnerships also emerge with young people from other parts of the world who live near protected areas. The national park administration aims to engage young people in discussion on nature conservation topics and give them a say in, and chance to shape the area's management. The German-Czech youth forum, where young adults discuss management matters or moral and ethical aspects of nature conservation, is aimed at promoting their involvement in society and policy. It provides a chance for young people to practise abiding by democratic rules, and strengthens key skills such as forward thinking and an interdisciplinary approach.

However, young people are not the only target group: national park rangers in both protected areas and forest guides are also included. 'Wild walks' are available to all age groups, both to locals and people from further afield.

The International Wilderness Camp is supported by a varied network of individuals and organisations active at local, regional, national and international level.

Reaching out to partners and mentors

The Wilderness Camp in the Bavarian Forest National Park is embedded in an extensive international network which is enabled by working with German development cooperation (with GTZ and DED). Its project partners in Asia, Africa and Latin America are each linked to their own German 'mentor groups'.

- Close cooperation has flourished between the Bavarian Forest and Šumava National Parks since 1999. In addition to nature conservation, cross-border tours and youth exchanges, Šumava is also a cooperation partner with the Wilderness Camp, and helps implement its activities.
- The Venezuelan partner is the Thomas Merle foundation, which works on issues including youth, education and environment, as well as operating the 'rainforest school', an environment centre in the catchment area of the Paria National Park.
- The Brazilian partner is the country's Institute for Ecological Research (Instituto de Pesquisas Ecológicas, IPE).
- The JugendUmweltBüro Hannover (JANUN e.V.) has for some time maintained links with the indigenous Khanty and Mansi groups in Siberia.
- The Chilean partner is the Instituto Indígena, which espouses the preservation of Mapuche culture and runs a school for Mapuche children.
- At national level in Germany, various educational institutions are involved, such as Capacity Building International, Germany (InWEnt), the Arbeitsgemeinschaft Natur- und Umweltbildung (ANU) or the University of Erlangen-Nürnberg.

At regional level, many local groups work alongside the two national parks in mentoring individual huts and / or protected areas. These include the young people's café in Zwiesel, the pathfinders from Freyung, nature conservation organisations, the junior rangers, and other regional groups. The Verein WaldZeit e.V. made its own contribution by building a copy of the Thoreau house.

Further information on the Wilderness Camp: www.wildniscamp.de

also mirrors the diversity of the world, and has no set timetable, with independent project work a priority. It sharpens the mind and elicits hundreds of fresh ideas.

In the context of cooperation between the Bavarian Forest National Park and German development cooperation, this educational facility went international in 2007. It is an official project for the UN decade of Education for Sustainable Development, and has already won two awards. The International Wilderness Camp is aimed at young people who want to experience other parts of the world.

The accommodation at the Camp originates from different parts of the world that have protected areas partnered with the Bavarian Forest National Park. Visitors can live and sleep in a Chilean Ruka, a Venezuelan Cabaña, a Caboclo hut from Brazilian Amazonia, an earth-built homestead from Benin, a Siberian chum, Mongolian yurts, a Vietnamese longhouse, a Bavarian-Bohemian cattle shed or the Thoreau log cabin from the US. The foreign-sounding hut names illustrate how much new and exciting material there is to discover, having travelled far from different continents.

The emphasis in the international part of the Wilderness Camp lies on learning from and with one another. How do people in West Africa or Mongolia live? What value do their societies place on nature, and how do they use natural resources on a daily basis? What does it mean to them to live in a protected area and what have their experiences got in common with ours in western Europe?

Besides the desire to conserve nature, other issues addressed also affect us all – including climate change. The group in an individual national hut looks at each issue from that nation's perspective, drawing comparisons between their own relationships and behaviours and those in the other country / hut.

The eight partner countries of the International Wilderness Camp are Benin, Brazil, Chile, Mongolia, Russia, the USA, Venezuela and Viet Nam, with Germany and the Czech Republic home to the linked Bavarian Forest and Šumava National Parks. In the following parts, the brochure takes a closer look at these countries from the point of view of climate change. Also featured will be climate change in Madagascar, a large, extremely species-rich island off the east African coast. Although Madagascar is not yet represented by a typical dwelling at the Wilderness Camp, the country is a prospective partner.

Hosting the world at the Wilderness Camp

In May 2008, alongside the ninth meeting of the Conference of the Parties to the Convention on Biological Diversity (COP 9) in Bonn, the Wilderness Camp held a Forum for 50 young people from 18 different industrialised and developing countries. At the Go 4 BioDiv International Youth Summit, contributions were prepared on the biological, social and cultural aspects of biodiversity. The Summit was a joint venture between BMZ, the Bavarian State Ministry of the Environment and Public Health, the city of Bonn, the Deutsche Bundesstiftung Umwelt (DBU), GTZ and the Bavarian Forest National Park.

The young people presented their policy messages to the policy-makers at COP 9, but also gave creative contributions such as a piece of dance theatre, a photographic exhibition and various glass art works inspired by the concept of the Ecological Footprint. Some of the participants came from near the Wilderness Camp's partner protected areas, and 'Climate Witness' accounts of how climate change has affected their lives can also be found in this brochure.

"Climate Witness" – a WWF project

Since 2005, people from around the globe share their stories on how climate change impacts their lives here and now: They tell about sea-level rise and coral bleaching, about typhoons and the disappearance of plants and animals and about deadly heat waves and droughts. Through this initiative, climate change gets a face and voices, it becomes comprehensive and tangible
For further information on the WWF Climate Witness project see: http://wwf.panda.org/about_our_earth/aboutcc/problems/people_at_risk/personal_stories/

Further Information:
www.dekade.org

Nachhaltigkeit lernen
Weltdekade der Vereinten Nationen 2005–2014
Bildung für nachhaltige Entwicklung
UNESCO
Offizielles Projekt der Weltdekade 2008 / 2009

The German Commission for UNESCO has acknowledged that the present series of brochures entitled 'Sustainability Has Many Faces' make a valuable contribution to implementing the aims of the Decade of ESD.

The youth Summit declaration and photo brochure of participants can be at the following link:
http://go4biodiv.org/home/press/declaration

Preparations for the 'Go 4 BioDiv' International Youth Summit took place at the Wilderness Camp in the Bavarian Forest National Park. Typical national dress symbolises the group's cultural diversity (the photo shows outfits from Mongolia, Viet Nam, Uzbekistan and Benin).

Climate change in the International Wilderness Camp's partner countries

Will climate change impact equally everywhere, in the tropics and at the South Pole, in Haiti and the Himalayas? Of course not. Do we know how will it affect the International Wilderness Camp's partner protected areas in Chile, Venezuela, Amazonia, Benin, Siberia, Mongolia or Viet Nam? Where will more rain fall in future, and where less? Will life generally be harder for farmers, or are there regions which will have reason to rejoice? Sometimes climate change that causes problems in one place can be insignificant elsewhere, or vice versa. Questions, questions, questions.

With their expressive dance theatre piece 'Go 4 BioDiv!' Youth Summit participants called attention to topics which 'move'. Developed and rehearsed under the guidance of professional choreographers, the 50 amateur dancers' debut performance thrilled the Bonn public, conference attendees and media representatives.

Ecological footprint and Carbon footprint

The concept of the ecological footprint offers a balancing sheet – it supplies us with a method to measure resource availability versus resource use in a given time and area. Thus, the ecological footprint of a country (or a city or company) shows on the one hand the available resources (biocapacity), on the other hand the total biologically productive area of land or sea required to produce all the food (including meat and seafood), wood and textiles its inhabitants consume, and to provide the energy and infrastructure and dispose of the waste the country generates. A footprint is measured in 'global hectares' (gha). The global average ecological footprint for an individual is 2.7 gha. However, only 2.1 gha of bioproductive area are available per person. This discrepancy between the resource availability (biocapacity) and resource consumption (footprint) is known as 'overshoot'. In 2010, humanity's ecological footprint exceeded the Earth's biocapacity by over 40%, reflecting that humankind is consuming not only the "interests" of the natural capital, but the capital itself, thus decreasing the available resources on our planet year after year.

The 'carbon footprint' has become popular recently, and is part of the broader ecological footprint concept. It denotes CO_2 emissions arising from the combustion of fossil fuels as a result of human activity (such as power generation or transport) or during the lifecycle of goods, and is measured in tonnes or kilogrammes. Sometimes other greenhouse gases such as methane (CH4) or laughing gas (N_2O) are included when calculating a carbon footprint.

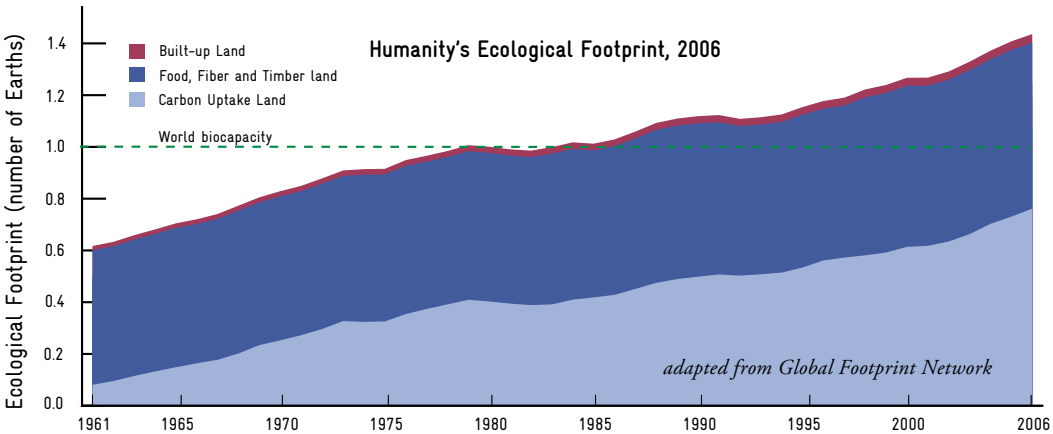
The Global Footprint Network goes one step further than this, and converts the pure CO_2 emissions figure to show the biologically productive area which would be needed to absorb and store these CO_2 emissions through photosynthesis. In 2005, one global hectare could absorb the volume of CO_2 released by burning around 1,450 litres of petrol (gasoline).

While it may be hard to interpret a figure stated as a volume of CO_2 emissions (what impact do 1,000 tonnes of CO_2 have?), but converting the figure to area aids understanding. It is easy to imagine what it means if the volume of CO_2 emitted would require 1,000 ha to absorb it, but only 500 ha are available. The remaining 500 ha cannot be absorbed, so they stay in the atmosphere, contributing to global warming.

Adapted from Global Footprint Network

The world's ecological footprint has grown continuously in recent decades. The diagram shows how it developed between 1961 and 2006. The field at the top (dark blue) reflects the proportion of natural resource consumption for food, extraction of raw materials and soil sealing. Resource consumption clearly exceeds biocapacity, i.e. the Earth's carrying capacity, from 1987 onwards (green dotted line). The field underneath (light blue) shows the growth in the global carbon footprint.

Source and further information: Global Footprint Network 2009, National Accounts (www.footprintnetwork.org) and WWF (2008): Living Planet Report



In-depth information on the ecological footprint is available in the brochure 'A Big Foot on a Small Planet? Accounting with the Ecological Footprint' from the series 'Sustainability Has Many Faces': www.conservation-development.net/?L=2&ds=313

Climate change can cause extended dry seasons in the Wilderness Camp's partner countries, as well as heavier precipitation.

Nobel Peace Prize for the IPCC and 'An Inconvenient Truth'

Al Gore, Vice President under Bill Clinton and 'almost president' of the USA, scored an unexpected hit with his documentary 'An Inconvenient Truth'. The film explains with great commitment the consequences of global warming, using humour and hope to make helpful suggestions. Al Gore's lecture series 'The travelling global warming show' used plentiful facts and images to illustrate in dramatic fashion the global environmental devastation now occurring, interspersed with scenes from his own life.
The film drew a US cinema audience of three million, and caused a stir at the Sundance and Cannes film festivals. In February 2007, Al Gore even received the Nobel Peace Prize for his commitment to the cause, jointly with the IPCC and its Chair Rajendra Pachauri. This meant hundreds of climate scientists were also honoured, as they had been painstakingly pushing forward the boundaries of knowledge on climate change for almost six years.
The German government congratulated the prize winners and singled out the Nobel Prize committee for their decision, which focused public attention on the issue of climate protection. Former German environment minister Sigmar Gabriel also ordered 600 copies of the film for German schools.

For further information, see:
www.climatecrisis.net/an-inconvenient-truth.php

Verena Treber
student of international business
Climate Witness from Germany

„Aufgrund der wärmeren Temperaturen gibt es hier immer öfter neue Arten aus dem Süden. Aus dem Mittelmeerraum kam zum Beispiel die 'Holzbiene' (Xylocopa violacea) in unsere Region. Der 'Admiral', ein Schmetterling der normalerweise nur im Sommer über die Alpen aus dem Süden nach Deutschland kam, bleibt nun auch über den Winter hier. In Mannheim gibt es sogar eine wachsende Population kleiner Papageien (Psittacula krameri). Sie können hier nur überleben, weil es wärmer als früher ist. Man könnte sagen, dass wir froh darüber sein sollten, dass es immer mehr Arten gibt, die sich in Deutschland ansiedeln wollen, aber die Veränderung in den Ökosystemen bringt auch viele Probleme mit sich."

"The warmer temperatures mean that Germany is increasingly seeing new species from further south. For example, the Carpenter Bee (Xylocopa violacea) has arrived in our region from the Mediterranean. The Red Admiral, a butterfly which normally only arrived crossing the Alps in summer, is now overwintering here in Germany. In Mannheim, there is even a growing population of small Rose-ringed Parakeets (Psittacula krameri). They can only survive here because it is warmer now than it used to be. You could say we should be glad that increasing numbers of species are settling in Germany, but the change in ecosystems also brings problems."

Discuss:

The fact that the weather in northern Europe is getting warmer sounds positive to many people. More swimming and other activities outdoors, the plants will grow better... You could certainly get used to it, they say. After all, Italy has always been warm and the Italians don't see the weather as a problem. There have always been climate changes on Earth, after all. But the current climate change is taking place very fast, and acting differently in different places. Some countries will see a greater impact than others: to take obvious examples, Switzerland will be less affected by a rise in sea level than the Philippines, and Germany less affected by desertification than Mongolia. There are advantages as well as disadvantages, affecting different ecosystems, species and populations: who will benefit? Are the advantages and disadvantages passing or permanent? Is it even possible to generalise? And will some things just be different, neither better nor worse? Can we get used to the down sides and adapt, or will this sometimes be impossible?

Will sledging in a northern European winter soon be a distant memory?

Many of the Wilderness Camp's partner countries, as well as Germany and the Czech Republic, face challenges as a result of climate change. In Benin and Brazil, an increase in periods of drought has been observed, in Mongolia and Chile glaciers are receding dramatically. In Russia's Siberian tundra, permafrost is thawing in the summer months, while Madagascar has seen an increase in destructive cyclones. In Viet Nam rising sea levels pose a threat to humans and nature in the extremely species-rich Mekong region. Venezuela suffers from very heavy, fluctuating rainfall and North America is plagued by hurricanes and drought. Germany and the Czech Republic are battling with floods and recurrent heat waves.

The eleven countries each respond to the challenges of climate change in their own way, which is determined by many factors. They represent a wide range of political, socioeconomic and environmental conditions.

The brief country profiles supplied in Part 7 of this brochure provide an overview of the present situation. They cover:

- Key country information, including the development index and living standard in each country;
- Ecological zones, including biological diversity and climate;
- Environmental conditions and national policy, including legislation on protected areas;
- Climate change, impacts and national policy.

Key country information

The partner countries' level of development (according to Human Development Index of the UN) and living standards (according to gross domestic product, GDP) range from highly industrialised OECD countries like the United States, Germany and the Czech Republic, to newly industrialising countries such as Venezuela, Chile and Brazil, to the world's least developed countries, LDCs). Among the latter are Benin and Madagascar, where a third of the population live in absolute poverty. In the USA, GDP per capita is one of the world's highest – at USD 45,592 in 2007 – compared to Madagascar's USD 375 (the lowest of the countries featured here).

Ecological zones, climate and biodiversity

The eleven countries also cover a great range in terms of their natural landscapes, local climate and biodiversity. They have widely varying ecosystems such as steppes, savannas and deserts, boreal forests and tropical rainforests, coastal ecosystems, wide expanses of watersheds and high mountainous regions. Some countries are megadiverse in terms of biology, such as Brazil and Madagascar; others are merely average as regards species diversity, like Benin or Germany.

In the partner countries, forest ecosystems play a leading role in terms of the regional and global impact of climate change. Intact forests are important not only for the provision of ecosystem services (99% of forests are used by humans) and for preserving biodiversity, but also due to their long-term ability to store carbon dioxide. To date, only one per cent of all forest areas on our planet is protected.

National environmental policy

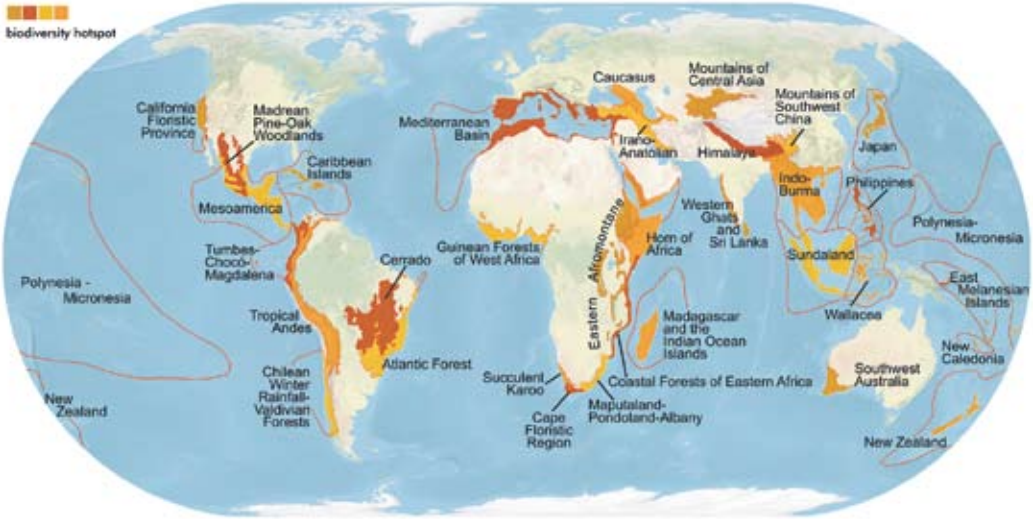
The priority accorded with regards to conservation of the environment in each individual country is not merely a function of their governments' direct environmental policy goals. Indications of this priority can also be drawn from the percentage of land already legally designated as protected areas or areas in the planning stage. Regions under strict protection (such as national parks) by definition play a greater role in preserving biodiversity than less strictly controlled areas which are used for forestry or recreation purposes – although in reality the management effectiveness on the ground may vary greatly.

In Mongolia, nature conservation is granted top priority in political debate. Around 14% of the country is currently protected, and this area is set to double by 2030. Equally, in 2003 Madagascan President Marc Ravalomanana announced his intention to triple the protected areas to 6 million hectares – primarily in order to guarantee the preservation of the country's unique biological diversity, which also is an important base for tourism and other direct and indirect ecosystem services. This nature conservation target is now

Biodiversity and biological hotspots

The distribution of well-researched vascular plants per square kilometer is used as an indicator of the diversity of genes, species and ecosystems in the Earth's habitats. Estimates on the number of vascular plants worldwide place them at between 200,000 and 422,000 species. The six global centres (or 'hotspots'), with over 5,000 vascular plants per 10,000 square kilometers, are in the tropics and subtropics: in Costa Rica, north-west Amazonia, eastern Brazil, the tropical eastern Andes, northern Borneo and New Guinea. These biodiversity centres only occupy 0.2% of the Earth's surface.

Source: The Royal Society (2005)
http://rstb.royalsocietypublishing.org/content/360/1454/359



Source: Conservation International
www.biodiversityhotspots.org

Conservation International's interactive map shows global biodiversity hotspots. It provides detailed information on these regions' ecosystems, fauna and flora: www.biodiversityhotspots.org/xp/Hotspots/pages/map.aspx

established as part of the government's five-year plan, and the area protected has reached 4,5 million hectares in 2010. In Venezuela, around 70% of the country's area is formally considered to be protected, yet most of these areas are forestry plantations. The situation in Germany is similar: over 30% of our land is protected, but less than three percent is subject to strict controls. Brazil's environmental legislation is exemplary in terms of protected area designation and regulation of the management. Viet Nam has also passed a law that specifically protects biodiversity; it came into force in July 2009.

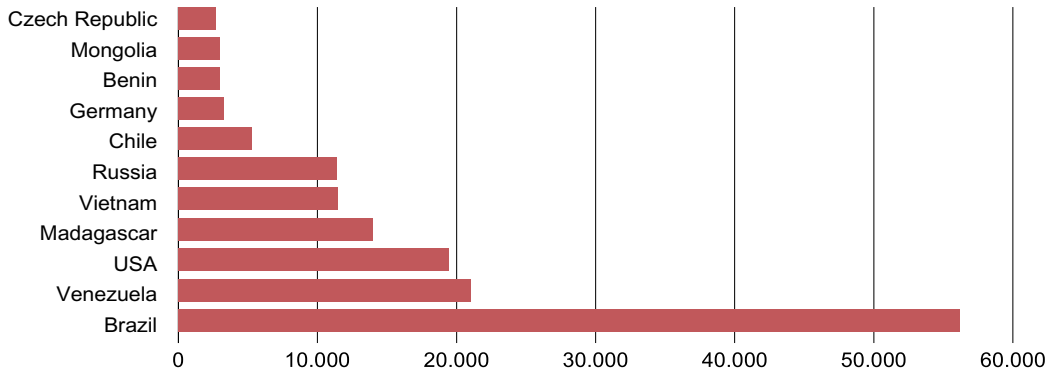
National climate policy

The individual countries have very different climate policies. Should they be seen 'climate polluters' or 'climate victims', or a bit of both? How are they tackling climate change? The brief country profiles in Part 7 also provide examples of this. All the countries have ratified the Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol and the Convention on Biological Diversity (CBD) – except the USA, which has neither ratified the Kyoto Protocol nor the CBD.

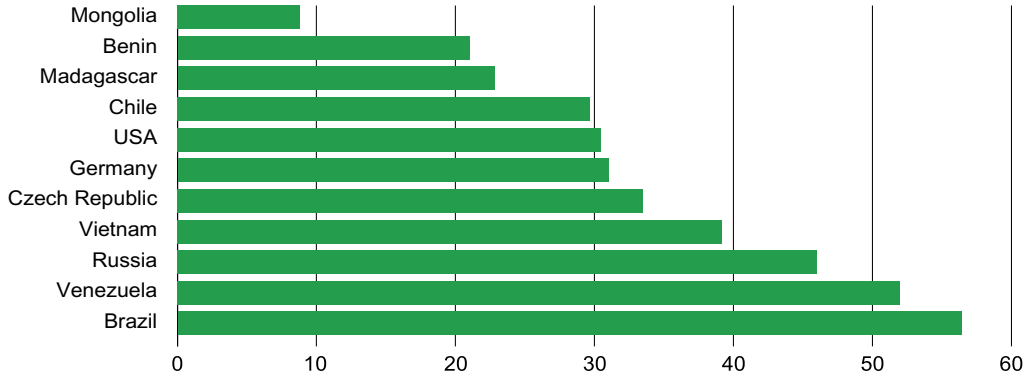
National climate reports

The UN Framework Convention on Climate Change categorises signatories in its annexes. Annex I lists countries that are obliged to reduce their emissions (OECD and some newly industrialised countries). Non-Annex I countries are not obliged to reduce emissions (developing countries). Other industrialised countries are named in Annex II of the Convention. Reporting obligations and standards vary significantly from Annex to Annex.

Comparison of biological diversity in the eleven countries studied (according to number of vascular plants, 2002).



Comparison of forest cover in the eleven countries studied (according to proportion of area, as a percentage).



For instance, an industrialised country like Germany has been obliged to submit four climate reports between 1993 and 2010. Since it has ratified the Convention in 1993 it must also submit an annual national inventory of greenhouse gas emissions. Developing countries have so far been asked for a single climate report, which most did not submit until after 2000. These countries have also only performed a single inventory of their greenhouse gas emissions, mostly as far back as the mid-1990s. As producing a climate report incurs considerable costs, the least developed countries like Madagascar receive financial support for this from the Global Environment Facility (GEF).

National greenhouse gas inventory

The emissions inventory is an important part of the climate report. It permits comparisons to be made between overall and per capita greenhouse gas emissions. Within the group of countries studied in this brochure, the USA are the main emitters, at 6,000 million tonnes of CO_2 a year. In contrast, Madagascar had the lowest annual greenhouse gas emissions of these countries at 2.8 million tonnes of CO_2.

Emissions of any greenhouse gas must be broken down according to five sectors: energy, industry, agriculture, waste, and land use, land-use change and forestry (LULUCF). The LULUCF sector is particularly important when calculating and analysing greenhouse gas emissions, as it reflects the complex interaction between land use and the climate system. In Brazil, the LULUCF sector is the main source of greenhouse gas emissions. However, the preservation and restoration of forests and peatlands and their carbon storage capacity can improve a nation's greenhouse gas inventory. Madagascar's overall emissions are low, and if the LULUCF sector is included in its greenhouse gas inventory the country omits no net CO_2 at all, and can therefore be termed a 'carbon sink country'.

Vulnerability

To what extent is any particular country at risk from climate change? In order to prepare for the effects of climate change, it is important that decision-makers establish how vulnerable certain sectors, regions and population groups are, and communicate these facts in the national climate report. In developing countries, the agricultural

sector, which makes a major contribution to their GDP, is very vulnerable, as changes to the climate system impact directly on plant and animal production. Factors such as income, education and access to knowledge and information determine the vulnerability of population groups. In this respect, Benin is among the countries in Sub-Saharan Africa which will be worst affected by climate change. In Mongolia, pasture systems are considered highly vulnerable due to desertification. In Viet Nam the large, productive river deltas are at high risk from the sea-level rise.

Sotima Constant Berate
student of development communications
Climate Witness from Benin

„Au cours des années antérieures, on a noté une baisse de la production agricole due aux aléas climatiques, la pauvreté des sols et l'érosion. De plus, des vents plus forts ont été aussi enregistrés pendant la saison pluvieuse. Comme conséquence suite au manque d'une végétation protégeant de nombreux dégâts matériels sont à déplorer."

"In the past few years, agricultural productivity has fallen due to dry soil, irregular rainfall and erosion. We are also experiencing more violent storms during the rainy season. As the protective covering of vegetation has vanished, these storms sometimes destroy simple houses."

These currently supply crops that form the basis for the diet of two thirds of the population, making the Vietnamese alimentation and economic sectors very vulnerable to climate change.

Destructive environmental practice such as deforestation, overgrazing, poor irrigation or the unsustainable use of natural resources (e.g. illegal logging) increase such vulnerability. But unplanned settlement and extensive single-crop plantations, i.e. for use as biofuels in Brazil, also aggravate the situation. Many of the national climate reports therefore consider biological diversity to be crucial for climate protection. However, in many cases diversity has been classified as highly vulnerable due to human activities.

Climate change adaptation and emissions reduction strategies

National climate reports also include measures to reduce or avoid greenhouse gas emissions and to adapt to climate change, aiming at the attenuation of its impacts on social systems and ecosystems. A country's climate policy is often determined by its financial capacity – but political will also comes into play.

Many countries' national **emission reduction strategies** concentrate on the energy sector, since increasing energy efficiency or energy savings here is a relatively cost-effective means of helping reduce greenhouse gas emissions. For example, in its report Chile emphasises that a large budget deficit restricts the country to measures of this type, in order to avoid high costs. The Chilean

The German Broadcaster ‚Deutsche Welle' is compiling projects on mitigating climate change and adapting to its impacts: 'Ideas for a cooler world.' www.dw-world.de/dw/0,,13279,00.html

Changes in land use, such as the rainforest clearance shown here, release carbon dioxide – this is known in technical climate terms as 'Land Use, Land-Use Change and Forestry' (LULUCF). In many developing countries, it is a major source of greenhouse gas emissions.

government considers the Clean Development Mechanism (CDM, see p. 42) to be a key management tool in the early identification of possible courses of action against climate change.

The Brazilian government points to existing projects such as its 'Pro-Ethanol Program' which ensured that all cars in Brazil run on a 23% ethanol blend, or its programme to improve energy efficiency. Even industrialised countries like the USA or Germany restrict themselves almost exclusively to reduction measures in the energy, construction and transport sectors.

Suggestions for further discussions

- How does each country trump the others in terms of environment or climate? Where are the oldest trees growing and what species they belong to? And where is the world's coldest capital city?
- Which countries will face the greatest loss in biodiversity due to climate change? Why? Which countries' ecosystems are most vulnerable?
- Venezuela is one of the world's leading oil producers. What does this mean for the nation's economy and on which figures does this impact directly? How does oil production possibly affect the balance between economic growth and environmental protection? What are potential links to climate protection: do oil deposits necessarily lead to high emissions and a polluted environment? What is the reality and does it have to be that way?
- Chile has a reputation as the Latin American country with the least corruption and the most transparent business dealings. Which index reflects this? What is Chile's position compared to your country?
- Brazil is one of the most advanced developing countries, with a dynamic economy. Yet much of the population is poor, and large discrepancies exist between regions. Which index shows this? Can this be associated with specific environmental issues?

Mbolatiana Ranjevasoa
student of forest engineering
Climate Witness from Madagascar

„Mitarika fiovana lehibe eo amin'ny tontolo manodidina ny fiovan'ny toetr'andro. Mihena ny ala nohon'ny tondradrano ary voatarika makany an-driaka ny fotaka entiny. Mihasimba hatrany ireo haren'ny morontsiraka, mihena ny morontsiraka ary isaky ny fahavaratra dia dia mitombo hatrany ny haben'ireo renirano. Any amin'ny faritra Atsimo, mamono olona na mampisy traboina maro ny ain-tany."

"The rises in temperature and heavy rain caused by climate change are altering our landscape. The forest is being lost due to flooding. The soil washed away accumulates as sediment in mangroves, reefs or seagrass beds, and destroys these. Thus every rainy season changes occur to the course of rivers and the coastline (one example is the Morondava coast). In the south of Madagascar, increasing aridity is causing a lot of damage."

Climate change and sea-level rise – a threat to small island states

The world's small islands are affected by climate change like almost no other region. Rising sea levels, an increase in storms, a lack of rainfall and the resulting droughts all threaten the survival of people and nature inhabiting many of the world's flat islands, in addition to increasing salination of the soils and coastal erosion. Yet these small island developing states (SIDS) rarely have sufficient funds or capacity to meet such challenges.

It is worth reflecting that they have scarcely contributed to global warming. The government of countries like Tuvalu in the Pacific, and the Maldives in the Indian Ocean, are already looking for somewhere else their populations can live. They assume, and predictions support this, that the consequences of climate change will be so serious that life on their island homes will become untenable. Young people must decide whether or not to leave the islands and relocate elsewhere. One of these young people is Kilom - one of seven youngsters to tell their stories in the Youth Supplement to the UN State of World Population 2009 report. Kilom lives on the Marshall Islands. This group of islands lies in the western Pacific, about half way between Australia and Hawaii. It consists of 29 atolls with over 1,200 islands lying only a few metres above sea level. 70,000 people live on these islands. Kilom feels very close to his country, bound by the long history of his ancestors there. Now he fears the impact of climate change. That is why he is working to protect the coral reefs and marine resources as a member of the Marshall Island Conservation Society:

"Well, until now the experts can't say how fast the sea-level is rising, so basically what we can do for the moment is help the reef grow healthier and faster to provide us with shelter from the waves, and more food. But I don't know... It's only small stuff that's not going to make any difference if the sea level increases rapidly. [...] I know there is going to be a time when this Island will be underwater. I don't know what's going to happen to our people, our way of life. There will no longer be a Marshallese language, a Marshallese culture, and for me that's really hard, because I feel so bound to this place. I love it and I consider it my own."

On behalf of the German development ministry, GTZ supports a regional climate change adaptation project in the South Pacific. The project supports the Secretariat of the Pacific Community (SPC) and ministries and inhabitants of Fiji, Tonga and Vanuatu so as to develop climate change adaptation strategies and integrate the issue into local plans for the sustainable management of natural resources. At local level, several pilot projects will test concrete climate change adaptation measures.

The State of World Population 2009 report contains a supplement on young people and climate change. Seven youngsters explain their experience of climate change and its consequences. 'At the Frontier: Young People and Climate Change' can be found in pdf format on the enclosed CD. It is also available at: www.unfpa.org/public/publications/pid/4462

Further information on the GTZ project in the south Pacific can be found at: www.gtz.de/en/praxis/27718.htm

Discuss: Cabinet meeting on the sea bed

In October 2009, the government of the Maldives, under President Mohammed Nasheed, invited cabinet members to meet under water wearing diving suits. The eleven ministers communicated using boards and hand signals during the meeting. They also signed a document calling for a worldwide reduction in CO_2 emissions. The motive for this meeting was to illustrate the precarious position in the Maldives, a result of climate change.

The government in Tuvalu is seeking to help its citizens by having them classed as environmental refugees. This would permit them to migrate to countries such as New Zealand.

What are the options for these Indian Ocean and Pacific islanders in terms of adapting to climate change? And what can they do if some of their islands become uninhabitable? What could the international community do to support them? Find out more about projects undertaken by GTZ and other organisations that might give Kilom on the Marshall Islands hope for the future. Look at what you could do to help him.

Countries in a weaker financial position often set positive trends: Viet Nam, one of the poorer developing countries, has developed and evaluated eighteen concrete possibilities for reducing greenhouse gas emissions, such as employing improved irrigation management in paddy fields to reduce their high methane emissions. The government of Madagascar launched one of the first projects on 'Reducing Emissions from Deforestation and Forest Degradation in Developing Countries' (REDD, see p. 35). However, such countries depend on international assistance to implement these ideas.

Adaptation strategies are mainly focused on agricultural production (preserving and / or promoting agrobiodiversity and agroforestry), water resources, health, infrastructure and coastal zones. Meanwhile, some countries have drafted or are drafting climate action plans to organise their adaptation strategies. Establishing a basis of information on climate change impacts vulnerability allows particularly sensitive sectors to be identified and responsibilities allocated. In Viet Nam for example, a climate action plan was agreed at the end of 2008, setting objectives, approaches and priorities for climate change adaptation measures, and an organisational structure for their implementation. The agricultural sector and coastal zone are identified as areas for priority action. In Mongolia, a similar plan is currently being prepared. To date, there has been little experience of putting such plans into practice.

The poorer developing countries in particular have been largely unable to formulate and implement national climate protection policies which limit emissions and protect against the consequences of climate change. In the main, they lack sufficient institutional and legal frameworks, experts and technical expertise, and public awareness. In such cases, support is required from the international community, i.e. via development cooperation.

New challenges for German cooperation in environmental communication

Advising partner countries on drafting and implementing their own national and subnational biodiversity and climate change strategies is a core element of German development cooperation. As recognition grows of the impact climate change has on both biodiversity and the natural resource base for human life, it is becoming increasingly important to integrate the two strategies. Promoting public awareness is another important component of German involvement in partner countries. Numerous environmental education and communication projects are based on either climate change or the loss of biological diversity, but rarely has a project combined both themes. We will look below at the new challenges addressed by development cooperation in this area, using concrete examples and strategies for awareness-raising and environmental communications.

Maitté Flores
journalist and student of disaster risk management
Climate Witness from Venezuela

„Desde hace algunos años el Gobierno ejecuta programas orientados a minimizar el impacto ambiental de las actividades económicas. [...] Desde 2005 se eliminó el plomo de la gasolina, así mismo el gobierno realizó la Misión Bombillo la cual fue ejecutada por el Ministerio de Energía y Petróleo y consistía en el cambio de 70 millones de bombillos fluorescentes, los cuales gastan menos energía eléctrica. También existe la Misión Agricultura, ésta en coordinación con el Instituto Nacional de Tierras trabaja para establecer procesos biológicos en lugar de químicos en los cultivos y controles de plaguicidas y fertilizantes en Mérida, Trujillo, Táchira y Zulia.“

"The government has been implementing programmes for several years which aim to reduce the impact of economic activity on the environment. [...] Since 2005 we have unleaded petrol. The government also brought in the 'Misión Bombillo' programme, implemented by the energy and oil ministry. Seventy million existing light bulbs were exchanged for energy saving bulbs. Then there's the 'Misión Agricultura' which works with the national land institute to use biological rather than chemical pesticides and fertilisers on agricultural land in the states of Merida, Trujillo, Táchira and Zulia."

Hope in a Changing Climate

The documentary 'Hope in a Changing Climate' illustrates the possibilities for rehabilitating large-scale ecosystems. The restoration of ecosystem functions can fundamentally improve living conditions for the local population and help to capture CO_2 naturally. This approach was applied on the Loess Plateau in China, a mountain landscape covering 640,000 km^2 situated in northern central China. Over 35,000 km^2 of previously degraded landscape is now blossoming once again. This forms the basis for a sustainable economy, as well as social and agricultural activity for the local population.
The documentary was made by the Environmental Education Media Project (EEMP), and directed by Jeremy Bristow. The film also features Ethiopia and Rwanda.
Duration: 22:24, can be viewed online at:
http://hopeinachangingclimate.org

Hands-on example: the Biodiversity-Day in Viet Nam

Every May, changing natural habitats worldwide host a day of action for biodiversity known as B-Day. Viet Nam had a highly successful B-Day in 2007, connecting climate protection, biodiversity conservation and poverty reduction. The Vietnamese ministry for natural resources and environment, with support from GTZ and the German Development Service (DED), launched

'Zero Emissions' was the motto of an 80km cycle tour, from Hanoi to the Tam Dao National Park.

The document on the international biodiversity day 'B-Day' (in English and Vietnamese) can be found in pdf format on the enclosed CD.

the day with a symposium on biodiversity and climate change in Hanoi. Decision-makers from the worlds of politics, economy, science and representatives of international development cooperation discussed the consequences of climate change, the loss of biodiversity and some possible adaptation strategies in Viet Nam. The question arose of how preserving biodiversity could contribute to poverty reduction. The recurring theme for this day of action, with a total of 700 participants, was first-hand experience of nature and the wild. The motto 'Zero Emissions' was applied to a cycle convoy from Hanoi to the headquarters of the Tam Dao National Park, about 80km away. The first 300 of around 10,000 trees were planted at six different 'biodiversity stations' around the national park. The day's programme was complemented by guided forest tours and a series of cultural and artistic events. The day also saw the inauguration of the Tam Dao forest school, which teaches school children and park visitors about the importance of biodiversity as they experience nature up close, with all their senses.

Hand-held mirrors provide pupils in Viet Nam with a fresh perspective on the unique biology in the treetops of the Tam Dao national park.

During the UN-Year of Biodiversity 2010, Viet Nam got involved in the B-Day celebrations again. You can find the report ad pictures from the World Heritage Site and national park Phong Nha-Ke Bang here: www.biodiversity-day.info/2010-vietnam.html

Nailza Sousa
Tourism manager
Climate Witness from Brazil

„Na Amazônia mesmo com sua grande biodiversidade atualmente muito se fala em listas de animais que entram em extinção. Infelizmente muitas pessoas por falta de informação acham que os recursos naturais da Amazônia serão inesgotáveis, que faz com que muitas pessoas não tenham sensibilidade de usar recursos naturais de maneira sustentável. Outro fator importante é quanto à necessidade de se fazer mais pesquisas sobre a biodiversidade da Amazônia, o que facilitaria a divulgação de informações para a conservação e preservação das espécies."

"Despite the extraordinary biodiversity here, we hear a lot in Amazonia about the 'Red List' of endangered animal and plant species. Unfortunately, a lack of information leads many people to believe that the Amazon's resources are inexhaustible. This in turn leads to the unsustainable use of natural resources. There should be more research into biodiversity in Amazonia. This would make it easier to transmit information on species conservation."

The combination of a scientific symposium with a sports and tourism-based visit to the national park was a first for Viet Nam. The B-Day campaign helped raise awareness of the impact of climate change. Neither decision-makers nor the general public had previously been asked to commit to combating species extinction and climate change in this way.

Hands-on example: the Mobile Environmental Education Project in Tunisia

Teaching Tunisian schoolchildren about global environmental problems and what they can do locally to conserve nature and protect their own environment is the objective of the Mobile Environmental Education Project, partly supported by GTZ. Every day, the environment bus pulls up at a different school. Using interactive learning methods, pupils can learn about the topics of water, energy, waste, desertification, climate change and biodiversity. They are also prompted to launch their own projects on these topics, with the support of local environmental organisations. One year after the project began in 2008, the bus had already visited 160 schools and 3,200 children have set up their own projects to protect the environment.

Hands-on example: materials from an exhibition from Peru

Jointly planned exhibitions can be used as educational resources. Indeed, they are especially well suited to raising public awareness of the impact of climate change and of the associated risks to biological and cultural diversity. The photographic exhibition, entitled 'The climate is changing, and so is my life' (El clima cambia, mi vida también)

A group of tambour players turns a visit of the environment bus at the primary school Kerkennah into a party.

'El clima cambia, mi vida también': the impact of climate change on people in Peru (the document from the exhibition is available in pdf format on the enclosed CD).

Lidia Feliciano Benique de Calsina
Small holder from the community of Huataquita (Cabanillas, Puno) in Peru

"Oh Lord! What a mess! Now it looks like the gringos have ruined the weather. Before, we knew when it was going to rain and when the frosts were coming. When the Andean gull laid its eggs in the prairie, we knew it was going to be a dry year, with little rain, but last year, the prairie flooded and the nests and all got washed away. So what we did was have a meeting of the elders to interpret what we saw. Many times, we guess correctly with our observations. That's how it is today."

presents 30 statements made by Peruvian people from three different ecological zones in the country (coast, uplands and rainforest). They express the ways in which climate change impacts on their daily lives and how they adjust to it. The exhibition was created in 2008 for the fifth summit of heads of state and government from the Latin America, the Caribbean, the European Union's Member States and the European Commission (EU-LAC/ALCUE). After the summit, it travelled through Peru. The elaboration of the exhibition and the journey through the country was jointly funded by German development cooperation and its Latin American partners.

Hands-on example: Interviews round the world – Environmental Memoirs

As one of the official projects for the UN decade of Education for Sustainable Development, Environmental Memoirs document how the natural world has changed in living memory. A young Spanish / Australian couple conducted 67 interviews with senior citizens from 13 nations, from the Basque country in northern Spain, via Russia to Asia and Australia. The project's instigators wanted to raise awareness of environmental change and ensure the local populations were more aware of and better prepared for present and future environmental challenges.

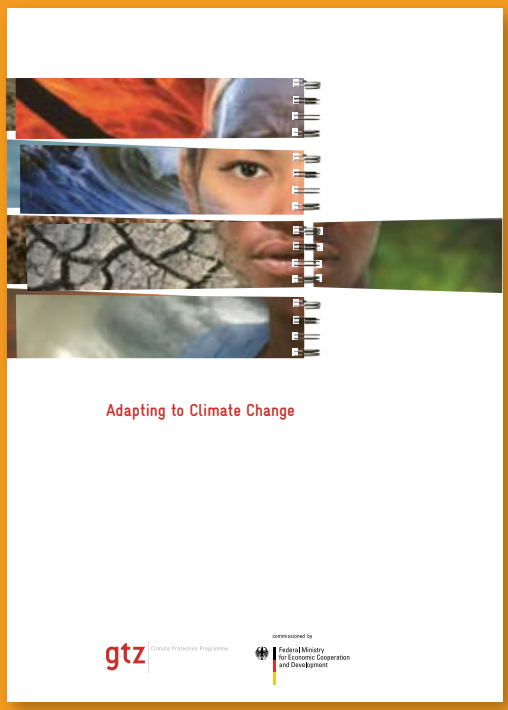
Further information on the Environmental Memoirs can be found at: www.swin.edu.au/ncs/environmentalmemoirs

A selection of the Environmental Memoirs was used in the six-month-long travelling exhibition 'Biografías del Medio Ambiente' in the Basque country in late 2007.

Further educational suggestions and ideas for activities

The table on the next page compares countries' CO_2 emissions. This data will help you answer the following questions:

- In almost all countries, overall carbon dioxide emissions increased between 1990 and 2004. The largest percentage increases were in Viet Nam, as well as Benin and Madagascar, i.e. in poorer developing countries. Why is this? What role do you think population growth, economic growth or changes in lifestyle play?



Adapting to Climate Change

GTZ has collected stories from people living in Africa, Asia and Latin America who are directly affected by climate change. How do they deal with global warming? Have they been able to take initiatives and adapt to the climate impacts? What are the perspectives of people in different parts of the world? These tales and additional information can be found in the pdf 'Adapting to Climate Change' on the enclosed CD.

- In Germany, the Czech Republic, Mongolia and especially in Russia, overall emissions have fallen. What could be the reason(s) behind this? Think about factors like climate policy, a slowdown in economic growth, demographics and changes in consumer behaviour. Is this falling trend likely to continue?
- The USA's per capita emissions are the highest of all the countries shown, twice as high as the average for the other OECD countries included. Germany and the Czech Republic have relatively high per capita emissions, but these are still below the OECD average. Do you think we can influence per capita emissions through our individual behaviour? Or do these emissions depend on factors we can only influence indirectly, for example at political level, such as whether or not new coal-fired power stations are built?
- China appears to have alarmingly high overall emissions. In 1990, the country emitted just under half as much CO_2 as the USA – but this was to change quickly. In 2006, China's CO_2 emissions were already 8% higher than those of the USA. Yet China's per capita emissions are relatively low. Which factors do you think could be responsible for the high overall emissions and for the low per capita emissions?
- In 2004, Brazil was the third-largest emitter of greenhouse gases among developing countries, after China and India. What could have caused these high overall emissions?

The table on page 74 clearly shows the role played by Land Use, Land-Use Change and Forestry (LULUCF) in various countries' greenhouse gas emissions. It will help you answer the following questions:

- Which are the main sectors responsible for greenhouse gas emissions in the industrialised countries, and which in the developing countries? You can also look at the brief country profiles in Part 7.
- If the LULUCF sector is included in the calculation of greenhouse gas emissions, the values change. The figure for most countries (except Brazil and Viet Nam) gets smaller. Why is this? What role do deforestation and / or forest preservation play in this? Madagascar and Benin even have negative greenhouse gas

You can watch videos spanning mitigation, adaptation and CDM projects worldwide here: www.climate-change.tv/cctv-videos/responses

Countries' CO_2 emissions compared

	Proportion of world's population (%)	Overall emissions (in million tonnes of CO_2)*		CO_2 emissions		
				Per capita emissions (t CO_2/year)	Annual change (%)	Proportion of global total (%)
		1990	2006	2006	1990-2004	2006
„Annex I" countries**						
Germany	1.3	963.3 (1991)	805	9.7	-1.3	2.2
Russia	2.2	2,074.9 (1992)	1,564.6	10.9	-1.9	4.4
Czech Republic	0.2	131 (1992)	114.8	11.3	-1.3	0.3
USA	4.6	4,864.6	5,752.2	19.0	1.8	16.3
„Non-Annex I" countries**						
Benin	0.0	0.7	3.1	0.3	16.7	0.0
Brazil	2.9	208.8	352.5	1.9	4.2	1.0
Chile	0.3	35.4	60.1	3.6	5.4	1.0
China	20.2	2,412.6	6,103.4	4.3	7.8	17.3
Madagascar	0.3	0.9	2.8	0.2	13.6	0.0
Mongolia	0.0	10.0	9.4	3.4	-1.0	0.0
Venezuela	0.4	122.1	171.5	6.3	3.4	0.5
Viet Nam	1.3	21.4	106.1	1.2	25.8	0.3
Overall totals						
OECD countries	14.3	10,259.2	11,605.7	13.2	1.5	32.9
Worldwide	100.0	20,762.3	28,431.7	4.5	2.0	100.0

* In this table, CO_2 emissions are used on their own for comparison purposes; other greenhouse gases are disregarded. ** See explanation on this, page 61

Source: Millennium Development Goals Indicators
http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=749&crid=

In order to permit more extensive comparison, China's emissions were also included. These figures come from the United Nations Millennium Development Goals Indicators website. The data is from the Carbon Dioxide Information Analysis Centre (CDIAC). This body reports to the US energy ministry and supplies estimates of CO_2 emissions at global, regional and local levels. In addition to the data from the UNFCCC website and that based on the national greenhouse gas inventories, several other data sources were used.

Various data sources are listed on the UNFCCC website, including data on greenhouse gas emissions: http://unfccc.int/ghg_data/items/3800.php

emissions figures. This means they release less CO_2 than they absorb. How can this be?

- In Germany, the Czech Republic and Mongolia, the difference between emissions figures with and without the LULUCF sector is not very large. But in Chile emissions are halved when this sector is included. Why?

Comparing climate change

It is of course true that researchers are investigating current climate change, evaluating experiences and making predictions for the future. You could do it too – the brief country profiles in Part 7 provide information on some of the impacts of climate change in these countries, for example in terms of climatic zones, seasons, temperature and precipitation. What can the figures tell us? How do the countries compare? Don't forget to look at what's happening in your country! You could use the table at the end of this Part (page 75) to prompt you, and jot down the data as you go along.

After all that thinking and calculating, your brain will need some food and your body might want some practical activity. How about doing some cooking?

International buffet

Each country also has traditional ways of cooking, favourite foods and special ingredients. A voyage of discovery round these countries' cuisine could

You can find recipes from around the world here: www.world-recipes.info

Climate cook book

If you speak German: Perhaps you'd like to try a recipe from the climate cook book produced by BUNDJugend, the youth section of Friends of the Earth Germany. Maybe some nut roast with onion sauce or Swedish chocolate cakes? Or you know of other traditional dishes, recipes, or even "climate cooking projects"?
Our eating habits warm up the atmosphere more than the entire transport sector. The German climate cook book provides a clear illustration of how simple it is to help save our planet, starting in the kitchen. The easy recipes, based on the variety of regional (organic) produce, with less meat and no air freighted fruit, are made for today's world. Further information is available (in German) at:
www.bund.net/bundnet/ueber_uns/bundjugend/klimakochbuch

In many countries climate change will impact precipitation patterns and lead to heavy rainfall events.

be very tasty! Some ask for ingredients which are hard to find outside the recipe's country of origin, but others use only basic foodstuffs. Have fun cooking, and bon appétit! You could sell international snacks at the school fête, or make food for your project group. It is interesting to think about why the dish is typical of its original country:

- Why do locals use these ingredients? (Is the climate there well suited to growing them?)
- Why are the dishes prepared in that particular way? (Which natural resources are available for cooking in the original country?)
- Why is the dish widespread there? (Is it particularly nutritious, portable, easy to preserve? Does it contain ingredients that are highly prized? Is it good value for money?)

Country comparison: Greenhouse gas emissions with and without Land Use, Land-Use Change and Forestry (LULUCF)

	Greenhouse gas emissions in mio. t CO_2-equivalent			
	with LULUCF		without LULUCF	
	„Annex I"-States*			
	Emissions in base line year (1995)	Emissions for the last year with available data (2005)	Emissions in base line year (1995)	Emissions for the last year with available data (2005)
Germany	1,095	1,002	1,064	965
Russia	2,092	2,133	1,934	2,289
Czech Republic	155	146	147	141
USA	6,477	7,242	5,868	6,432
	„Non-Annex I"-States*			
	Emissions in the year of the inventory**			
Benin (1995)	39		-8	
Brazil (1994)	659		1,477	
Chile (1994)	55		28	
Madagascar (1994)	22		-217	
Mongolia (1998)	16		16	
Venezuela (1999)	192		178	
Viet Nam (1994)	85		104	

* see explanation on page 61
** in brackets: Year of the first and up to now only national inventory

Source: www.unfccc.int

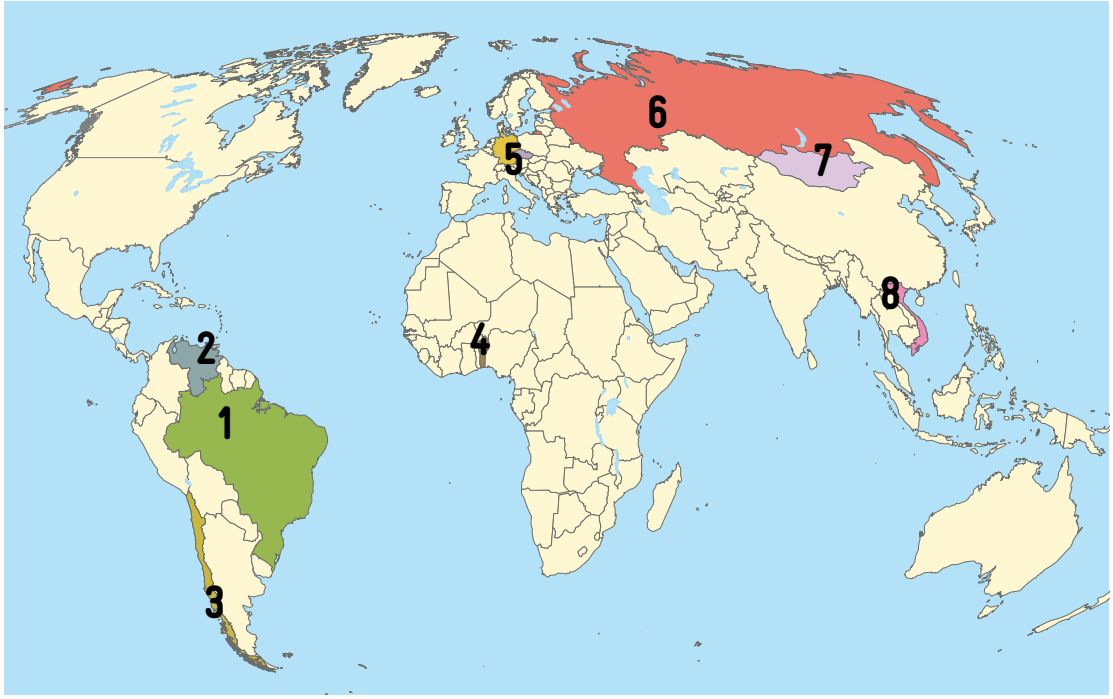
These data derive from the national climate reports and are used by the secretary of the UNFCC to compare countries in different tables. In order to compare the potential effect of greenhouse gases with one single number, the potential effect of other greenhouse gases than CO_2, such as methane or nitrous oxide are compared with that of CO_2. This is called 'CO_2-equivalent'. Methane has a potential of 23 times higher than CO_2, nitrous oxide even 296 times higher.

Possible Climate Change Trends	Observations and scenarios for the particular country	Impacts on Plants	Impacts on Animals	Impacts on People
Temperature rise				
Higher evaporation				
Higher variabilty in rainfall				
Sea-level rise				
Melting of polar ice caps and glaciers				
Increase of extrem events				

Part 5
The local level: challenges for people and nature on site

Partner protected areas of the International Wilderness Camp at a glance:

1 Anavilhanas Ecological Station, Brazil
2 Paria National Park, Venezuela
3 Conguillío National Park, Chile
4 Pendjari Biosphere Reserve and National Park, Benin
5 Transboundary protected area: Šumava and Bavarian Forest National Parks, Czech Republic and Germany
6 Autonomous territories of the indigenous Khanty and Mansi, Siberia/Russia
7 Khan Khentee Wilderness Area, Mongolia
8 Tam Dao National Park, Viet Nam



All of the partner countries of the Wilderness Camp have established protected areas in their national territories – yet they differ in their objectives and management categories. Which types of protected areas have the governments chosen to designate? What are the implications for the local population? What opportunities do these areas offer for the conservation of biodiversity? What problems can arise? What impacts is global climate change having on nature, and on the people living in and around these protected areas? How are protected areas relevant to the efforts of German development cooperation to reduce poverty and stimulate local development? The following section aims to highlight the challenges faced by people and nature on site.

Igor Moiseenko
student of politics and civics
Climate Witness from Russia

„изменения в видовом составе рыбы влияют на традиционный способ существования местного населения – рыболовство."

"Changes in the composition of fish species are affecting our population's traditional way of life and of catching fish."

Protected areas and their role in times of climate change

A 'protected area' is defined as an area of land and / or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means. The World Conservation Union IUCN distinguishes six management categories for protected areas:

Ruth Carolina Caniullan Huaiquil
assistant paramedic and student nurse
Climate Witness from Chile

„La cosmovisión mapuche tiene su base en el respeto a la naturaleza, la biodiversidad y el equilibrio de la vida entre los diferentes organismos de la tierra. En nuestras prácticas tradicionales nosotros pedimos a Dios la lluvia, buenas cosechas, salud, pero a veces no podemos reunirnos debido al clima. Además, la medicina Mapuche ha sido afectada debido a la pérdida de plantas medicinales y así no es posible trabajar la medicina, un aspecto fundamental de la cultura mapuche."

"The worldview of the Mapuche is based on respect for nature, biodiversity, and the vital balance between all the different organisms on Earth. In our traditional practices we ask the world spirit to grant us rain, good harvests and good health. Sometimes the storms stop us from holding our gatherings. Traditional Mapuche medicine is also suffering because of the loss of medicinal plants. Producing medicine is a fundamental aspect of Mapuche culture, but without the plants, it often can't be done nowadays."

Gabriela Gemio
student of ecology and environmental management
Climate Witness from Bolivia

„El cambio climático está teniendo un fuerte impacto sobre los pueblos indígenas. A los indígenas se los conoce por la habilidad que tienen de 'leer la naturaleza' a través de indicadores naturales para la predicción de situaciones. Ahora ellos se sienten 'confundidos' porque ya no llueve cuando debería y llueve cuando no debe y esto provoca cambios en los ciclos agrícolas."

"Climate change has severe impacts on indigenous communities. They are well known for their ability to 'read' the signs of nature in order to predict natural phenomena. Now they are 'perplexed' because when it should rain, it doesn't, and it rains when it shouldn't. Agricultural cycles are changing as a consequence."

Category Ia	Strict Nature Reserve
Category Ib	Wilderness Area
Category II	National Park
Category III	Natural Monument
Category IV	Habitat / Species Management Area
Category V	Protected Landscape / Seascape
Category VI	Managed Resource Protected Area

The differentiation between these categories is based on their management objectives and uses of the landscape compatible with these objectives. This is particularly relevant in countries such as Brazil, Chile and Russia, where indigenous and other local communities have lived inside or in the immediate vicinity of a protected area for many centuries and are dependent on the use of its natural resources. These people's cultural identity is inextricably linked to the territories they inhabit.

Areas in categories Ia to IV are classified as relatively strictly protected. Most of the partner protected areas introduced in the country profiles fall into one of these categories: the six national parks – Conguillío in Chile, Paria in Venezuela, Tam Dao in Viet Nam, Pendjari in Benin, Šumava

Source:
www.iucn.org/mab

Yasuní National Park, Ecuador: cash in return for leaving oil in the ground?

Growing international competition for access to commodities (oil, gas, minerals) causes price inflation in the global market. This heightens the pressure on sites of special biological value and protected areas located over deposits of such resources.

A recent example of this problem was seen at the Yasuní National Park in Ecuador: this unique area of megadiversity in the Amazon Basin has been a UNESCO biosphere reserve since 1989, as well as the territory of the indigenous Tagaeri and Taromenane peoples who live there in voluntary isolation. In order to guarantee the total protection of the area and its inhabitants, a section of the park was designated as 'untouchable' in January 2007. Despite this, certain areas of the Ecuadorian Amazon region have been allocated for oil drilling for some time now, and lots known as blocks have been demarcated. The 190,000 ha area of the ITT (Ishpingo-Tiputini-Tambococha) block holds 20% of national crude oil reserves. Not only is this located almost entirely inside the Yasuní National Park; it also cuts across part of the 'untouchable' no-go area.

The Ecuadorian government declared itself willing to forego the revenues from crude oil extraction in the ITT block – provided that it would receive international support: in April 2007, President Rafael Correa called upon the international community to compensate Ecuador by paying half of the projected revenue from oil-drilling – USD 350 million per year over a 13-year period. In return, Ecuador would 'leave the oil in the ground' and designate the area as permanently protected by concluding binding agreements in international law. This money could be paid into a fund, for example, and Ecuador would invest it in social projects, the development of alternative energy sources, nature and environmental conservation projects, and ecotourism. The Latin American country would absorb the loss of the other half of the sacrificed income itself. Correa's arguments were hard-hitting: deforestation and emissions from the consumption of fossil fuels are among the primary causes of global climate change. If the forests in the Yasuní National Park are preserved as CO_2 sinks and extraction of the oil is avoided, this will not only conserve the region's unique biodiversity and the territories inhabited by indigenous peoples, but also make an immense contribution to combating global climate change.

In the meantime, the Yasuní-ITT initiative has won many sympathisers. According to the entrepreneur Roque Sevilla, who was sent to Europe to advocate the proposal on behalf of the Ecuadorian president, Germany, Spain, Belgium, France and Sweden have pledged 49% of the target amount of 3.5 billion dollars for ten years. 15 other countries had also expressed interest in helping to prevent the emission of 410 million tonnes of CO_2.

In August 2010, the negotiations made considerable progress. The United Nations Development Programme (UNDP) and Ecuador signed an agreement to leave the oil in the ground. UNDP established a trust fund of USD 3,5 billion. That is amounting to half of the estimated USD 7 billion worth of oil. It remains in question however, if the UN member states are playing along and contribute to the trust fund as many details yet have to be clarified, such as: Who guarantees, that the next Ecuadorian government will not start producing oil? Thus, the future prospects of preserving this area's unique biodiversity and the homelands of the indigenous Tagaeri and Taromenane peoples is still in question.

Source: http://mdtf.undp.org/yasuni

in the Czech Republic and Bavarian Forest in Germany (all Category II) as well as the Khan Khentee Wilderness Area in Mongolia (Category Ib). Of this group of partner protected areas, the Anavilhanas Ecological Station in the Brazilian Amazon is subject to the strictest protection (Category Ia).

In contrast, in category V and VI areas, sustainable use of the natural resources is permitted. The environs of the Pendjari National Park in Benin have been recognised as a UNESCO biosphere reserve since 1986, in order to protect its savannas, pristine forests and numerous animal species, but also to promote agricultural use and

local sustainable development. The concept of the biosphere reserve (BR) was developed within the framework of UNESCO's programme 'Man and the Biosphere' (MAB). Its explicit aim is to balance human resource use with nature conservation.

Discuss the case of the Yasuní National Park:

- Could Ecuador's proposal work as a model for involving developing countries in combating global climate change? What difference might it make that the idea gained support from the global community at the international climate negotiations?
- What criticisms might be levelled against Ecuador's arguments? In this context: what part is played by the legally designated no-go zone in the national park? Do you think that the decision to forego oil extraction in the national park would alter our oil consumption in the industrialized countries? Or would we just switch to drilling other sources? What are potential implications of this case for other countries that have petroleum reserves and high biodiversity? What could be the role of indigenous communities and their representatives in the negotiations?
- What are your views about putting a financial 'valuation' on biodiversity and 'bargaining' with it in this way? What is the likely outcome of the case, in your opinion?

Protected areas have a special role in the context of climate protection. Compared to other forms of natural resource management, they have numerous advantages:

- They have clearly defined boundaries, which make it easier for example to measure carbon sinks for the purposes of the implementation of REDD-plus (see p. 35).
- They are based on legally recognised regulations and management systems aimed at stable and long-term conservation of ecosystems.
- Due to the existing management and financing structures, protected areas are a low-cost option for adaptation to climate change impacts.

For these reasons, both the Intergovernmental Panel on Climate Change (IPCC) and the former World Bank chief economist Sir Nicholas Stern recommend working harder on using and, where possible, enlarging existing protected areas to meet climate protection objectives. Introducing sustainable use practices as part of the management

Sotima Constant Berate
student of development communication
Climate Witness from Benin

„Du fait de la disparition de certaines espèces végétales, la médecine traditionnelle africaine qui est l'un des domaines clés de la connaissance traditionnelle devient de moins en moins efficace."

"With the disappearance of many tree and plant species, traditional African healing, one of the most important elements of our traditional knowledge, is becoming less and less effective."

Source:
UNESCO's programme 'Man and the Biosphere':
www.unesco.org/mab

Further information on the role of protected areas in times of climate change: CEESP (2008): Climate change, energy change & conservation (included in pdf format on the CD accompanying this brochure).

Protected areas do more than just help to conserve biodiversity and counteract climate change. If they are used sustainably – for certain kinds of tourism, for example – they also create alternative sources of income for the local population.

of protected areas and their buffer zones holds out great potential for long-term biodiversity conservation, even beyond the boundaries of the actual protected area. This is not just relevant for the regional and global climate, but can also contribute to reducing local poverty, making it a profitable approach on a number of levels.

The following passage describes the particular problems of a region and the threat of climate change, using the Khan Khentee Wilderness Area in Mongolia as an example.

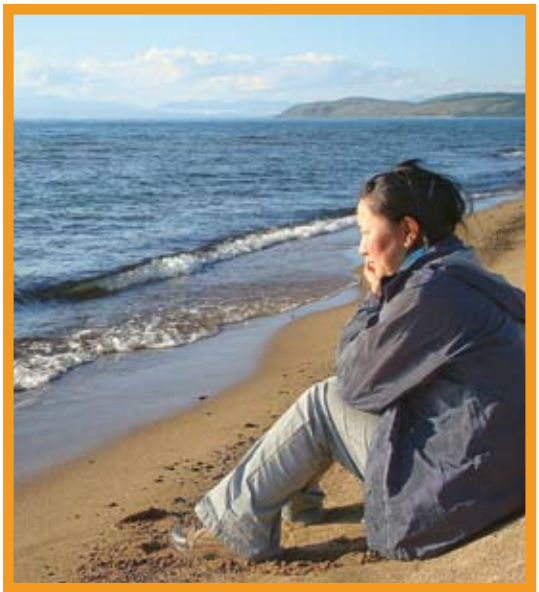
The strictly protected **Khan Khentee Wilderness Area** in the north-east of **Mongolia** is the country's third-largest protected area. It is 50 times the size of the Bavarian Forest National Park and contains a variety of ecosystems such as taiga forests, wetlands, forest-steppe and tundra. It is an important drinking water catchment area for the region, and three of Mongolia's major rivers have their sources here.

The area has strong cultural associations for the population, being the homeland of Genghis Khan and the location of a significant cluster of cult sites which the people revere as sacred places. Sustainable value-creation from natural resources, i.e. the processing of natural products, especially from forest and pastureland, is very important in Mongolia. Industry and commerce barely exist, but the country is generously endowed with forest – so the processing of natural materials directly helps to combat poverty.

Every year, however, large areas of Mongolian forests fall victim to fires, either started by people accidentally or erupting spontaneously in increasingly dry conditions. Even the Khan Khentee Wilderness Area is under threat from forest fires, poaching and the destructive exploitation of natural resources. Added to that, constantly rising livestock numbers lead to overgrazing. Climate change also exacerbates these problems: dry summers reduce many rivers to a trickle, and woody plants and trees encroach on grassland, further restricting the grazing capacity. Thus the long-term conservation of the wilderness area is threatened.

The GTZ programme on climate change and biodiversity in Mongolia is supporting the development of management plans, not only for protected areas but also for forest and grazing lands, which take account of the impacts of climate change. Another focus of the programme is the distribution of relevant climate change information, to make the local population and policy-makers more aware of the issues. Concrete measures for adaptation to climate change can then be jointly developed and implemented.

When entering a Mongolian ger (yurt) it seems small at first, because it only has one room. The instantly felt cosiness is due to its circular form and the wooden lattice structure, which is completely wrapped in large grey sheets of felt. The nomadic shepherds – many people in the Khan Khentee protected area – spend a great deal of time out in the open and on the move.



Saulyegul Avlyush
biologist
Climate Witness from der Mongolia

„Монгол орон уур амьсгалын өөрчлөлтийн асуудлыг зайлшгүй авч үзэх, сонирхох шалтгаанууд бий. Мянга мянган жил Монгол хүн мал малласаар ирсэн бөгөөд хүн амын зонхилох хэсэг мал аж ахуй, уур амьсгалаас хамааралтай салбараас хараат байдаг. Уур амьсгалын аливаа өөрчлөлт нь хөдөө аж ахуйн бүтээмжид шууд нөлөөлж, ургац, малын гаралтай бүтээгдэхүүний хэмжээ, эцсийн дүндээ орон нутгийн болон үндэсний хүнс тэжээлийн чадавхийг бууруулдаг. Ийм учраас хүрээлэн буй орчин, уур амьсгалын нөхцөл байдал нь манай улсын тогтвортой хөгжилд түлхүүр үүргийг гүйцэтгэдэг.“

"Mongolia has every reason to be concerned about climate change. For thousands of years, the people here have kept livestock for a living. The majority of the population depends upon its herds. Every detrimental impact of climate change on grazing capacity reduces the yield of animal forage and fodder, threatening the productivity of the herd and ultimately affecting local and national food production. That is why environmental and climatic conditions play a key role in the country's sustainable development."

German development cooperation on site

Merely establishing national parks or other protected areas is not enough – it is also essential to ensure that their conservation objectives are achieved. The majority of developing countries, however, have to face manifold pressing problems. As a result, not only rural resource users but also governments, civil society and the private sector suffer from a lack of practicable strategies for reconciling the competing economic, social and environmental interests. Therefore, the "green" projects of German development cooperation concentrate on developing together with their partners viable solutions for ensuring the long-term conservation of these areas.

Research the impacts of climate change in each of the partner protected areas of the Wilderness Camp. Analyze the brief country profiles in Part 7:

- As the Andean glaciers melt, what will be the likely impact on the drinking water supply for people and animals in the homelands of the Mapuche Indians in Chile?
- According to forecasts, how will a sea-level rise of even a few centimetres affect the national parks on the coasts of Viet Nam and Venezuela?
- What will happen to the ethnic groups of the Khanty and Mansi if there is thawing of the Siberian permafrost soils?
- What effect could the expansion of deserts in the Mongolian steppes have on the traditional way of life of the yurt-dwellers?
- What are the options for people and nature in the Amazon region, in response to the worsening drought?
- What impacts of climate change are already apparent in the species-rich Pendjari National Park in Benin, West Africa?
- How does the situation in the Czech-German Bohemian Forest International Park compare with the other mentioned protected areas?

Many GTZ-supported projects and programmes relate to protected areas and sustainable use of resources in their environs. Examples are the 'Management of Tam Dao National Park and Buffer Zones' project in Viet Nam, the 'Cerro Hoya National Park' in Panama, or the 'Pendjari National Park' in Benin – all of them successfully concluded or phasing out.

Important tasks of development cooperation, in addition to the training and upgrading of park staff, include driving forward measures to combat forest destruction and illegal logging. The strategy of placing forests under protection to safeguard them from climate-damaging deforestation is already being implemented successfully in Brazil. In the 1990s, German development cooperation carried out preparations for the Pilot Programme for the Protection of Brazilian Rainforests (PPG7) and supported the Brazilian Amazon Region Protected Areas Programme (ARPA) in the Amazon Basin (see brief country profile of Brazil in Part 7).

Aline Nowak
secondary school student
Climate Witness from Germany

„Meine wichtigste [mentale] Klima-Umstellung besteht darin, dass Ostereier nun im Schnee gesucht werden, dafür auf das Schlittenfahren in den Winterferien verzichtet wird. Außerdem kaufe ich mir keine Übergangskleidung mehr, da ich entweder meine Schnee- oder meine Sommerjacke tragen kann."

"My most important (mental) climate adjustment is that we now hunt for Easter eggs in the snow but miss out on sledging during the winter holidays. Also, I no longer buy between-season clothing because I can either wear my winter coat or my summer jacket."

Xiaoji Chen
biology student
Climate Witness from China

"24节气是中国农历日历上的24个特殊日期。在中国古代，它被用来指示气候变化，从而指导农事安排。它已经有效地为我们服务了超过两千年了。不幸的是，随着气候的变暖，节气在农业上的重要作用逐渐下降了。现在，根据节气很难准确判断一年中什么时候是最适合播种或收获的时候。"

"The 24 'jieqi' (solar cycles) are special nodes on the traditional Chinese calendar. In ancient China, the calendar was used to interpret climate phenomena and to plan the farming year accordingly. It worked very well for over two thousand years. Now that the planet is getting warmer and warmer, unfortunately the jieqi are losing their meaningfulness for agriculture. It is now becoming increasingly difficult to use the jieqi to determine the best sowing and harvesting times in advance."

Hands-on example: giving people a say in Benin

Under the 'Conservation and management of natural resources' programme, GTZ supports sustainable resource management in the Pendjari National Park and Biosphere Reserve in Benin. The biosphere reserve is subdivided into three zones: in the core zone, the National Park area, the conservation of biodiversity is the top priority. The core zone is surrounded by a hunting zone, where limited hunting is permitted as a form of sustainable use. The outer, buffer zone is designated for sustainable development measures. The challenges are enormous: the rapidly growing local population of the immediate buffer zone (approx. 30,000 people) and the hinterland (around 100,000 people) with their rising demand for food and energy place constant pressure on the natural resources of the hunting zone. The increasingly long dry seasons and declining volumes of rainfall associated with climate change are weakening the basis for agriculture. Pressure on the reserve is further intensified by illegal use – made possible by the inadequacy of surveillance and management systems, as well as institutional and material weaknesses of the responsible administration. Not enough was done to involve the local population early on, which resulted in hostility to the conservation efforts – overexploitation and settlement were set to pose long-term threats to conservation of the area.

Since 2004, GTZ has been advising the agricultural and environment ministry on involvement of the local population in the long-term maintenance of the Pendjari National Park. The direct management of the park and

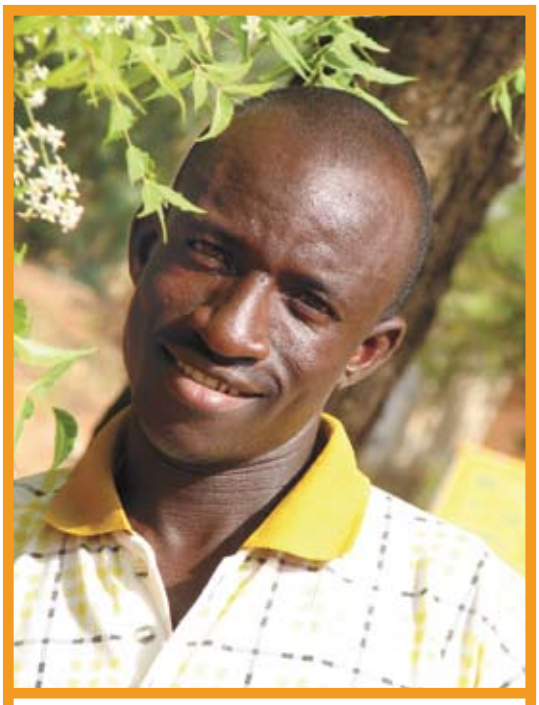
The walls of the Benin's clay hut are built up from layers of clay, a little more each day, without the aid of a supporting structure. This relies on a very arid climate in which the clay can dry out from one day to the next.

'Climate proofing' of nature conservation projects in Morocco

GTZ has set itself the objective of checking every project to establish what climate risks it is exposed to. It should then be possible to adapt the design of projects in good time. This is especially important in the area of biodiversity conservation. The tool 'Climate Proofing' was developed to achieve this objective. It is used to analyse the impacts of climate change systematically, to assess vulnerability and to determine the implications for project design. The tool was first used on projects supporting protected areas in the Central African Republic, Morocco and Laos.
In Morocco the impacts of climate change, like declining precipitation and rising temperatures, are already quite tangible. Water shortage and falling groundwater levels are causing forest loss and thus posing a threat to biodiversity. The local population is heavily dependent on natural resources and is hard hit by losses of income and food shortages. Future impacts of climate change will steadily worsen the situation. To identify options for improving the present situation and averting additional risks in future, the Climate Proofing tool was used. Discussions and workshops were held to analyse climate impacts and vulnerability in relation to the project objective and measures. To enable the project objective to be achieved despite the expected climate impacts, options for adaptation were subsequently identified. These were prioritised and integrated into the project as new measures. The new approaches include the use of a pilot National Park, where measures for the conservation of biodiversity, environmental education and income generation are being specially tailored to the new challenges of climate change. Beyond this, GTZ is supporting its partner institutions in the development of national adaptation strategies.

Further information:
- Nature conservation and desertification control project in Morocco: www.gtz.de/en/praxis/16088.htm
- Presentation on 'Climate Proofing for Protected Area and Natural Resources Management' included on the accompanying CD
- GTZ Climate Check and Climate Proofing: www.gtz.de/climate-check

Further information on the Pendjari National Park can be found in the brochure 'Use it or lose it' (German and French), the third volume of the series 'Sustainability Has Many Faces'.



Antoine Nagassi
school student
Climate Witness from Benin

„Mon village Mamoussa se trouve dans la périphérie du Parc de la Pendjari. Autrefois, nos grands parents avaient l'habitude de détruire les ressources naturelles du Parc en extrayant de bois et en chassant des animaux tels que les singes, les antilopes et les crocodiles. Depuis que la direction du Parc National et l'association de populations riveraines ont commencé par coopérer étroitement il y a quelques années, le nombre de certaines espèces animales et de plantes a augmenté à cause de la plus grande efficacité des activités de conservation."

"My village, Mamousa, adjoins the Pendjari National Park. In the past our parents destroyed the park's natural resources by cutting down timber and hunting animals like monkeys, antelopes and crocodiles. Since the National Park management and the organisation for the population of the buffer zone started to manage the park jointly a few years ago, the numbers of animals and plants have risen, thanks to the more efficient conservation measures."

hunting zone will now be carried out jointly with the neighbouring population, which is gradually taking a much more active role in this work. Hunting tourism, mainly by foreigners, creates desperately-needed income streams for village communities from the lucrative charges levied for hunting trophies. As a result, poaching has decreased dramatically. The park is now home to more wild animals than all the neighbouring areas combined. The rural population is able to derive far greater benefits from the sustainable management of the biosphere reserve than in the past. This is improving people's living conditions – and turning them into supporters of the park administration.

Hands-on example: co-management of a protected area in Viet Nam

In Viet Nam, GTZ provided support to the Tam Dao National Park administration until 2008 under the 'Management of Tam Dao National Park and Buffer Zones' project. The intense resource use pressure, especially in the park surroundings, is threatening the biodiversity of the region. More than 190,000 people live in the immediate environs of the park, most of them in the buffer zone. They derive their income largely from agriculture and harvesting of forest products. The lack of alternative sources of income makes them heavily dependent on the park's natural resources. Although formally prohibited, they go into the protected area to gather firewood, food and medicinal plants; they extract drinking and irrigation water from it; and they use the area as pasture land. Climate change is only making the existing problems worse: the rising sea level, coastal erosion and floods in the Red River delta are eroding important areas of productive farmland.

The project introduced cooperative management measures between the local population and the responsible authorities, for example via the introduction of a village resource-use plan. A lively exchange of information and opinions now takes place between the National Park administration and the buffer-zone population about resource-use

Source:
GTZ Viet Nam: Management of Tam Dao National Park and Buffer Zones, www.gtz.de/en/praxis/10064.htm

demands and conflicts of interest. The project also supported the conservation and reintroduction of rare animal and plant species, as well as measures to improve forest conservation and management of the pristine forest.

Further educational suggestions and ideas for activities

So far, each chapter has been rounded off with stories about climate change, with the simulation of a world climate conference, and with numerous facts and figures about the countries covered in this brochure. This section will suggest some ways in which you can get even more closely acquainted with the situation in your imaginary 'host countries' in the International Wilderness Camp.

Model huts from around the world

The construction of the dwellings at the International Wilderness Camp raises all kinds of questions. How about exploring these by recreating them in the form of miniature models, as a pleasant and creative way to spend a (rainy?) afternoon? Start by looking closely at the lodges and take time to think about:

- What materials were they built from?
- Why were these particular materials most likely chosen?
- What would be used instead in our country? (Also, what unavoidably had to be done differently when setting up the Wilderness Camp, e.g. different timber, a foundation…?)
- What are the climate-related properties of the huts and dwellings: are they warm or cold in the day, and do they cool down dramatically or just a little in the evening?
- What is the climate like where these lodges are traditionally built? To what extent are the lodges adapted to the climate in that region?
- What is the layout of the dwelling, and what shapes do the walls, rooms and roof have? Why are they made in this way? How are they made in your country?
- Is there scope for further subdivision of the rooms? How many people live in each room? What are the social implications of shared living space?

You can find illustrations of the huts here: www.wildniscamp.de/main/laenderhuetten/

The Vietnamese long house is raised on stilts so that snakes and other animals cannot simply enter the people's home. The internal space is airy and the windows can be slid open. The reasons for locating the doors on the east and west walls are largely practical: this gives the best protection from the hot midday sun in Viet Nam.

Presentations on a protected area

To paint a better 'picture' of any protected area in question, you could produce an illustrated poster about it (e.g. what are the area's special features), or paint a picture on the subject (what do you see if you look out the window of our longhouse in Viet Nam?). Produce a chart of the information you find most interesting, or construct a model of the protected area, make a relief map, or describe it totally subjectively in the form of a text, a song, a dance or a sketch…

In case you have formed several sub-groups you can compare the different protected areas of your 'host countries': What do they have in common, what are their differences? It could also be helpful to display the protected areas from the climate viewpoint – either as a drawing, a painting, or a model, as in the section on 'Model huts'.

The aim here is not to speculate 'wildly' about the possible impacts of the changing climate in the individual regions, but to develop clearer ideas about the climate and to think about the kinds of changes that local inhabitants might theoretically face, and what might be involved in adapting to changing climatic conditions.

Guided climate-change trek

Climate change will, of course, also have impacts on the natural world in your immediate surroundings. What is likely to change? A few of you could think about this and act as guides for a short trek on which you explain to others exactly what changes will take place. It might sound challenging – but it can be done:

1. Consider what your own natural environment looks like right now (what habitats and species are there, what are the prevailing climatic conditions?)
2. Research what difference global climate change has already made to conditions in your country or region.
3. Choose a route that offers plenty of good examples of climate change so that people can notice the impacts for themselves – and consider who you want to join you and how to invite them.

An interesting variation: If climate change happens as predicted (in the best-case and worst-case scenarios), how might your walk look 20 or 40 years from now? In the Bavarian Forest National Park, for example, you might think about these points:

- There will probably be more areas of wind throw because pine stands are suffering from increasing drought stress and storms.
- The numbers of pines will probably be much reduced, because they are adapted to cooler weather than is likely to prevail in the Bavarian Forest in future.

Research:

You could research other interesting correlations yourself:

- Which cars produce the highest carbon dioxide emissions? How do computers rate? What difference does it make to leave devices on standby?
- How high is the average energy consumption in your classmates' or your neighbours' households? You could devise a points system (e.g. 1 point per standby device, 1 point per conventional light bulb) and compare scores!

Research and discuss:

- Do the traditional dwellings at the Wilderness Camp have features in common? If so, which? Why? Are there reasons connected to the climate?
- The Bavarian "Rindenkobel" (bark cabin) is the form of lodge adapted to conditions in southern Germany. It has a different style of roof from all the other countries' lodges – why? What can be concluded about the other dwellings in winter?
- What about you: How do you live? What is special about your home? What principles determine its layout? What influences the way that you arrange your own room? What kind of house would be your ideal home?

Further Information:
- http://actonco2.direct.gov.uk/home.html
- www.carbonfootprint.com/calculator.aspx

- Instead there will be more beeches, since they are more heat-tolerant.
- At times, the water levels in the streams that have to be crossed on many treks will be different from today – higher or lower, depending on the season.
- In summer we will put on lighter clothing because there will be more warm days and temperatures will be hotter overall – are we likely to be in T-shirts even in September / October? Maybe we will need sun-creams with a protection factor of 80? If we were sun-cream producers it would make us rich, in any case.
- What kind of rations will we carry on the trek – oranges grown in Bavaria? Might fresh strawberries be available as early as March?

Each group could find out about the conditions in one particular country and prepare a trek, e.g. Mongolian style: start with a greeting in Mongolian, explain the nature of climate change in Mongolia, and built ceremonial sites where offerings can be made to the spirits of the mountains – represented by a traditional stone cairn ('ovoo' in Mongolian) with an upright branch in the centre, draped with a blue scarf. These offering sites could be set up by the Mongolia group at the highest point of its trail (in Mongolia they are often at mountain passes). Traditionally, everyone dismounts from horseback (or gets out of the car) and walks three times round the ovoo so that the mountain spirits will grant them a safe journey.

On a climate-change trek, you can discover for yourself how your surroundings are changing with the climate and will probably continue to change. But does it actually make any difference if we each do something to combat the adverse effects of climate change individually? – In the end, can we really afford to settle for a proverbial drop in the ocean? In the table below you will find a list from which you can easily work out which changes will save a lot of carbon and which ones will save at least a little: some of it is quite surprising!

Energy saving bulbs & Co: What can they contribute?

Measure	Contributes a little Up to 99*	A little more 100+*	Does make a real impact 500+*	Superb! 3.000 – 4.000*
Using one energy saving bulb				
Using energy saving bulbs everywhere				
Boiling only as much drinking water as needed				
Driving 10% of the annual distance with 90 instead of 110 km/h				
Drying laundry in the air				
Abstaining from one short plane trip (Cologne-Mallorca)				
Change to a renewable energy supplier				
Abstaining from one long-distance plane trip Frankfurt-New York				

* CO_2-reduction in kg CO_2 / year

Source: www.zeit.de/zeit-wissen/2007/02/Titel-CO2-Zahlen

Part 6
Outlook

Action today for tomorrow's climate

Despite the alarming evidence shown in the Fourth Assessment Report of the IPCC, it is still possible to avert dangerous levels of climate change that would threaten human life. The positive message of the IPCC is that the world not only has the necessary technologies but also the required financial resources to achieve this. However, if we want to succeed with our actions, according to the Stern Review's conclusions, from now on we must take a cohesive approach as an international community and act immediately and strategically. The failure of the Copenhagen Climate Summit in December 2009, however, demonstrated how difficult it is for this 'One World' to jointly establish new rules. This failure, along with new research findings on climate change, makes the need for action more pressing than ever. The longer we wait the more difficult and more costly it will become to protect our species from the consequences of dangerous climatic changes.

And what about biodiversity – do we really need it in order to tackle climate change? To capture CO_2 emissions already released to the atmosphere, all that is basically needed is large-scale, monocultural reforestation – despite the clear disadvantages this would have in terms of biodiversity. We do not have to opt for the 'lesser evil', however. In this context, Nicholas Stern explicitly recommends the establishment of new protected areas to avert deforestation and thereby prevent greenhouse gas emissions as the cheapest and best way of mitigating climate change. Moreover, to be able to adapt to the climate challenges – many of which yet unknown – we will need diversity. In many developing countries, especially the poor depend on this diversity for their survival: they use a broad range of animal and plant species, varieties and breeds. The traditional knowledge that is connected to the cultivation, processing and use of natural resources may well prove vital for the survival of humankind in the near future.

It thus becomes very clear: in times of climate change initiatives to protect biodiversity also help safeguard potential means of adapting to changed conditions, and maintain use options of biodiversity both for us and future generations. On the international level, it would surely be beneficial if the bodies of the major environment conventions (especially the Convention on Biological Diversity, CBD and the UN Framework Convention on Climate Change, UNFCCC) while acknowledging the close links and interdependence between them further reinforce cooperation.

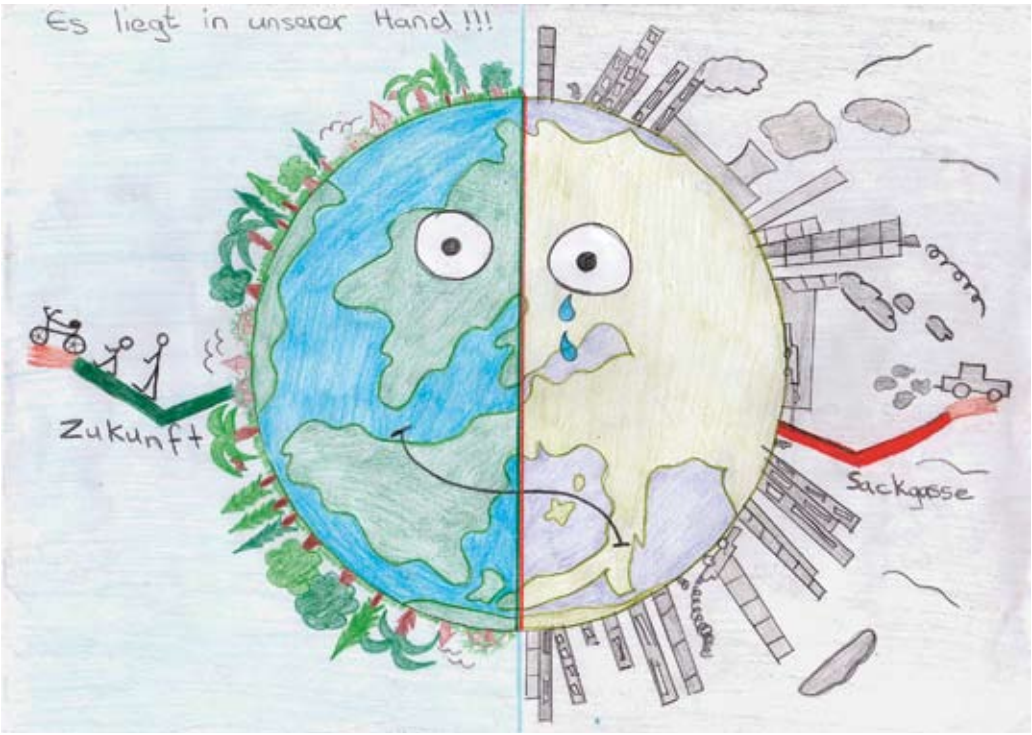
Think global, act local

The lifestyle choices of people everywhere, but especially those in industrialised countries, are under scrutiny. This is the central message of the United Nations International Decade of Education for Sustainable Development. This is why initiatives aimed at environmental education and enhancing public awareness of energy-saving consumption and travel choices are crucial. Every single one of us can do something to help mitigate climate change. IPCC chairman Rajendra Pachauri, for example, calls for people in the northern hemisphere to start wearing sweaters instead of T-shirts at home in winter to save energy on heating.

Businesses have begun to promote the idea of energy saving in their marketing. Even the piece of meat on our plate and the biofuel we put in our petrol tank contribute to climate change. Being aware of this can help us make decisions about our own consumption and lifestyle. Last but not least, there are many seemingly trivial things that

About 1,4 billion of the poorest people live in rural areas. They are dependent on traditional agriculture and genetic resources from plants and animals. The conservation of this agrobiodiversity also keeps the options open for a variety of uses, particularly in the era of climate change.

For more information on the Climate Generation programme see: www.british-council.de/icc



The British Council's 'Climate Generation' programme – young people take a proactive interest in climate change

With its worldwide 'Climate Generation' programme the British Council is giving a voice to those who have the greatest interest in averting the consequences of climate change: the young people of this world. The initiative was launched in late 2007 in 13 different countries under the title 'International Climate Champions'. More than 1800 young climate activists in 60 countries form part of the international Climate Generation Network. Magdalena Gründl (aged 18, school student) is one of the Climate Champions in Germany:
'Last year I wrote to all the German schools abroad. I enclosed a flyer encouraging the children and young people there to think about environmental conservation and climate protection, and asked them to draw a picture. I had reckoned on getting maybe 20 pictures, but more than 900 youngsters from every continent sent pictures expressing how concerned they are about an intact environment and conservation of our resource base. I want to use these pictures to encourage even more people to take positive action.'

This picture above comes from Magdalena's 'Save the World' competition and was drawn by Lina Dimashkie (aged 9, pupil of the German school in Beirut). What about you? Do you have ideas that you could express in a creative way? What would your picture look like?

make a vital – indeed perhaps the most important – contribution to protecting our planet.

Innovative educational initiatives like the International Wilderness Camp demonstrate the connections in a way that brings them to life. This helps to anchor in people's minds the fact that all human beings depend on the natural resources of our planet. Experiencing the natural environment at close hand and becoming aware of living conditions of people in other corners of the globe can change people's perspectives, generate a willingness to take positive action and enable us to shape the future in a way that is active, responsible and fair.

Part 7
Background Information

Global warming is causing climatic changes worldwide: temperatures are rising, patterns of precipitation are changing. More extreme precipitation is occurring during shorter periods, while dry seasons are becoming longer. Moreover, extreme events such as storms are on the rise. At the same time, rising sea levels are threatening the coastal regions of the world. What impacts are these climatic changes having on site in the partner countries of the International Wilderness Camp? And what, in comparison, are the impacts in Germany and the Czech Republic? Where will more rain fall? Where is it getting drier? Where are the impacts of climate change on biological diversity already being felt? What does this mean for farming? Where might drinking water resources become scarce? How is climate change influencing the economy of an entire country? Which country-specific strategies and measures need to be adopted to counter these effects? How do economic interdependencies influence the environmental and climate policy of a country? Which local approaches are being pursued to tackle the global problem that is climate change?

To be able to answer these and other questions, one needs to get to know the individual countries better. The eleven brief country profiles on the following pages (grouped by continents) provide a good starting point. The aspects mentioned are intended to be representative – by no means comprehensive.

Where not otherwise stated, the information given in the country profiles comes from the following sources:

- Auswärtiges Amt (German Foreign Office, 2010)
- CBD Country Profiles
- CIA Factbook (8/2010)
- Earthtrends Country Profiles
- GEF Country Details
- Global Footprint Network: Ecological Footprint Atlas 2009
- InWEnt: Country pages
- Living Planet Report (2008)
- UNDP: Human Development Report (2009)
- UNFCC: National climate reports
- UNFCC: National Adaptation Programmes of Action
- World Data Base on Protected Areas (WDPA, 2010)

The eleven countries portrayed in this brochure represent the continents Africa, North and South America as well as Central and Southeast Asia.

Research and analyse the facts in the brief country profiles

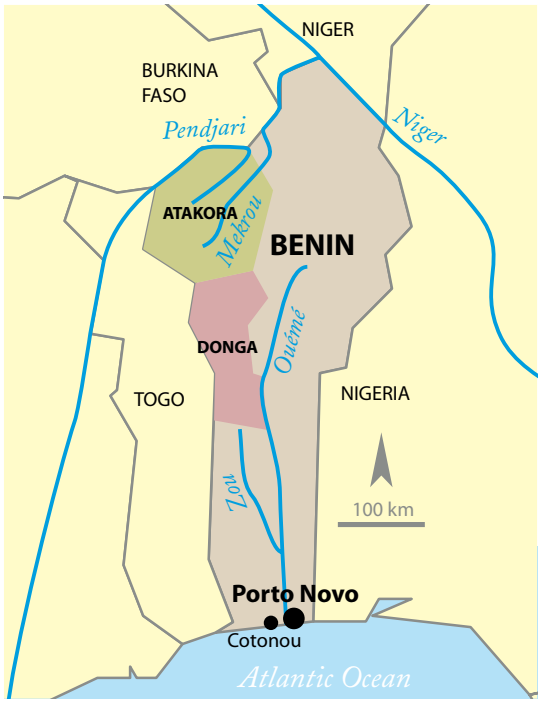
- What are the ecological and climate superlatives for each country? Which country has the world's coldest capital city, for example?
- How do the countries differ in terms of climate zone, average temperature, seasons and precipitation? On that basis, which countries can be classified as especially vulnerable to the impacts of climate change?
- Which countries are likely to suffer the greatest loss of biodiversity as a result of climate change? and why? Which countries are the most vulnerable with regard to their ecosystems?
- Which sectors are responsible for the bulk of greenhouse gas emissions in industrialised countries, and which sectors in developing countries?

Look at some of the countries in more detail:

- Venezuela is one of the world's leading petroleum producers. What can this mean for the country's economy? Which statistics / climate indicators are directly affected by this? What influence could this have on the delicate balance between economic growth and environmental protection? How does all this relate to climate protection measures: must oil reserves automatically lead to high emissions and a polluted environment?
- Chile enjoys a reputation in Latin America as the country with the lowest corruption and the highest business transparency. Which index reflects these factors? Where does Chile rank in comparison with Germany?
- Brazil is one of the newly industrialised countries thanks to its highly dynamic economy. Nevertheless a majority of the population is poor and there are great regional disparities. On which index can this be verified? What environmental problems can be linked to these facts?
- Emissions per head of the population in the USA are the highest out of any of the countries covered in this booklet. They amount to double the average level for all OECD countries. Per-capita emissions in Germany and the Czech Republic are relatively high but below the average for the OECD countries. What do you think: can our individual behaviour make any difference to per-capita emissions? Or do they result from circumstances that we can only influence indirectly, maybe on the political level; e.g. whether or not new coal-fired power stations are built?
- Many countries make use of the watercourses from their mountain ranges and the storage function of glaciers. As the Andean glaciers melt, for example, what impact might this have on the drinking water supply for people and animals in the homelands of the Mapuche Indians in Chile?
- The Earth's coasts are becoming ever more densely populated and increasingly exploited. Many countries have extensive regions within river floodplains and deltas, some of which are even below sea level. According to forecasts, how will a sea-level rise of even a few centimetres affect the national parks on the coasts of Viet Nam and Venezuela?
- Many changes to the climate have an effect on economic, social and cultural life: what will happen to the ethnic groups of the Khanty and Mansi if the Siberian permafrost soils are thawing?
- What effect could the expansion of deserts in the Mongolian steppes have on the traditional way of life of yurt-dwellers?
- What are the options for people and nature in the Amazon region in response to the worsening drought?
- What impacts of climate change are already being felt in Benin today? And how are the people coping with them?
- What impacts are we already noticing in our country? How does our way of managing the impacts differ from the approaches in other countries?

Benin

Republic of Benin
République du Bénin



To tackle and cope with climate change, all parts of the population need to be involved. Campaigns designed to spread knowledge and raise awarenessnare important steps towards successful adaptation and behavioural changes.

Too much water and too little: Adapting to climate change in Atakora-Donga

GTZ supported an innovative project designed to promote adaptation to climate change in the northwest of Benin in 2006 and 2007. The Atakora-Donga region is exposed to extreme climatic fluctuations – the vital water catchment area suffers either from long periods of drought or severe flooding. Moreover, the destruction of gallery forests, combined with intensive agricultural land use lacking fallow periods, has exhausted soils and has caused erosion. Rice yields in the region have declined by half.

The main thrust of the project was to raise awareness among the rural population of the impacts of climate change, while at the same time building their capacity to manage their water catchments effectively. Practical measures on the ground involved stabilising soils at risk of slip erosion (for instance by reinforcing embankments) and improving water supply (for example by enhancing the water retention capacity of river plains). The cultivation of selected vegetable varieties and of rice varieties resistant to drought was also improved. The innovative heartpiece of the project, however, was communication: local radio stations broadcast news on important activities, and the involvement of traditional elements such as 'town criers' or the 'parley tree' as a site for discussion contributed decisively to the success of the project.

Key country information	
Area	11.262 million ha
Population (2006)	8.8 million
Population growth rate (2005–2010)	3%
Population density (2006)	69 Inhabitants/km²
Life expectancy (2007)	61 Jahre
Literacy rate (2007)	40.5%
Gross domestic product (GDP, 2007)	USD 5.4 billion
GDP/year/capita (2007)	USD 601
Human Development Index (2009)	0.492 (place 161 / 182)
Portion of the population living below the absolute poverty line (USD 2 per day) (2007)	75.3%
Gini coefficient of income distribution (1992–2007)	38.6

Ecological zones

Benin's five ecological zones are characterised by a climate that is increasingly arid from south to north:

- In the south: coastal zone with a tropical-moist climate
- Central inland: fertile plain known as the 'terre de barre' (clay earth)
- In the northeast: Precambrian shelf plain with dry forests and savannahs, with transition from moist sub-equatorial to semi-arid climate further north
- In the northwest: Atakora mountain chain with nutrient-poor soils and dry southern Sahelian climate
- To the west of the Atakora mountains: plain named after the Pendjari and Niger rivers, with an even relief and largely dry savannahs

The GTZ Factsheet 'Adapting to climate change in Benin' is included in pdf format on the accompanying CD.

Environmental conditions and national policy

Environmental problems	• Deforestation • Soil degradation and desertification • Coastal erosion and overfishing of lagoon areas • Ineffective waste management and high levels of air pollution, especially in cities • Insufficient potable water supply for the population
Ecological Footprint (Ökologischer Fußabdruck, 2006)	1 gha/person (global average: 2.59 gha/person)
Biocapacity (2006)	0.8 gha/person
Area with designated nature conservation status (2010)	2.6 million ha (23.4% of national territory),
Area strictly protected under the IUCN Categories I & II (2010)	777,500 ha (6.9% of national territory)

Detailed information on the Pendjari National Park is available in the brochure 'Use it or Lose it' published as the third volume of the present 'Sustainability Has Many Faces' series (in German and French).

Climate change, impacts and national policy

Climate change impacts and vulnerability	• As a result of increasing drought: desertification and declining water availability • Increasing hygiene and health problems • Decline in harvest yields by 3–18% from present levels • Threats to biological diversity, e.g. to mangroves or freshwater ecosystems due to rising temperatures and sea-level rise
Adaptation	**National Adaptation Programme of Action** (2003): • Action to combat coastal erosion • Establishment of artificial wetlands
National greenhouse gas emissions (2006)	3.1 million t CO_2 (= sink country), corresponding to 0.3 t CO_2/year per capita. **Main sources:** Agriculture and LULUCF
Mitigation	• Improved efficiency of energy use in charcoal production • Production of improved stoves for the rural population • Support for renewable energies

Madagascar

Republic of Madagascar
Repoblikan'i Madagasikara
République de Madagascar

Logging around Ambositra: By avoiding further deforestation, Madagascar will make an important contribution to greenhouse gas reduction.

Source: CBD/GTZ (2009): Biodiversity and Livelihoods: REDD benefits www.cbd.int/doc/publications/for-redd-en.pdf

'REDD-plus' in the Makira forest reserve

The Makira plateau lies in the northeast of Madagascar. The Wildlife Conservation Society, an international non-governmental organisation, has been working since June 2008 with Madagascar's government and other partners to involve the communities living on the plateau in long-term conservation measures. The Makira forest stores enormous quantities of carbon. The protected area is to be financed by selling up to 9.5 million tonnes of carbon credits over the next 30 years. Such 'avoided deforestation' (REDD-plus, see also page 35) in 350,000 ha of the Makira forest will thus ensure long-term conservation of the forest, in a process that involves the communities in protected area management and drives sustainable development for the region.

GTZ has also played its part, carrying out a pilot project that has helped the country's authorities test methods by which to conserve natural forests as carbon reservoirs.

Key country information

Area	58.704 million ha
Coastline	4,842 km
Population (2007)	18.6 million
Population growth rate (2005-2010)	2.7%
Population density (2007)	34 Inhabitants/km^2
Life expectancy (2007)	59.9 Jahre
Literacy rate (2007)	70.7%
Gross domestic product (GDP, 2007)	USD 7.4 billion
GDP/year/capita (2007)	USD 375
Human Development Index (2009)	0.543 (place 145 / 182)
Portion of the population living below the absolute poverty line (USD 2 per day) (2007)	89%
Gini coefficient of income distribution (1992-2007)	47.2

Ecological zones

Madagascar's climate is tropical-moist along the northwest and eastern coast, and dry hot in the southern parts of the country:

- In the north: high mountain region with mixed forests
- In the centre: uplands with montane rainforest and distinct rainy and dry seasons (landscapes greatly modified by human activity)
- In the east: tropical-moist lowland rainforest with high species diversity
- In the west: dry deciduous forests with a dry period lasting almost seven months
- Southern tip: dry forests and thorn scrub savannah

Madagascar is one out of 17 megadiverse countries on our planet. Thanks to its isolation, a great number of endemic animal and plant species have developed here.

Environmental conditions and national policy

Environmental problems	• Increasing desertification • Loss of primary forests due to rising demand for new arable land and for firewood • Threats to unique fauna caused by land-use change • Soil erosion and declining soil quality caused by inappropriate traditional farming practices • Contamination of surface waters caused by wastewater and other organic wastes
Ecological Footprint (2006)	1.2 gha/person (global average: 2.59 gha/person)
Biocapacity (2006)	3.2 gha/person
Area with designated nature conservation status (2010)	4.54 million ha (7.7% of national territory)
Area strictly protected under the IUCN Categories I & II (2010)	1.1 million ha (1.9% of national territory)

Climate change, impacts and national policy

Climate change impacts and vulnerability	• Threats to mangrove forests and to unique coral reefs • Increasing land degradation, with negative consequences for farming and forestry • The Alaotra region (Madagascar's 'breadbasket') is considered the most vulnerable • Huge forest areas are at threat due to the increasing intensity of cyclones
Adaptation	**National Adaptation Programme of Action** (2006): • Increasing the resilience of ecosystems • Improving disaster preparedness • Conducting reafforestation measures
National greenhouse gas emissions (2006)	2.8 million t CO_2 (= sink country), corresponding to 0.2 t CO_2/year per capita. **Main source:** Energy sector (use of firewood)
Mitigation	As a sink country, Madagascar has the potential to make a positive contribution to greenhouse gas emissions reduction by storing carbon in its natural forests. A REDD strategy is currently being developed.

Mongolia
Mongol Uls

Nature conservation and sustainable pasture management for adaptation to climate change

Climate change impacts are already making themselves felt in Mongolia: for instance, fires are becoming more frequent and water more scarce. Around 35% of the Mongolian population leads a nomadic life dependent upon livestock breeding. The very livelihoods of these people are at threat due to the loss of steppes that results from climate

In the long and cold winter months, the nomadic pastoralists lead a frugal life. In the autumn months, drinking water is fetched as long as possible from the rivers and wells while these freeze over. In winter, blocks of ice are thawed for people to get drinking water, while for livestock holes are broken in the ice.

Key country information	
Area	156.65 million ha
Population (2007)	2.6 million
Population growth rate (2005)	1.2%
Population density (2008)	2 Inhabitants/km²
Life expectancy (2007)	66.2 Jahre
Literacy rate (2007)	97.3%
Gross domestic product (GDP, 2007)	USD 3.9 billion
GDP/year/capita (2007)	USD 1,507
Human Development Index (2006)	0.727 (place 115 / 182)
Portion of the population living below the absolute poverty line (USD 2 per day) (2007)	49%
Gini coefficient of income distribution (1992-2007)	33.0

change. The climate-related decline of forest area will also cause losses in forestry. Biodiversity conservation and climate change adaptation are thus rising ever higher on the agenda in this Asian state. In 2009, GTZ, working together with the Mongolian government, reoriented the programme for the conservation and management of natural resources: the focus is now placed on efforts to adapt to climate change and conserve biological diversity over the long term. Guided by the overarching principle of sustainable pasture, forest and water management, strategies are being developed together with the partners, with a firm eye on climate impacts and biological diversity.

Ecological zones

The continental, semiarid climate of Mongolia is characterised by major temperature swings, both in the course of the day and across the seasons.

- In the northwest: Altai mountains with peaks up to 4000 m and extensive forests, rivers and lakes
- Towards the south: forests give way to the Siberian mountain taiga, mountain forest steppes and extensive steppe plain landscapes
- In the south: Gobi Desert

Source and further information on the GTZ project: www.gtz.de/en/weltweit/asien-pazifik/mongolei/17020.htm

Environmental conditions and national policy	
Environmental problems	• Land degradation caused by overgrazing and erosion • Deforestation • Loss of biodiversity caused by habitat destruction • Resource over-exploitation and pollution • Urban air pollution and ineffective solid waste management
Ecological Footprint (2006) **Biocapacity** (2006)	5 gha/person (global average: 2.59 gha/person) 0.8 gha/person
Area with designated nature conservation status (2010)	21.79 million ha (14% of national territory)
Area strictly protected under the IUCN Categories I & II (2010)	19 million ha (12.1% of national territory)

Source: UNEP (2005): Mongolia, State of the Environment 2002 – Loss of Biodiversity.

Climate change, impacts and national policy	
Climate change impacts and vulnerability	• Forest fires • Spread of dry steppe and desert areas • Threats to the water balance caused by thawing glaciers and permafrost soils • Strong dependence of the population upon livestock implies great vulnerability to any decline in soil fertility and pasture biomass
Adaptation	National Climate Action Plan in preparation (2010)
National greenhouse gas emissions (2006)	9.4 million t CO_2, corresponding to 3.4 t CO_2/year per capita **Main sources:** Energy and agriculture
Mitigation	• Improving household stoves in urban areas • Substituting fossil fuels with cogeneration (combined heat and power, CHP) systems and renewable energies for transport and residential uses

Strategies for adapting to climate change in pasture ecosystems in the central mountain region of Mongolia are described in the article 'Climate Change Adaptation Strategies for Pastoral Communities of Mongolia's Central Mountainous Region' by Chuluun Togtokh, published in 'Mountainous Regions: Laboratories for Adaptation' in November 2008. www.indiaenvironmentportal.org.in/files/Climate%20Change%20Adaptation.pdf

Russia

Russian Federation
Rossiiskaja Federazija

You can find more specific info in an article on climate change affecting the Nenets people from north-west Siberia: www.guardian.co.uk/environment/2009/oct/20/arctic-tundra

Today, not many Khanty and Mansi nomads of Siberia maintain a nomadic lifestyle. They live in permanent settlements. The tent „Tschum" thus has a symbolic meaning and refers to the preservation of traditions.

Indigenous peoples in the Arctic: Witnesses of climate change

Some 40 different indigenous peoples with around 240,000 members live in Siberia, whose cultures and activities are determined by the Arctic environment. For millennia, they have adapted perfectly to the extreme conditions here. The Khanty and Mansi peoples in the northwest of Siberia, for instance, live off hunting, gathering, fishing and reindeer herding. In recent decades, however, their ways of life have repeatedly come under severe pressure: Oil production, together with uranium and diamond mining, left ecological disaster zones in their wake, in which indigenous communities have scarcely any prospect of

Key country information	
Area	1709.82 million ha
Coastline	4,828 km
Population (2007)	141.9 million
Population growth rate (2007)	-0.4%
Population density (2008)	8 Inhabitants/km²
Life expectancy (2007)	66.2 Jahre
Literacy rate (2007)	99.5%
Gross domestic product (GDP, 2007)	USD 1,290.1 billion
GDP/year/capita (2007)	USD 9,079
Human Development Index (2007)	0.817 (place 71 / 182)
Portion of the population living below the absolute poverty line (USD 2 per day, 2007	data not available, 19% live below national poverty line
Gini coefficient of income distribution (1992-2007)	37.5

survival. These pressures are now being joined by climate change, which is currently making itself felt most severely and most rapidly in the Arctic compared to all other climatic zones of the world. Pack ice is melting, glaciers and permafrost soils are thawing. The winters are becoming shorter and warmer. Whether the global community succeeds in containing climate change will be a factor determining whether the indigenous Siberian peoples and their traditions survive.

Sources:
- GfbV (2005): Neuer Waldkodex in Russland
- Koch, S. (2007): Die Wildnis ruft

Ecological zones

Russia is characterised by a north-south gradient – from an arctic climate in the polar zone to a continental climate with dry and very cold winters and warm-hot summers.
- In the north: cold desert of the polar zone with permafrost soils and treeless tundra
- In the centre: boreal forests (Siberian taiga), steppes and semi-deserts cold in winter
- To the south: deciduous broadleaved and mixed forests
- In the southwest: Black Sea coast of Mediterranean character, with sclerophyllous forests

Environmental conditions and national policy

Environmental problems	• Soil erosion • Illegal logging • Air pollution (particularly in the cities) • Pollution of inland and coastal waters • Soils contaminated by agro-chemicals • Areas rendered uninhabitable by high levels of radioactive contamination (resulting from the 1986 Chernobyl nuclear disaster)
Ecological Footprint (2006) **Biocapacity** (2006)	4.44 gha/person (global average: 2.59 gha/person) 6.33 gha/person
Area with designated nature conservation status (2010)	210.1 million ha (11.7% of national territory)
Area strictly protected under the IUCN Categories I & II (2010)	25.2 million ha (1.5% of national territory)

Climate change, impacts and national policy

Climate change impacts and vulnerability	• Agriculture, forestry, water resources and permafrost areas are considered particularly vulnerable • Thawing soils are threatening infrastructure, such as roads, buildings, industrial facilities, as well as cultural identity and traditions by irreversible changes in everyday life
Adaptation	No adaptation strategy has yet been adopted. The foundation for a future adaptation strategy is to be laid by improving knowledge about the potential impacts of climate change.
National greenhouse gas emissions (2006)	1,564.6 million t CO_2, corresponding to 9.7 t CO_2/year per capita **Main source:** Energy sector
Mitigation	Energy efficiency and energy conservation programmes with the target of reducing CO_2 emissions by a total of 780-830 million t by 2012 from a 2004 baseline

Viet Nam

Socialist Republic of Viet Nam

Cộng hòa Xã hội Chủ nghĩa Việt Nam

You can watch a short film on forests and climate change in the Mekong Delta at: www.dw-world.de/dw/episode/0,,5386282,00.html

Conserving biodiversity in the Mekong delta: Safeguarding against the impacts of climate change

In the Mekong delta, people are already feeling the impacts of climate change: the sea level is rising and storms are becoming ever more frequent. The protective mangrove forest belt in the delta, however, has been largely cut down to make way for shrimp farms. The forest remnants are so severely damaged by excessive use that they now scarcely protect the land behind them. Moreover, the poor people who hunt edible animals in the mangroves and collect firewood there are gradually losing their livelihood base. Acting on behalf of the German federal government and in cooperation with the Australian government, GTZ is working to halt this development by helping three Vietnamese provinces to maintain or restore the ecological balance of the wetlands and promote sustainable use of these areas. As a part of this work, in Soc Trang province 110 hectares have already been planted with a selected range of mangrove species along the coast, and a further 30 hectares in Bac Lieu province. In Kien Giang province, GTZ is helping to improve

The Mekong delta lies only a few metres above sea level, and is thus greatly at risk from sea-level rise. In the city of Bac Lieu, the poor live directly on the waterfront.

Key country information	
Area	32.956 million ha
Coastline (without islands)	3,444 km
Population (2007)	86.1 million
Population growth rate (2005 – 2010)	1.2%
Population density (2008)	286 Inhabitants/km²
Life expectancy (2007)	74.3 Jahre
Literacy rate (2007)	90.3%
Gross domestic product (GDP, 2007)	USD 68.6 billion
GDP/year/capita (2007)	USD 806
Human Development Index (2009)	0.725 (place 116 / 182)
Portion of the population living below the absolute poverty line (USD 2 per day) (2007)	48.4%
Gini coefficient of income distribution (1992-2007)	37.8

park management in the Minh Thuong National Park and in two further protected areas. The park harbours, on an area of 148,000 ha, the last intact major wetland of the Mekong delta. Conserving and reforesting the species-rich coastal forests makes the coastal regions more resilient to climate change impacts over the long term. At the same time, this enables the local population to make sustainable use of the mangroves.

Ecological zones

The climate ranges from subtropical in the north to tropical, dominated by the rainy and dry seasons of the monsoon in the south.

- In the north: uplands and Red River delta
- In the centre: uplands, partly extending to the coast
- In the southwest: low-lying Mekong delta

Viet Nam counts among the countries with the greatest biological diversity in South-East Asia. The species richness of the lower Mekong region makes it a biological hotspot.

Sources and further information:

- GTZ in the Mekong delta: www.gtz.de/en/presse/23696.htm
- GTZ's Soc Trang project: http://czm-soctrang.org.v

Environmental conditions and national policy	
Environmental problems	• Deforestation • Soil degradation • Decline in marine flora and fauna • Curtailment of potable water supply due to groundwater contamination from arsenic soils • Deterioration of the environmental situation in Hanoi and Ho Chi Minh City.
Ecological Footprint (2006) **Biocapacity** (2006)	1 gha/person (global average: 2.59 gha/person) 0.6 gha/person
Area with designated nature conservation status (2010)	3.57 million ha (10.8% of national territory)
Area strictly protected under the IUCN Categories I & II (2010)	479,369 ha (1.5% of national territory)

Climate change, impacts and national policy	
Climate change impacts and vulnerability	• Coastal erosion, flooding, drought and soil salination • The coastal zone (coral reefs, mangroves and fishing villages), the water catchment areas (i.e. the supply of potable and irrigation water) and, as a result, the agricultural sector are considered particularly vulnerable • The deltas of the Mekong and of the Red River (Viet Nam's breadbaskets) are greatly at risk from sea-level rise and an increase in storms
Adaptation	**National Adaptation Plan of Action** (2008): • Identification of vulnerable sectors • Strengthening of disaster risk management • Improvement of coastal protection • Integration of climate aspects in development planning
National greenhouse gas emissions (2006)	106.1 million t CO_2, corresponding to 1.2 t CO_2/year per capita **Main sources:** Agriculture and energy
Mitigation	Greenhouse gas reduction in the energy and farming sectors by 2020: e.g. improved irrigation management in rice paddies in order to reduce the high methane emissions

Brazil

Federative Republic of Brazil
República Federativa do Brasil

The Amazon counts among the most species-rich regions of the world.

Brazil as an important pace maker

Brazil's National Climate Action Plan adopted in 2008 represents a paradigm shift in the climate policy of this South American country. It is the first time that a newly industrialising country has presented quantitative national emissions reduction targets – albeit initially only on a voluntary, non-binding basis. Brazil's strategy concentrates particularly on reducing emissions from deforestation. The declared goal is to reduce deforestation by 70% by the year 2020. This would correspond to 4.8 billion tons of carbon that would not be emitted to the atmosphere. A further goal is to advance reforestation and the certification of sustainable forest management. Specifically, the rate of afforestation is to exceed the rate of deforestation by the year 2015. Moreover, Brazil intends to provide financial resources for measures to adapt to climate change and combat desertification. The German government is supporting numerous climate protection projects in Brazil. These include activities within the ARPA protected area programme in the Amazon basin. The programme's objective is to award conservation status to 10% of the area of Amazonia and thus to conserve the rainforest, but also to safeguard the right of indigenous peoples to self-determined development and to maintain their traditional knowledge.

Key country information	
Area	851.5 million ha
Coastline	7,491 km
Population (2007)	190.1 million
Population growth rate (2005 – 2010)	1.0%
Population density (2008)	23 Inhabitants/km²
Life expectancy (2007)	72.2 Jahre
Literacy rate (2007)	90%
Gross domestic product (GDP, 2007)	USD 1,313.4 billion
GDP/year/capita (2007)	USD 6,855
Human Development Index (2009)	0.813 (place 75 / 182)
Portion of the population living below the absolute poverty line (USD 2 per day) (2007)	12.7%
Gini coefficient of income distribution (1992-2007)	55.0

Ecological zones

The climate is predominantly tropical, with only minor seasonal fluctuations in temperature. While the north is rich in rainfall, precipitation is often lacking in the arid regions of the northeast.

- In the north: Amazon region with extensive tropical rainforests, high forests, alluvial forests, river floodplains, savannahs and mangrove swamps
- In the semiarid northeast: extensive steppe and savannah areas (caatinga)
- Western centre: largest flood plains and alluvial areas of the world (pantanal)
- Along the Atlantic coast in the east: Mata Atlântica mountains originally densely covered with Atlantic rainforest (today, only 14.7% of the original forest cover remains)
- In the south: large savannah areas (cerrado) and open grassland (pampa)

Brazil is the country with the greatest biological diversity on our planet. It hosts 70% of all red-listed species and the largest number of endemic species.

Environmental conditions and national policy

Environmental problems	• Deforestation • Illegal trade in wildlife • Water contamination caused by inappropriate mineral resource extraction • Wetland degradation caused by severe oil pollution • Air and water pollution in the major cities
Ecological Footprint (2006) **Biocapacity** (2006)	2.4 gha/person (global average: 2.59 gha/person) 7.3 gha/person
Area with designated nature conservation status (2010)	243.29 million ha (28.6% of national territory)
Area strictly protected under the IUCN Categories I & II (2010)	48.36 million ha (5.7% of national territory)

Climate change, impacts and national policy

Climate change impacts and vulnerability	• The tropical rainforest and the alluvial areas of the pantanal are the most vulnerable ecosystems in Brazil • Frequent drought, combined with increased vulnerability to forest fires, is causing decline of the Amazon rainforest • Declining water availability
Adaptation	**National Climate Action Plan** (2008): • Provision of substantial financial resources for measures to adapt to climate change and combat desertification • Improvement of the information available on the concrete impacts of and vulnerability to climate change
National greenhouse gas emissions (2006)	352.5 million t CO_2, corresponding to 1.9 t CO_2/year per capita **Main sources:** Land-use change and forestry
Mitigation	• Envisaged reduction of deforestation rate by 70% by 2020 • Promotion of reforestation and certification of sustainable forest management

A summary of Brazil's National Climate Action Plan is available at: www.mma.gov.br/estruturas/imprensa/_arquivos/96_11122008040728.pdf

Chile

Republic of Chile
República de Chile

Climate change in the Conguillío National Park and the Pehuenche people

The retreat of glaciers across large parts of the southern Andes is causing water to become scarce for people and nature alike. The monkey-puzzle tree (Araucaria araucana, which can reach an age of up to 3000 years and is thus one of the most long-lived tree species of the world) is particularly affected by the new aridity – the species is at risk of extinction, as, due to its slow development, it cannot adapt to the rapid process of climate change. For the indigenous Pehuenches, a part of the Mapuche people, this means that a vital part of their diet, but also important spiritual links with the tree and the ecosystem and thus their cultural identity will presumably be lost. In addition, the cultivation of traditional crops will decline, as will animal grazing, due to rising aridity and reduced productivity of the soils.

If the money-puzzle trees, which crucially determine the appearance of the landscape, disappear and if snowfalls further decline, this probably also will have fatal impacts on hiking tourism in summer and skiing tourism in winter. This, in turn, must be feared to lead to drastic losses of income in the national park and for the local people.

Sources:
- GfbV (2003): Mapuche (Chile). Der bürokratische Völkermord.
- Instituto Indígena: www.institutoindigena.cl
- www.mapuche-nation.org

As in many other parts of the world, deserts are encroaching in Chile. In the Atacama Desert, the desert sand slowly grinds its way into the village of San Pedro Toconão.

Key country information	
Area (excluding Antarctica)	75.6 million ha
Coastline	6,435 km
Population (2007)	16.6 million
Population growth rate (2005 – 2010)	1.0%
Population density (2008)	23 Inhabitants/km²
Life expectancy (2007)	78.5 Jahre
Literacy rate (2007)	96.5%
Gross domestic product (GDP, 2007)	USD 163.9 billion
GDP/year/capita (2007)	USD 9,878
Human Development Index (2009)	0.878 (place 44 / 182)
Portion of the population living below the absolute poverty line (USD 2 per day) (2007)	2.4%
Gini coefficient of income distribution (1992-2007)	52.0

Ecological zones

Due to its enormous length of more than 4,200 km, considerable differences in elevation and the presence of the Humboldt Current, which conveys cold seawater from the Antarctic to the north, Chile harbours the most diverse climatic and vegetation zones:

- In the north: landscape rising steeply from west to east, highland plain at 1,000 to 1,500 m (altiplano)
- To the east of the mountains: Atacama Desert (one of the driest regions of the world)
- In the centre: valley plain with Mediterranean climate, allowing arable farming, fruit-growing, wine-growing and forestry
- In the east: Andes mountain chain (up to 6,900 m, extending along the length of the country from north to south)
- In the west: lower coastal cordilleras
- In the south: sparsely populated, precipitation-rich region with lakes, forests and mountains
- Southernmost tip: Tierra del Fuego (Fireland) with glaciers and volcanoes, polar climate

Chile's topographic diversity has led to great species diversity and one of the highest degrees of endemism in Latin America and the Caribbean.

Environmental conditions and national policy

Environmental problems	• Increasing desertification in the dry north • Air pollution in the central region • Deforestation rate of 0.15% per year • Land degradation and erosion due to land-use changes and copper mining • Effects of salmon aquaculture are endangering marine ecosystems and thus also the large marine mammals living off the south coast of Chile
Ecological Footprint (2006) **Biocapacity** (2006)	3.1 gha/person (global average: 2.59 gha/person) 4.1 gha/person
Area with designated nature conservation status (2010)	14.85 million ha (18.3% of national territory)
Area strictly protected under the IUCN Categories I & II (2010)	8.7 million ha (11.5% of national territory)

Climate change, impacts and national policy

Climate change impacts and vulnerability	• Agriculture and forestry are particularly at risk, as are the coastal regions • Declining water availability in the central region • Massive temperature fluctuations off the coast of northern Chile are endangering marine ecosystems
Adaptation	**National Climate Strategy** (2006) • Improvement of information on specific impacts of climate change • Identification and implementation of adaptation measures
National greenhouse gas emissions (2006)	60.1 million t CO_2, corresponding to 3.6 t CO_2/year per capita **Main sources:** Transport and energy
Mitigation	Because of budgetary constraints, Chile is concentrating on measures that incur no net cost, such as saving energy or enlarging carbon sinks, for instance by means of reforestation.

Chile's national climate strategy is available at: http://sinca.conama.cl/uploads/documentos/08a329326cb4cb5f16ddcc2f0eaeb0de.pdf

Venezuela

Bolivarian Republic of Venezuela
República Bolivariana de Venezuela

Peninsula de Paria National Park: Paradise in peril

The attractive and diverse National Park is located in the North-east of Venezuela, at the tip of the Paria Peninsula. Its unique Caribbean coastal montane cloud forests are the last remaining ecosystems of their kind. Park management is based on Venezuelan land-use law. This determines which human activities are permitted, restricted or prohibited. However, due to a lack of park ranger staffing, training and equipment, it is scarcely possible to monitor land uses. Efficient park management and constant monitoring would indeed be important to ensure conservation of the high and unique biological diversity still found in the protected area. As a result of sea-level rise caused by climate change, farming areas close to the coast are suffering salt intrusion. 'Conuqueros', smallholders living at the foot of the mountains, therefore are moving ever higher up the slope in their search for new arable land.

Sources and further information:
- Fundación Thomas Merle: www.fundacionthomasmerle.org.ve
- www.parkswatch.org/parkprofile.php?l=eng&country=ven

The beautiful sand beaches of the Paria Peninsula are important egg-laying sites for five critically endangered marine turtle species.

Key country information	
Area	91.644 million ha
Coastline	2,800 km
Population (2007)	27.7 million
Population growth rate (2005 – 2010)	1.6%
Population density (2008)	32 Inhabitants/km²
Life expectancy (2007)	73.6 Jahre
Literacy rate (2007)	95.2%
Gross domestic product (GDP, 2007)	USD 228.1 billion
GDP/year/capita (2007)	USD 8,299
Human Development Index (2009)	0.844 (place 58 / 182)
Portion of the population living below the absolute poverty line (USD 2 per day) (2004)	10.2%
Gini coefficient of income distribution (1992-2007)	43.4

Ecological zones

The climate of Venezuela ranges from tropical-hot coastal climate to cool-temperate climate in the Andes. The rainy season prevails across large parts of the country from May to November.

- In the north: The Andes stretch along the Caribbean Sea, with fertile valleys
- In the northwest: Maracaibo Basin with Lake Maracaibo, an inland lake covering 13,000 km^2. The richest oil reserves of the country are found on the eastern coast of the lake.
- In the centre: Orinoco plains (llanos) with grassland, and the Orinoco delta with mangrove swamps
- In the southeast: Guiana Highlands with high plateaus and tributaries to the Orinoco

Venezuela counts among the 10 most species-rich countries of the world. With its diverse and fragile ecosystems, the country's biodiversity is highly vulnerable.

Environmental conditions and national policy

Environmental problems	• Loss and degradation of natural forests • Pollution of Lake Maracaibo with oil and wastewater • Urban and industrial pollution along the Caribbean coast • Soil contamination caused by oil extraction
Ecological Footprint (2006)	2.33 gha/person (global average: 2.59 gha/person)
Biocapacity (2006)	2.65 gha/person
Area with designated nature conservation status (2010)	66.3 million ha (72.4% of national territory)
Area strictly protected under the IUCN Categories I & II (2010)	12.58 ha (13.7% of national territory)

Climate change, impacts and national policy

Climate change impacts and vulnerability	• Sea-level rise, coastal erosion and a growing risk of flooding in the coastal region • Venezuela's islands and long coastline are highly vulnerable (the key economic activities of the country, such as oil extraction, tourism and fishing, all take place here) • The rapid retreat of the Andes glaciers is jeopardising potable water resources as well as water supplies for farming
Adaptation	National Climate Strategy (2005): • Promoting environmental education • Strengthening disaster risk management • Strengthening nature conservation • Improving river basin management
National greenhouse gas emissions (2006)	171.5 million t CO_2, corresponding to 6.3 t CO_2/year per capita **Main source:** Energy
Mitigation	• Fuel switching to biodiesel • Energy savings and improvement of energy efficiency • Increasing carbon storage by improving the management of the remaining natural forests

Source and further information on Venezuela's national climate strategy: http://venezuelanalysis.com/news/1210

USA
United States of America

Source: www.rockymountainclimate.org/programs_7.htm

The Yosemite National Park is one of the oldest national parks of the world. The gradual disappearance of ancient tree giants such as silver firs and tamarack pines is also due to the impacts of climate change.

US climate policy and its global impacts

From the very start of multilateral climate negotiations (see also Part 3) the US political leaders have refused to accept quantified greenhouse gas emissions reduction targets, since these are viewed as a brake on growth. The north American lobbyists fear disadvantages in competition with newly industrialised countries such as Brazil or China, which did not have to accept commitments in Kyoto. China, in turn, is using the refusal of the USA as an argument for its own rejection of binding reduction targets. Climate policy in the USA is thus widely considered to be a kind of Gordian knot that needs to be cut if international climate negotiations are to move forward.

Under the presidency of Barack Obama hope arose that a turnaround might be initiated in the USA in climate policy, too. Indeed, in June 2009 the Clean Energy and Security Act passed the House of Representatives. The act envisages a reduction in emissions by 17% by 2020 (from a 2005 baseline). Buoyed by this success, the Democrats submitted an even more ambitious bill to the Senate, providing for a reduction by 20% by 2020. President Obama originally intended to present the adopted act at the climate negotiations in Copenhagen. However, protracted debate on health reform delayed adoption of the act by the Senate. Following the election of senators in Massachusetts in January 2010, the Republicans have recaptured a senate majority and the fate of climate legislation is entirely uncertain.

Key country information	
Area	982.663 million ha
Coastline	19,924 km
Population (2007)	308.7 billion
Population growth rate (2005 – 2010)	0.6%
Population density (2008)	33 Inhabitants/km²
Life expectancy (2007)	79.1 Jahre
Literacy rate (2007)	99%
Gross domestic product (GDP, 2007)	USD 13,751.4 billion
GDP/year/capita (2007)	USD 45,592
Human Development Index (2009)	0.956 (place 13 / 182)
Portion of the population living below the national poverty line (USD 10,991 per annum) (2008) *Source: US Census Bureau:* www.census.gov/hhes/www/poverty/data/incpovhlth/2008/tables.html	12.7%
Gini coefficient of income distribution (1992-2007)	40.8

Ecological zones

Due to the country's size there are various climatic zones. Most of the country is located in the temperate zone.

- Alaska in the far north: Arctic tundra and permafrost soils
- In the northwest: temperate rainforests
- On the west coast: Rocky Mountains and other mountain chains
- In the southwest: arid lowlands with extensive deserts
- Mid-west: major river systems of the Mississippi and Missouri
- In the centre: extensive plains with semiarid climate
- On the east coast: forested areas and uplands
- In the southeast: subtropical Florida with mangrove forests
- 4,000 km from the coast: tropical islands of Hawaii

Environmental conditions and national policy

Environmental problems	• Air pollution and acid rain caused by heavy industry • Water pollution caused by pesticides and fertilisers • Limited freshwater resources in many western areas • Desertification
Ecological Footprint (2006) **Biocapacity** (2006)	9 gha/person (global average: 2.59 gha/person) 4.4 gha/person
Area with designated nature conservation status (2010)	149.8 million ha (15.8% of national territory)
Area strictly protected under the IUCN Categories I & II (2010)	55.36 million ha (5.6% of national territory)

Climate change, impacts and national policy

Climate change impacts and vulnerability	• Threats to rangeland management arising from climatic fluctuations and extreme weather events • Increase in drought in northern grasslands • Increase in the frequency and intensity of hurricanes • Threat to Florida's mangrove forests due to sea-level rise • Threat to the water regime in many regions
Adaptation	The country does not yet have a national adaptation strategy, but adaptation strategies have been adopted at the level of several states such as California and Alaska.
National greenhouse gas emissions (2006)	5,752 million t CO_2, corresponding to 19 t CO_2/year per capita **Main sources:** Transport, households and waste management
Mitigation	The USA have not signed the Kyoto Protocol. Climate protection initiatives have been adopted at the level of several states and cities: • A voluntary commitment by more than 500 cities to comply with the Kyoto reduction targets • Several states now have plans setting out effective climate change mitigation measures • California has set itself the target of reducing CO_2 emissions to the level of 1990 by 2020 (which corresponds to a reduction by 25%)

Germany
Federal Republic of Germany

course taken by negotiations. In the Climate Change Performance Index 2010 produced by the non-governmental organisation Germanwatch, Germany has even slipped from fifth to seventh place. This is mainly due to the poorer appraisal of German climate policy by experts. At the

Germany – Climate protection pioneer?

At international level, Germany likes to present itself as a climate protection pioneer. The country certainly did justice to this role at the G8 summit in Heiligendamm in 2007 and when, in the same year, it announced at the climate conference in Bali its national reduction target of 40% by 2020 from the 1990 baseline. However, at the climate conference in Copenhagen, Germany and the EU did not hold the reins, leaving it up to countries such as the USA and China to determine the

The installed capacity of wind turbines in Germany reached 25,777 megawatts (7.58% of gross electricity consumption) in 2009.
Source: Germany Wind Energy Association BWE: www.wind-energie.de

According to the definition agreed by the European Union member states, persons are considered poor who command over less than 60% of the average net income. Hence,the poverty risk threshold in Germany in 2005 was at a net annual income of USD 11.930. On that basis, 13% of the population is poor.
Source: Leben in Europa 2006

Key country information	
Area	35.705 million ha
Coastline	2,398 km
Population (2007)	82.3 million
Population growth rate (2005 – 2010)	-0.2%
Population density (2008)	230 Inhabitants/km²
Life expectancy (2007)	79.8 Jahre
Literacy rate (2007)	99%
Gross domestic product (GDP, 2007)	USD 3317.4 billion
GDP/year/capita (2007)	USD 40,324
Human Development Index (2009)	0.947 (place 22 / 182)
Portion of the population living below the national poverty line (2005)	13%
Gini coefficient of income distribution (1992-2007)	28.3

European level, the fact that Germany blocked stricter EU-wide CO_2 standards for cars and failed to implement the EU Energy Efficiency Directive had a negative effect on the experts' assessment. Moreover, several studies have shown that Germany (at least until the end of 2007) was only pursuing an actual reduction of its greenhouse gas emissions amounting to 30% by 2020 – the promised 40% were not within the scope of the policies in place. If it is to remain a climate protection pioneer, Germany will need to make substantial efforts.

Ecological zones

Germany's climate is unusually mild for its latitude. This is determined by, among other things, the Gulf Stream. Both the winter and summer are characterised by precipitation.

- In the north: flat lowlands with Atlantic flora and nutrient-poor heathland
- In the centre: upland zone with the Black Forest and Bavarian Forest reaching elevations up to 1,400 m
- In the south: Alpine foreland and Alps up to 2,962 m (Zugspitze peak)

In the Climate Change Performance Index of German Watch Germany is on the seventh place only, Brazil is at first place: www.germanwatch.org/klima/ccpi.htm

Environmental conditions and national policy

Environmental problems	• Air pollution • Forest degradation due to acid rain • Pollution of the Baltic Sea • Hazardous (nuclear) waste repositories • Landscape loss to urban sprawl, sealing of soils • 69% of terrestrial biotopes at risk due to intensive land use and interventions in the water regime • Declining quality of waters
Ecological Footprint (2006)	4 gha/person (global average: 2.59 gha/person)
Biocapacity (2006)	1.9 gha/person
Area with designated nature conservation status (2010)	11.66 million ha (31.7% of national territory)
Area strictly protected under the IUCN Categories I & II (2010)	962.048 ha (2.7% of national territory)

Climate change, impacts and national policy

Climate change impacts and vulnerability	• Increase in precipitation in the winter and decline in the summer leads to warmer, moister winters and hotter, drier summers • Disruption to the seasonal rhythm of many migratory bird species • Rising number of extreme events (flooding, heat waves) with major potential for damage to the economy
Adaptation	**Strategy for Adaptation to Climate Change** (2008): Foundation for a medium-term, step-by-step process in which the risks posed by climate change are evaluated, the need for action is identified, the corresponding goals are defined and possible adaptation measures are developed and implemented.
National greenhouse gas emissions (2006)	805 million t CO_2, corresponding to 9.7 t CO_2/year per capita **Main sources:** Energy and transport
Mitigation	• Expansion of combined heat and power generation (CHP, cogeneration) • Promotion of renewable energy sources • Improvement of energy efficiency in private buildings

Source: German Strategy for Adaptation to Climate Change (2008): http://www.bmu.de/english/climate/downloads/doc/42841.php

Czech Republic
Česká Republika

Climate change in the Šumava and Bavarian Forest National Parks

Together with the neighbouring Bavarian Forest National Park in southeast Germany, the Šumava National Park takes in one third of the largest forest area in central Europe – the Bohemian Forest (Czech: Šumava). Formerly the region was split by the 'Iron Curtain' of the political systems, but since 1999 the close and constructive cooperation between the two park administrations is regulated by a memorandum. This enables the development of long-term management strategies and sustained realisation of the conservation objectives.
In the two protected areas, more than 50% of coniferous trees have already been destroyed by acid deposition and bark beetle calamities. Peat mires and mountain pastures are also endangered. Climate change is threatening the biological diversity of the Šumava Park through declining precipitation, increasing storms, periods of drought and heat, and heavy rain events. Since phenological observations started (1974 to 2006) beech trees in the region come into leaf approx. 20 to 23 days earlier, which means a substantial extension of the vegetation period. Over the same observation period, the average temperature was found to rise by 0.5°C per decade. Minimum temperatures no longer fall as low as in the past, both in summer and winter. This has definite impacts on the vegetation. For instance, the Himalayan Balsam, which is sensitive to frost, has now spread in the park and is displacing the native flora.

Sources and further information:
- Šumava National Park: www.ckrumlov.cz/uk/region/soucas/t_napasu.htm
- Regional climate change and its impacts (in German): www.nationalpark-bayerischer-wald.de/aktuelles/presse/detailansicht.htm?tid=19061

Since the Iron Curtain fell, the Šumava National Park and the Bavarian Forest National Park have been cooperating across borders.

According to the definition agreed by the European Union member states, persons are considered poor who command over less than 60% of the average net income. Hence, the poverty risk threshold in the Czech Republic in 2005 was at a net annual income of USD 9.930.
Source: Leben in Europa 2006

Key country information

Area	7.866 million ha
Population (2007)	10.3 billion
Population growth rate (2005 – 2010)	0%
Population density (2008)	132 Inhabitants/km²
Life expectancy (2007)	76.4 Jahre
Literacy rate (2007)	99%
Gross domestic product (GDP, 2007)	175.0 billion
GDP/year/capita (2007)	USD 16,934
Human Development Index (2009)	0.903 (place 36 / 182)
Portion of the population living below the national poverty line (2005)	9%
Gini coefficient of income distribution (1992-2007)	25.8

Ecological zones

The Czech Republic is located in a climatic transitional zone between oceanic and continental influence, with cool summers and cold, wet winters.

- In the west: 'Ore Mountains' (in Czech: Krušné hory) and to the east of this the Bohemian Mountains on both sides of the Elbe river and the Bohemian-Moravian Uplands (600 to 800 m high) with unique peat mires and meadows
- In the east: western Carpathian uplands with mountain character
- In the north: 'Giant Mountains' (in Czech: Krkonoše) as a part of the Sudetes mountain system and the fertile Bohemian basin

Environmental conditions and national policy

Environmental problems	• Air and water pollution in northwest Bohemia • Forest degradation caused by acid deposition
Ecological Footprint (2006) **Biocapacity** (2006)	5.3 gha/person (global average: 2.59 gha/person) 2.6 gha/person
Area with designated nature conservation status (2010)	1.24 million ha (15.8% of national territory)
Area strictly protected under the IUCN Categories I & II (2010)	86.000 ha (1.1% of national territory)

Climate change, impacts and national policy

Climate change impacts and vulnerability	• Extension of the vegetation growth period through an earlier onset (early March) and later end (October, early November) • Increase in the frequency of heat waves • Threats to tree and forest ecosystems, above all to unstable young and old spruce monocultures, due to extreme weather conditions • Threats to harvest yields and water resources due to more frequent periods of drought and declining precipitation in the summer months • Increase in springtime flooding
Adaptation	**National Programme to Abate the Climate Change Impacts in the Czech Republic** (2008): • Landscape conservation and improved water resources management • Promotion of adaptive agricultural cultivation methods • Increase of biodiversity in forests in order to improve their resilience • Improvement of early warning systems for extreme events (e.g. heat waves) and appropriate healthcare
National greenhouse gas emissions (2006)	114.8 million t CO_2, corresponding to 11.3 t CO_2/year per capita **Main sources:** Energy and industry
Mitigation	• Expansion of renewable energies for electricity generation • Promotion of agrofuels in the transport sector

Further information on the National Programme to Abate the Climate Change Impacts in the Czech Republic (2008) is available at: http://iris.env.cz/AIS/web-pub2-en.nsf//cz/national_program_to_abate_the_climate_change_impact

Appendix

Glossary

Anchor countries

Anchor countries are an important target group of German development cooperation. They play a key role for economic and political stability in their regions and also in meeting global challenges such as climate and environmental protection, shaping the global economy and ensuring that development is sustainable, just and peaceful. The anchor countries with which Germany engages in development cooperation include China, India, Indonesia, Pakistan, Egypt, Nigeria, South Africa, Brazil and Mexico. Development cooperation with these countries is being steadily developed into strategic partnerships.
www.bmz.de/en/service/glossary/anchor_countries.html

Adaptation to climate change

Measures to alleviate the impacts of climate change on social, economic and ecological systems.

Biodiversity

Biological diversity of life on Earth, encompassing genetic diversity, species diversity and diversity of ecosystems.
www.gtz.de/en/themen/umwelt-infrastruktur/20523.htm

Biocapacity or biological capacity

In the context of the Footprint concept: The capacity of ecosystems to produce resources and to absorb waste materials generated by humans. Resources refer to biological materials used by the human economy. The biocapacity of an area (in global hectares) is calculated by multiplying the actual physical area by the yield factor and the appropriate equivalence factor.
www.footprintnetwork.org/en/index.php/GFN/page/glossary

Biosphere reserve

UNESCO's Man and the Biosphere (MAB) programme has been in existence since 1976. The concept of the biosphere reserve (BR) is explicitly aimed at the human use of resources in harmony with nature conservation. The zoning system of BR includes three zones and is designed to allow human communities to have development opportunities while achieving nature conservation objectives at the same time: In the core area no human activities are permitted. It should make up at least 3% of the total area of the reserve. The buffer zone is for the conservation of ecosystems that have only arisen through land use. Together, the buffer zone and the core area should amount to at least 20% of the total area. The transition area that surrounds the buffer zone is intended for sustainable development. All forms of land use and economic practices in this zone have to be benign to the environment and society.
http://portal.unesco.org/science/en/ev.php-URL_ID=4801&URL_DO=DO_TOPIC&URL_SECTION=201.html

BMZ

The Federal Ministry for Economic Cooperation and Development (BMZ) is responsible for planning and implementing the German federal government's development policy. It commissions various independent organisations to carry out specific projects and programmes for German development cooperation, or provides the financial resources to realise them.
www.bmz.de/en/index.html

Carbon sink

Reservoir that temporarily or permanently absorbs and stores carbon from the atmosphere. While stores are static, i.e. their capacity to bind CO_2 is already saturated, sinks are dynamic and have the potential to bind additional CO_2, i.e. in afforested areas. Currently, the most important carbon sinks found are forests, peatlands (but only those which have net growth in biomass production), and oceans.

Climate scenarios

Climate scenarios are based on projections of how high the level of emissions in the atmosphere will be in future. This is heavily dependent upon economic and technological development: in the 'business as usual' scenario, emissions will rise drastically. However, if we manage to reduce population growth, use renewable energy to meet the greater part of energy demand, and reduce demand for resources by improving technologies and changing consumption habits, emissions will

rise less steeply. For the modelling of the climate scenarios, this information is combined with global or regional climate models, and these in turn contain data on precipitation, evaporation or temperature. Computer calculations help to determine how the climate will change in specific regions in the future. Since climate modelling calculations are based on emissions scenarios and not on the conditions that are actually occurring, they contain a lot of uncertainties and thus are not precise reflections, but predictions of possible climate changes. The IPCC and other bodies therefore always work on the basis of several alternative scenarios in order to highlight the political, social, economic and scientific alternatives and options for action.

CO_2-Equivalent

Different greenhouse gases have different effects on the process of climate change, which means that they are not directly comparable. For this reason the Intergovernmental Panel on Climate Change has developed a method for estimating their impacts in terms of CO_2–Equivalents. Over the course of 100 years, one tonne of methane has the same effect on the climate as 23 t CO_2, and one tonne of nitrous oxide the same impact as 296 t CO_2. Similarly, the sequestration of carbon can be stated in CO_2-equivalents: 1 tonne of carbon is equivalent to 3.67 t CO_2.

Convention on Biological Diversity (CBD)

International legally-binding treaty, adopted in Rio de Janeiro in 1992, with three main goals: conservation of biodiversity; sustainable use of biodiversity; fair and equitable sharing of the benefits arising from the use of genetic resources. Its overall objective is to encourage actions which will lead to a sustainable future. Up to now, 193 parties (192 countries and the EU) have joined the Convention. Germany as a signatory party has committed to not only conserve the country's own biodiversity but also to support developing countries in realising the necessary steps to do so.
www.cbd.int

Copenhagen Accord

Unofficial final document from the UN Climate Conference in Copenhagen. In order to round off the failure of the Copenhagen negotiations with a positive outcome and to document at least the minimal consensus among the delegations, the Accord was drafted at the last minute by China and the USA. It contains declarations recognising the necessity of undertaking mitigation efforts and setting out measures for adaptation to climate change. The Copenhagen Accord was signed by 26 industrialised and developing countries, but the Secretariat of the Convention only 'took note' of it, so it did not formally gain official or political approval and therefore has no binding force.

Desertification

Degradation of land in arid and dry sub-humid areas due to various factors, including climatic variations and human activities. Desertification results mainly from man-made activities: it is principally caused by overgrazing, overusing of groundwater and diversion of water from rivers for human consumption and industrial use. Therefore it is more appropriate to use the synonym 'land degradation'. The United Nations Convention to Combat Desertification describes the causes and consequences and sets out goals and objectives for globally coordinated action.
www.unccd.int

Developing countries

There is no standard definition or internationally binding list of 'developing countries'. In the literature and the media, the designation 'developing country' is applied to countries where low per-capita income is accompanied by an inadequate food supply, poor health care for broad sections of the population and limited educational opportunities. Official Development Assistance (ODA) is based on the country list of the Development Assistance Committee (DAC) of the OECD (see below).

Ecological footprint

The ecological footprint is a measure of human demand on the Earth's ecosystems. It compares human demand with planet Earth's ecological capacity to regenerate. It represents the amount of biologically productive land and sea area needed to regenerate the resources a human population consumes and to absorb and render harmless the corresponding waste.
www.footprintnetwork.org

Ecosystem

According to Article 2 of the Convention on Biological Diversity (CBD) an ecosystem is defined as a "dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit".
Text of the Convention on Biological Diversity:
www.cbd.int/convention/convention.shtml

Endemism

The occurrence of an animal or plant species in one restricted area as a result of geological and ecological changes over the course of time. High densities of endemism are characteristically found on islands or in inaccessible mountain valleys.

Evapotranspiration

Refers to the evaporation of water from plants, animals and the soil surface.

Financial Cooperation

is carried out via the Federal Republic of Germany's development bank, KfW Entwicklungsbank. It supports investments and project-related advisory services for the development of social and economic infrastructure, trade and industry, and environmental and resource protection in selected priority regions and countries.
www.kfw.de

Gini coefficient (GC)

Measure of a country or region's personal income distribution. The GC lies between 0 (absolutely equal distribution) and 100 (maximum inequality of distribution).
http://hdr.undp.org/en/statistics

Global Environment Facility (GEF)

The Global Environment Facility is an international financing mechanism to support the implementation of the Convention on Biological Diversity (CBD) and the Framework Convention on Climate Change (UNFCCC) in developing countries and emerging nations. GEF projects are administered by UNEP, UNDP and the World Bank. Over USD 8.8 billion have already been redistributed through this mechanism.
www.thegef.org

Greenhouse gases

Gases in the atmosphere which absorb the long-wave radiation reflected from the Earth's surface. They cause warming of the air. The United Nations Framework Convention on Climate Change (UNFCCC) targets six gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O, also known as 'laughing gas'), partially halogenated hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6). The greenhouse gases with the greatest impact are carbon dioxide (CO_2) from stationary and mobile combustion processes, methane (CH_4) from animal husbandry, fuel transmission and landfill emissions, and nitrous oxide (N_2O) from agriculture, industrial processes and traffic. These three gases also occur naturally in the atmosphere. Fluorinated gases, which are used as refrigerants and propellants, practically never occur in nature and are almost exclusively produced by human society. They have a very high global warming potential (up to 20,000 times higher than CO_2).

Gross domestic product (GDP)

Measure of a country's overall economic output. It is the total market value of all the goods and services produced within a country.
www.ucatlas.ucsc.edu/glossary.html

GTZ

Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH – German Technical Cooperation is a federal owned organisation. It primarily carries out international cooperation projects for sustainable development under commission from the Federal Ministry for Economic Cooperation and Development (BMZ). GTZ engages in knowledge transfer in technical, organisational and economic fields, and acts as a mediator in social conflicts of interest.
www.gtz.de

Human Development Index (HDI)

Indicator for comparing the status of human development in different countries. Factors included in the HDI are life expectancy, the literacy rate and real per-capita purchasing power. A country's HDI can lie between 1 (very high development) and 0 (low development).
http://hdr.undp.org/en/statistics/

IUCN categories

The International Union for Conservation of Nature (IUCN) has developed a system of protected area categories, taking account of their different conservation objectives and permitted use provisions. This classification system is a worldwide reference framework which serves as a guideline for national legislation in numerous countries.
www.iucn.org

Kyoto Protocol

The Kyoto Protocol was agreed by the Parties to the Framework Convention on Climate Change in 1997 in the Japanese city of Kyoto. It entered into force in 2005, and for the first commitment period from 2008 to 2012 it sets binding targets for the "Annex I countries" to reduce their emissions of the six most important greenhouse gases (an average of 5.2% in relation to the 1990 level). "Non-Annex I" states do not have to comply with reduction targets during this period.
http://unfccc.int/kyoto_protocol/items/2830.php

Least Developed Countries (LDC)

The criteria for classifying a country as an LDC are set by a committee of the United Nations Economic and Social Council (ECOSOC). The final decision is made by the General Assembly of the United Nations. The relevant criteria for this classification include gross domestic product (GDP); the 'Human Assets Index' (HAI), which is essentially based on health and education indicators; industrial production and the service sector as a proportion of GDP; the export orientation of a country's economy, and its population figures. The LDCs benefit from substantially more favourable conditions in their cooperation with the United Nations than the other developing countries.

Megadiversity

The vast majority of meagdiverse countries (with a species abundance of more than 5,000 higher plants per 10,000 km^2) are situated in the tropics and subtropics, and have extremely fragile ecosystems. In the run-up to the World Summit for Sustainable Development in 2002, the environment ministers of 12 megadiverse countries (Brazil, China, Colombia, Costa Rica, Ecuador, India, Indonesia, Kenya, Mexico, Peru, Venezuela and South Africa) adopted the Cancún Declaration. Their aim was to draw attention to the existential importance of biodiversity for almost 50% of the world's population, since 70% of the world's biodiversity is found in their national territories. To date, five additional countries have signed up to this declaration: the Democratic Republic of Congo, Bolivia, Madagascar, the Philippines and Malaysia.
www.lmmc.nic.in

Mitigation of climate change

Measures which encompass all activities that minimise or prevent the emission of carbon dioxide and other greenhouse gases.

Montreal Protocol

The Montreal Protocol on Substances that Deplete the Ozone Layer is an international treaty dating from 1987, when it was resolved initially to freeze and ultimately to put a complete stop to the production of chlorofluorocarbons (CFCs). CFCs are chemicals that contain chlorine and bromine which destroy stratospheric ozone.
http://ozone.unep.org

National Park (IUCN category II)

A protected area managed mainly for ecosystem protection and recreation. It represents a natural area of land and / or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.
www.iucn.org/about/work/programmes/pa/pa_products/wcpa_categories/pa_categoryii/

Newly industrialised countries (NICs)

There is no standard definition or internationally binding list of 'newly industrialised countries' (NICs). The term refers to a group of larger economies with medium incomes, which are undergoing rapid industrialisation, such as Brazil or China. They are characterised by a fast growth in their economic strength, and a corresponding leap in per-capita income.

OECD countries

The aim of the OECD (Organisation for Economic Cooperation and Development) is to contribute to the development of the global economy through economic cooperation among its 30 member states (almost all of which are industrialized nations) and through dialogue with other countries on the development of the global economy. All members express their commitment to democracy and a free market economy. A key role is played by the Development Assistance Committee (DAC). The DAC determines which development contributions are recognised as Official Development Assistance (ODA) and which countries are classified as developing countries.
www.oecd.org

Permafrost

Soil or sediment that remains at a temperature at or below 0°C for at least two years in succession is considered to be permanently frozen. Permafrost occurs both in the Arctic and Antarctic regions and worldwide in high mountain ranges. Permafrost affects almost one-quarter of the global land area and the overwhelming majority of it – some 23 million km^2– is in the northern hemisphere. Large areas of Russia, Canada, Alaska and western parts of China are permanently frozen.

Plankton

All plants (Phytoplankton) and animals (Zooplankton) that are drifting passively in water and can only control ascending and downward motions. Phytoplankton mainly consists of diatom, a small single-cell alga. It provides a crucial source of food to many sea dwellers and it stores large amounts of carbon.

Protected area

An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.
www.iucn.org

Ramsar wetland site

The "Convention on Wetlands of International Importance especially as Waterfowl Habitat" was concluded in 1971 in the Iranian city of Ramsar. By acceding to the Ramsar Convention, the member states (which numbered 159 in 2010) commit to designating at least one wetland within their territory as a 'Wetland of International Importance', to take steps to maintain and develop this site and, if possible, further sites. Originally, the objective was the conservation of all wetlands as the habitat of water birds. In recent years, the objectives have broadened, now covering the comprehensive protection of wetlands as important ecosystems for the maintenance of biodiversity.
www.ramsar.org

Renewable resources

Collective term for biomass-based materials and their use in energy production (agrofuels, biofuels).

Sustainability

Sustainability or sustainable development means meeting the needs of the present without compromising the ability of future generations to meet their own needs. (Brundtland 1987). Sustainability should be the basis of all political decisions concerning the treatment of natural, societal and technical resources. Since the United Nations Earth Summit in Rio in 1992, sustainability has been accepted as a global guiding principle, to be put into practice as set out in Agenda 21, which was also adopted in Rio.
www.gtz.de/en/top-themen/12347.htm

Technical Cooperation

By transferring technical, economic and organisational knowledge and skills, it aims to strengthen the capacity of individuals and organisations in partner countries of development cooperation. These inputs, which in the case of Germany are mainly administered through GTZ, are contributions to the partners' projects, and supplement the contributions they make themselves.
www.bmz.de/en

Vulnerability

The degree of susceptibility of societies and ecosystems to risks. In this brochure, the term refers to vulnerability to the impacts of climate change. The more severely a country is exposed to climate risks and the lower its capacity to adapt to climate-related changes, the greater that country's vulnerability. Those most vulnerable are those who are least able to adapt to the consequences, because they lack technological and financial capabilities: poor countries and poor people in developing countries.
www.gtz.de/en/themen/umwelt-infrastruktur/umweltpolitik/4169.htm

Abbreviations

ABS	Access and Benefit Sharing
ARPA	Áreas Protegidas da Amazônia – Brazilian Amazonas Protection Programme
BMU	Bundesministeriums für Umwelt, Naturschutz und Reaktorsicherheit (German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety)
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (German Federal Ministry for Economic Cooperation and Development)
BR	Biosphere Reserve
CBD	(United Nations) Convention on Biological Diversity
BUND	Bund für Umwelt und Naturschutz (German Section of Friend of the Earth International)
CCD	(United Nations) Convention to Combat Desertification
CDM	Clean Development Mechanism
CO_2	Carbon Dioxide
COP	Conference of the Parties
COMIFAC	Commission des Forêts d'Afrique Centrale (Central Africa Forest Commission)
DAC	Development Assistance Committee
DBU	Deutsche Bundesstiftung Umwelt (German Environmental Foundation)
DED	Deutscher Entwicklungsdienst (German Development Service)
EU	European Union
EUETS	European Union Emission Trading System
GEF	Global Environmental Facility
gha	global hectare
GC	Gini coefficient
GDP	Gross Domestic Product
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation)
ha	hectare
HDI	Human Development Index
HDR	Human Development Report
IPBES	Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services
ICI	International Climate Protection Initiative of the BMU
IPCC	Intergovernmental Panel on Climate Change
IISD	International Institute for Sustainable Development
InWEnt	Internationale Weiterbildung und Entwicklung GmbH (Capacity Building International)
IUCN	International Union for Conservation of Nature
JI	Joint implementation
JLG	Joint Liaison Group
KfW	KfW Entwicklungsbank (KfW Development Bank)
LULUCF	Land-use, land-use change and forestry
LDC	Least Developed Countries
MAB	Man and the Biosphere – UNESCO Programme
MDG	Millennium Development Goals
NIC	Newly Industrialised Country
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
PPG7	Pilot Program to Conserve the Brazilian Rain
ppm	parts per million
RAMSAR	Convention on Wetlands of International Importance
REDD	Reducing Emissions from Deforestation and Forest Degradation
SIDS	Small Island Development States
SPC	Secretariat of the Pacific Community
TEEB	The Economics of Ecosystems and Biodiversity
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
USD	US-Dollar
WDPA	World Database on Protected Areas

WMO	World Meteorological Organisation
WWF	World Wide Fund for Nature
WRI	World Resource Institute
WSSD	World Summit on Sustainable Development, 2002 in Johannesburg

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BMZ

German Federal Ministry for Economic Cooperation and Development
www.bmz.de

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IPBES

Intergovernmental Science Policy Platform on

Biodiversity and Ecosystem Services
www.ipbes.net

IUCN

International Union for Conservation of Nature
www.iucn.org

KfW Entwicklungsbank

KFW development bank
www.kfw.de

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www.bmu.de

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BMZ

German Federal Ministry for Economic Cooperation and Development
www.bmz.de/en/index.html

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Global Footprint Network

www.footprintnetwork.org
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www.footprintnetwork.org/gfn_sub.php?content=national_footprints
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www.wwf.org/
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http://assets.panda.org/downloads/living_planet_report_2008.pdf
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International Wilderness Camp

Illustrations of the traditional dwellings in the Wilderness Camp

www.wildniscamp.de/main/laenderhuetten/

International Youth Summit 'Go 4 Biodiv'

www.go4biodiv.org
- Declaration
http://go4biodiv.org/home/press/declaration/
- Photo brochure „Unity in Diversity"
www.go4biodiv.org/home/outcomes/unity-in-diversity-broschure

Ecological Footprint

Beyers, Bert; Kus, Barbara; Amend, Thora & Andrea Fleischhauer (2010)

A Big Foot on a Small Planet? Accounting with the Ecological Footprint. Succeeding in a world with growing resource constrains. In: Sustainability has many faces, Nr. 10. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, Eschborn.

Educational Material

Allianz Umweltstiftung (2007)

Information on the Topic of "Climate": Fundamentals, History and Projections
www.allianz-umweltstiftung.de/publikationen/wissen/klima_eng/index.html

Atmospheric, Climate & Environment Information Programme

Information Webpage on climate change. Includes

comprehensive fact sheets for Great Britain's key stages 2 - 4 on climate change and other related topics.
www.ace.mmu.ac.uk/resources.html

BMU

- Educational resources on biodiversity and climate change/climate policy (secondary levels I/II): these resources are based on the teaching materials for teachers and are ideal for use as student workbooks for class teaching. (German, Englisch and French Language)
  www.bmu.de/publikationen/bildungsservice/bildungsmaterialien/sekundarstufe/doc/6773.php

Climate Challenge

Climate Challenge is a single-player game about climate change, playable for free on the BBC website.
http://www.gamesforchange.org/main/gameprof/677

Conservation and Development

Material on the topic of conservation and development – for educational and professional use
www.conservation-development.net

- Series ‚Sustainability Has Many Faces'
  www.conservation-development.net/?L=2&ds=247

Environmental Memoirs

www.swin.edu.au/ncs/environmentalmemoirs

Friends of the Earth Shout about packs

Shout about is Friends of the Earth's annual activity project for 11 - 13 years olds who want to get active on environmental issues.
www.foe.co.uk/learning/educators/resource_index.html#Secondary

Met Office UK

The webseite of the UK Met Offivve contains fact sheets, case studies and quizzes for all ages and for teachers on weather and climate change.
http://www.metoffice.gov.uk/education/

Global Learning

- Education for Sustainable Development Toolkit: Link list for ESD
  www.esdtoolkit.org/resources/web_esd.htm
- UNESCO Multimedia Teacher Education Programme
  www.unesco.org/education/tlsf/

Country Information (general)

Auswärtiges Amt

German Federal Foreign Office
Travel information by countries (German)
www.auswaertiges-amt.de/diplo/de/LaenderReiseinformationen.jsp

CBD

Country Profiles
www.cbd.int/countries

CIA World Factbook

Country Profiles
www.cia.gov/library/publications/the-world-factbook/

Global Environmental Facility

GEF Country Profiles
www.gefonline.org/Country/CountryProfile.cfm

InWEnt

County information website (German)
http://liportal.inwent.org

OECD

Net Official Development Assistance in 2006
www.oecd.org/dataoecd/14/5/38354517.pdf

United Nations Development Programme

UNDP
www.undp.org

- Human Development Report (HDR) 2007/2008:
- Country Factsheets
  http://hdr.undp.org/en/countries
- Interactive statistics and country reviews from the UN
  http://hdr.undp.org/en/statistics

United Nations Secretariat (2008)

World Population Prospects: The 2008 Revision
http://esa.un.org/unpp

WDPA

World Data Bank on Protected Areas
www.wdpa.org

World Bank

- World Development Indicators Database
  http://data.worldbank.org/data-catalog
- GNI per capita 2006, Atlas method and PPP
  http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD

World recipes

www.world-recipes.info/

Country Profiles

Benin

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  http://benin.ded.de/
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Pendjari National Park

www.pendjari.net

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  www.unesco.org/mabdb/br/brdir/directory/biores.asp?code=BEN+01&mode=all
- WDPA
  http://sea.unep-wcmc.org/sites/pa/0289p.htm

Brazil

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  http://www.dedbrasil.org.br/
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- WDPA http://sea.unep-wcmc.org/sites/pa/0152q.htm

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Conguillío National Park

www.gochile.cl/html_s/Conguillio/Conguillio.asp

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- UNESCO-MAB Biosphere Reserves Directory: Biosphere Reserve Information Chile, Araucarias www.unesco.org/mabdb/br/brdir/directory/biores.asp?mode=all&code=CHI+06
- WDPA http://sea.unep-wcmc.org/sites/pa/0087q.htm

Czech Republic

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www.ckrumlov.cz/uk/region/soucas/t_napasu.htm

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Germany

- Bundesverband Windenergie e.V. www.wind-energie.de
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Paria National Park

www.parkswatch.org/parkprofile.php?l=eng&country=ven&park=ppnp&page=con

- Thomas Merle Foundation
  www.fundacionthomasmerle.org.ve
- WDPA
  http://sea.unep-wcmc.org/sites/pa/0442q.htm

Viet Nam

- B-Day at Phong Nha-Ke Bang National Park
  www.biodiversity-day.info/2010-vietnam.html
- DED in Viet Nam
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- GTZ in Viet Nam
  www.gtz.de/vietnam
- GTZ projects on coastal area management in the Mekong Delta
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Contents of the CD "Sustainability Has Many Faces"

All material of CD1 (brochures 1 to 4) and CD2 (brochures 5 to 9) can also be found on the web: www.conservation-development.net/?L=2&ds=248

5 Innovative cooking stoves and ancient spirits

The brochure (pdf-file, French/German)

Material presented

Madagascar-Memory (flash format computer game)

Photo gallery

Links und literature as well as selected topical pdf files

6 User Rights for Pastoralists and Fishermen

The brochure (pdf-file, English/German)

The new pastoral code (Code pastoral) in fable and poetic format (pdf, Arabic)

Photo gallery

Links und literature as well as selected topical pdf files

7 Who Protects What for Whom?

The brochure (pdf-file, German)

Exhibitions

Placards about the millennium development goals

Amazon River - Memory (flash format computer game)

Photo gallery

Links and literature as well as selected topical pdf files

8 Nature and Mankind facing Climate Change

The brochure (pdf-file, German 1. edition; German/English 2. edition)

Country profiles of Benin, Brazil, Chile, Germany, Madagascar, Mongolia, Russia, Czech Republic, USA, Venezuala, Vietnam

Traditional accommodation in the international wilderness camp / Bavarian Forest National Park

Collected didactic suggestions, ideas and activities to the topic week on climate change

Statements from climate change witnesses in their respective languages and in German

Educational materials on the topics of climate change and biodiversity (in German)

Environmental Memoirs

Links and literature as well as selected topical pdf files

9 Energy is Life

The brochure (pdf-file, German)

Material presented

Photo gallery

Links and literature as well as selected topical pdf files

Exclusion of liability

With its ruling of 12 May 1998 - 312 O 85/98 - "liability for links" Hamburg Regional Court held that anyone including a link may also share liability for the content of the linked page. This can only be avoided by explicitly disclaiming responsibility for the content in question. We hereby disclaim responsibility for the content of all the web pages mentioned or linked in the present text, and of any further links included there, which we do not adopt as our own.

Development Needs Diversity
People, natural resources and international cooperation

Nature Conservation Is Fun
Protected area management and environmental communication

Use it or Lose it
Hunter tourism and game breeding for conservation and development

Land Rights Are Human Rights
Win-win strategies for sustainable nature conservation

Innovative cooking stoves and ancient spirits
Conserving nature at the interface between energy efficiency and traditional customs

User Rights for Pastoralists and Fishermen
Agreements based on traditional and modern law

Who Protects What for Whom?
Participation and governance for nature conservation and development

Nature and Mankind facing Climate Change
One planet with many people – what's the future?

Energy is Life
Sustainable development and poverty alleviation need energy

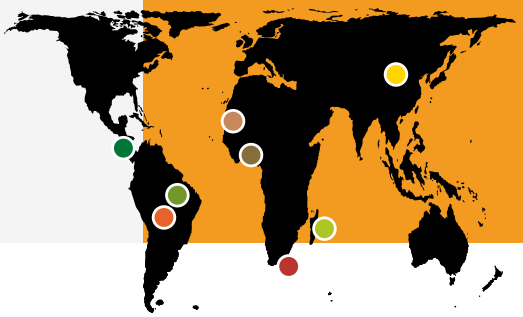
A Big Foot on a Small Planet?
Accounting with the Ecological Footprint

Mountain Gods and Wild Rice
Agrobiodiversity as the Basis of Livelihood

SUSTAINABILITY HAS MANY FACES

A brochure series with accompanying materials on development cooperation for the UN Decade of Education for Sustainable Development

Conserving biological and cultural diversity prepares the ground for human development. The examples included in this series present various "faces" of sustainability, offering ideas, contributions and suggestions on education for sustainable development both in and out of school (UN Decade 2005-2014). They show how people in countries with which we are less familiar find ways of improving their living conditions, while at the same time learning to protect their environment. In these settings, development cooperation means helping facilitate difficult economic and social change processes.



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