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

SUSTAINABILITY HAS MANY FACES

A Big Foot on a Small Planet?

Accounting with the Ecological Footprint

Succeeding in a world with growing resource constraints

gtz

On behalf of
Federal Ministry
for Economic Cooperation
and Development

Global Footprint Network
Advancing the Science of Sustainability

Nationalpark
Bayerischer Wald

The following brochures have been published in the series "Sustainability Has Many Faces":

1 Development needs Diversity
People, natural resources and international cooperation. Contributions from the countries of the south.
Editors: Stefanie Eißing and Dr. Thora Amend
Languages: German, English, French, Spanish

2 Nature Conservation is Fun
Protected area management and environmental communication. Contributions from Panama.
Editors: Dr. Thora Amend and Stefanie Eißing
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3 Use it or lose it
Hunter tourism and game breeding for conservation and development. Contributions from Benin.
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in preparation

11 Mountain Gods and Wild Rice
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A Big Foot on a Small Planet?

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Contents

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 Development'. 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 Footprint Brochure

Wherever we may live, whether in a village or in the middle of a city, the provision of food, clothing, energy and the building materials for homes and schools – in short, our whole life – depends upon the sustenance which the ecosystems of the Earth provide us. The Ecological Footprint is a way of measuring this natural capital. Ecological Footprint data show that we are consuming nature's services (for producing resources and absorbing carbon dioxide emissions) at a rate considerably faster than what nature can sustainably produce.

Footprint data also make global differences clearer and more tangible. If we compare the Ecological Footprint of an average resident of Germany, for example, with that of an average resident of Madagascar who uses one fifth of the resources, it raises many questions. How do lifestyles in these countries differ? What does it say about the global economy when we have these disparities? But also, very simply, how do we want to live? What is important to us?

The Ecological Footprint provides a guiding framework for sustainable development, since the availability of natural resources is increasingly becoming a decisive factor for economic success. Thus Global Footprint Network, which is working to advance use of the Ecological Footprint at all levels of decision-making, is committed to increasing the use of the tool in development cooperation. The Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) already uses the Footprint intensively in the field of education for sustainable development. At the International Wilderness Camp at the Falkenstein, a collaborative project of the Bavarian Forest National Park, GTZ and other organizations, it has become a fixture of the educational program. One of many unique features of the camp includes its collection of household dwellings typical to its partner countries throughout the world. Through this hands-on feature, global differences can be experienced first hand.

In addition to building new partnerships, there is an opportunity in development cooperation for establishing the Footprint concept in economic and political consulting activities and in designing strategies. Footprint data provide valuable indicators for governance of a country or community: How should intervention and investment priorities be set so as to reverse threatening trends? What do resource demand and natural capital mean for a country's stability and its ability to provide for the well-being of its people?

More and more organizations and institutions are using the Footprint as an indicator in reporting systems – from the Secretariat of the Convention on Biological Diversity (SCBD), to various UN institutions, the EU, and Switzerland right down to the Federal State of Bavaria. The ability of the tool to reduce complexity makes its application in global cooperation very helpful and, ultimately, necessary.

The participants in the International Youth Summit "Go 4 BioDiv" came right to the point in their declaration: "We have only this one planet". Humanity must adapt its resource consumption to what the Earth can supply. Otherwise, we undermine the potential for our own well-being as well as that of future generations.

Dr. Stephan Paulus

Director "Environment and Climate Change" of the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH

Karl-Friedrich Sinner

Director of the Bavarian Forest National Park

Dr. Mathis Wackernagel

Co-creator of the Ecological Footprint concept and President of *Global Footprint Network*

Part 1
Introduction, overview, structure

Ecological accounting

Humanity relies on the planet's ecological services to provide basic needs – food, clothing and shelter. But how do we know how much we're using, and how much we have?

The Ecological Footprint is a resource accounting tool that measures how much nature we have, how much we use, and who uses what. Similar to a bank statement, the Footprint can determine whether we are living within our ecological budget or consuming nature's resources faster than the planet can renew them. It calculates how much land and water area (i.e., forests, agricultural land, rivers, etc.) a human population requires to produce the resources it uses and to absorb its wastes, using prevailing technology. Nature's ability to provide these services is called biocapacity. It is the source of clean water, grain for our bread, lumber for our houses, vegetable or animal fibers for making our clothes. Ultimately, the Footprint can account for all human activities by answering the question: How much nature does it take? This tool can be used for individuals, as well as for businesses, cities, countries and humanity as a whole.

The Ecological Footprint describes through scientific principles the supply of natural capital and humanity's demand on it – this is arguably the greatest strength of this tool. It can reduce human activities, whether they be food, travel or computer games, to a single number: the Footprint. This picture is extremely powerful. Whether it is applied to daily life, in a city council, in corporate boardrooms or in international negotiations, the Footprint enables discussion about resource consumption and alternatives. Ecological accounting with the Footprint gives us a clear perspective. After all, one can also overdraw one's nature account by felling trees at a faster rate than they can regrow, catching more fish than get restocked, or pumping more water than nature can replenish. Similarly, people can continue to draw on credit, spending more money than they earn. But debts pile up, and at some point there is an end to this, as we have seen from the recent global economic crisis.

Money has entered a new dimension in this crisis: bailouts for banks, stimulus packages for a tail-spinning economy, national budgets drifting further and further into debt. The crisis has long passed millions of Dollars or Euros, and now involves billions or even trillions. No one knows exactly when – or how – it will play out.

When faced with the unimaginable sums that flicker across our television and computer screens day after day, many people forget that money is ultimately only a symbol which secures our access

Healthy ecosystems, and, therefore, our "natural capital" are becoming scarcer and more valuable. They are the source of all natural goods and ensure the availability of drinking water, clean air, building material and energy supplies. They are the central foundation for human and non-human life.

to real values, such as human capital (proficiencies, manpower, knowledge), natural capital (resources, ecosystem services) and to physical capital (housing, factories, rail lines). Human capital – and the demands on nature that come with it – continue to grow, while natural capital is becoming increasingly scarce and, therefore, more critical. The Footprint gives us a tool to describe, assess and manage these natural riches and to safeguard our consumption of them.

The Footprint answers the question for individuals, businesses, cities, countries and for humanity: "How large is your appetite for natural capital?"

The 21st Century already has some challenges in store for us, as well as for our children and grandchildren. We currently (2010) use over 50 percent more ecological services than the Earth can renew. A growing population – which, according to official estimates, could reach between 9 and 10 billion by the middle of the century – is increasing the demand for resources. Additionally, there is the fact that the inhabitants of emerging countries such as China, Brazil, Indonesia and India are increasingly emulating resource-consuming Western lifestyles, which are unsustainable.
The situation is serious. It is certainly conceivable that climate problems will develop into a major threat to economic stability or that fisheries will be further depleted and eventually collapse altogether. These are but two examples. A moralistic dialogue between hope and terror makes little sense, however, in solving this challenge. In contrast, the Footprint takes a scientific approach by showing us where we stand. When businesses, cities or countries recognize how much biocapacity they need and how much they have at their disposal, they are able to make more informed decisions.

If current trends continue, things will definitely not get easier. We are entering a period beyond oil scarcity: most resources humanity depends on might get tighter, including food and water. Resource distribution and good stewardship of natural assets will become a central challenge of the 21st Century. Countries and cities that prepare themselves for resource scarcity will be the winners. In contrast, countries and regions that possess scant natural resources and lack the economic resources will eventually face serious threats to their well-being, particularly if they have not curbed their resource dependence.
Footprint analyses open new horizons and approaches to problem-solving. Against this backdrop the tool is, above all, useful for development cooperation. The Footprint is exceptionally effective in building an understanding of the relevance of ecological limits, as well as instrumental for educational work. For example, when students compare the average per capita Footprint of someone living in Germany or the USA to that of someone living in Mali or India, there will be inevitable questions and in-depth discussions. For many, the complex interactions emerging from globalization are made comprehensible for the first time via the Footprint.
Footprint accounting is about charting a course for governments, corporations, cities and individuals. It is about priorities and, ultimately, about questions of how to live well. Following the guideline of "living well within the means of one planet", the Footprint does not divide the world into good and evil, and does not moralize. Instead, it simply informs us about who is consuming how much of the planet's ecological services, and how much is available where. This view of the world has proven to be sufficient for raising central questions and sparking the conversations that are needed to reverse current trends.

> **"The Ecological Footprint is one of the most important environmental concepts in currency today, with virtually unlimited educational and practical implications."**
>
> **Edward O. Wilson**, Evolutionary biologist and Harvard professor emeritus

Structure of the brochure

The following **Part 2** introduces the concept and scientific methods of the Ecological Footprint. Terms such as biocapacity, global hectare, land types, Carbon Footprint and overshoot are explained through illustrative examples, as is the difference between production and consumption Footprints. The questions of how countries can run ecological deficits or have ecological remainders, or on what date the annual Overshoot Day falls are also answered. Brief historical sections clarify why our planet's resources are becoming increasingly scarce, and how the idea came about to develop a scientifically based method for comparing the supply of ecological services, the so called "biocapacity", with demand for it – the Footprint.

The essence is quite simple: "Demand" as calculated in the Footprint reflects how much of the biosphere's regenerative capacity is used by human activities. When measuring how much is available, we also need to consider that this capacity needs to be shared with wild species. The less people leave for other species, the less the prospect for healthy biodiversity. But the Footprint does not make that choice for us. It just shows how much we take, and how much we leave. A brief introduction to these choices are available in the included documentary film "The Footprint – Large Demands on a Small Planet" with Dr. Mathis Wackernagel, co-creator of the Ecological Footprint.

The utility of the Footprint at the individual, policy and economic levels is subsequently demonstrated through case studies. The diverse benefits of the tool are illustrated with examples ranging from calculating a city's Footprint, such as Berlin, to measuring the resource consumption of an Australian shopping center, or to using the Footprint as a framework for global development discussions.

The Footprint's "big picture" view is presented in the chapter about the planet's condition. What are the trends for inhabitants of high-, medium-, or low-income countries? Which countries are running ecological deficits, which ones have ecological remainders? The chapter also shows how the world's Ecological Footprint has changed since 1961, the year when the United Nations first published complete data records for more than 170 countries, and how international trade of biocapacity impacts the Footprint of both the producing and the consuming country. The Footprint data presented in this document are, if not noted otherwise, consumption Footprints from 2005. An interview with Mathis Wackernagel rounds out chapter 2.

"We are the link between the older generation and the future generation. With human demand for natural resources constantly growing, we are faced with the daunting task of ensuring the survival of mankind without compromising that of biodiversity.

Monika Shikongo from Namibia, Ranger and "Go 4 BioDiv" participant

Participants in the International Youth Summit "Go 4 BioDiv", who engaged deeply with the Ecological Footprint, read their Declaration at the International Wilderness Camp.

Part 3 of the brochure examines the relevance of the Ecological Footprint to development cooperation. We will look behind the scenes into the working world of a German Gesellschaft für Technische Zusammenarbeit (GTZ) staff member, and explore future trends of the Footprint. This is relevant not only for collaborations between GTZ and governments of partner countries, but also for assessing the effectiveness of projects themselves. The linkage of Footprint tools, which overlay a country's resource consumption with its human development (as measured for instance with the United Nation's Human Development Index) opens interesting windows into the development debate.

The Footprint is also an excellent learning tool for sustainable development. **Part 4** shows how GTZ is using it in its public outreach and describes some of its uses in German schools and NGOs. It also features its utility for the International Youth Summit "Go 4 BioDiv", held in the International Wilderness Camp in the Bavarian Forest National Park and in Bonn. There, the Footprint catalyzed discussions among the participants, and stimulated workshops, artistic work, and various creative elements of the summit. These ideas have stayed alive and will be taken up again in "Go 4 BioDiv" events during the upcoming UN biodiversity conference of the signatory parties in Japan.

A general perspective follows (**Part 5**), which reveals the urgency for individuals, communities, local and national governments, as well as industries to take action. The section also explores exciting prospects and solution strategies. The background information in **Part 6** provides comprehensive Footprint data, ecological balance sheets and trends for some of the countries represented in the International Youth Summit "Go 4 BioDiv", as well as for Japan and the United States. In conclusion, after a comparison of China with Germany, there is extensive educational material on the resource situation of "Go 4 BioDiv" participants' countries. The **Appendix** contains, in addition to a glossary and bibliography, a summary of specific Footprint terminology.

This multimedia brochure employs a mixture of examples, interviews, personal descriptions, information boxes (framed in grey), overview tables, educational materials (highlighted with the color of each chapter) and many teaching ideas to help bring the material alive (framed in the color of the particular chapter). Quotations from experts and well-known individuals representing science, politics and NGOs, as well as those from young participants in the International Youth Summit "Go 4 BioDiv" are dispersed throughout (framed in orange). The latter report, among other things, on their use of the Footprint tools in their home countries. Audiovisual materials in the accompanying DVD serve as content-rich, inviting entry points into the extensive topic of the Ecological Footprint. In addition to an array of text documents, for a deeper appreciation of the brochure's material photos of the Youth Summit, and ways to use the Footprint in various workshops, are made available.

The brochure was conceived primarily for German students in collaboration between GTZ, the Bavarian Forest National Park and Global Footprint Network. It is geared toward high school teachers and educators in the field of environmental and developmental studies, or group leaders of extracurricular activities on global learning for sustainable development. Because of this German focus, the accompanying DVD also includes plenty of German language material. Despite this fact, the brochure should also be valuable to non-German speakers interested in the Ecological Footprint and its relevance to poverty alleviation, international relations, sustainable development and human well-being.

Part 2
Ecological accounting

How much nature does it cost?

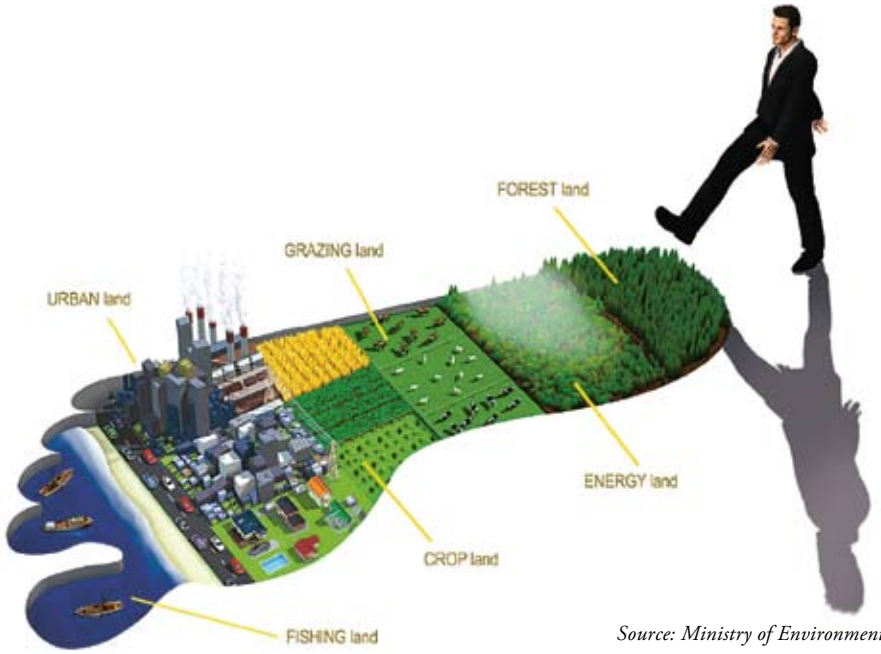
Humanity is utterly dependent upon nature. Nature supplies what we need to run our economies and provides untold ecological services, but in order for our economy to be 'fit for the future', in other words, 'sustainable,' we can't use natural resources faster than nature can regenerate them, nor can we create more waste than nature can absorb and process. Ultimately, overuse can only be temporary.

The Ecological Footprint works like a bank statement, documenting whether we are living within our ecological budget or not. It allows us to measure the land area necessary to supply us with what we need to support our lifestyles, from the clothes we wear and the food we eat, to how we travel from home to school. We can think of the way we use nature as living from the yields from our 'global farm'. Knowing how much we have compared to how much we use is really important if we want to make sure that our societies can persist into the future.

By measuring the Footprint of a population – an individual, city, business, nation, or all of humanity – we can better understand our pressure on the planet and its resources. This can help us manage our ecological assets more wisely and take personal and collective action in support of a world where humanity lives within the Earth's bounds.

How much does it cost to go out to dinner? To pay for a vacation? To buy a new car? In our daily lives we know these costs fairly precisely since none of us has an unlimited amount of money. With nature just as with our household budgets, we need to know what we can afford. What is the ecological cost of building a highway? Of a trip in an airplane? Almost everything we do has an ecological cost, and that's OK, as long as we live

Every human activity needs a biologically productive area. This area is its Ecological Footprint.



Source: Ministry of Environment, New Zealand

To what extent can mankind live off the global farm which is the Earth? Ecological accounting provides us with the basis for answering this question.

Overview: Ecological accounting

Humanity needs what nature provides, but how do we know how much we have compared to how much we use? We need ecological accounting to answer this question.
The Ecological Footprint has emerged as the world's premier measure of humanity's demand on nature. It measures how much land and water area a human population requires to produce the resource it consumes and to absorb its wastes, using prevailing technology.

Supply and demand
Just like in financial accounting, Ecological Footprint accounting looks at two sides of the balance sheet. The **supply** side measures what we have, our ecological budget. The capacity of ecosystems to produce useful biological materials and to absorb the waste generated by humans is called biocapacity. Forests, farmland, grazing land, and fishing grounds all provide this biocapacity.

Our **demand** is composed of what humanity extracts from nature (renewable resources such as food and wood) as well as the forest area necessary to absorb the CO_2 from our energy use. The Footprint sums up the total land area which is necessary for the maintenance of this "metabolism." We measure both our supply and demand in units called "global hectares (gha)" which we will examine more closely later on.

Ecological overshoot
Turning resources into waste faster than waste can be turned back into resources puts us in global ecological overshoot, depleting the very resources on which human life and biodiversity depend. Just as in financial bookkeeping, it is also possible to spend more of our natural capital than we earn – at least for some time. But if we overdraw our account in the long term and expand our ecological deficit, nature goes bankrupt.

within nature's budget.
Money has many functions. For example it can be spent, saved or invested. We tend to value financial capital very highly. The Footprint, on the other hand, measures natural capital, which is generally undervalued in our economic models. We still behave as if natural resources were unlimited and the Earth's ability to absorb our waste was boundless. But as human pressure increases and resources become more limited, it will be the health of natural ecosystems that will be the deciding factor for human survival; money is a mere symbol.

"Sustainability is the best choice we have – yet it also requires significant reorientation. The good news is this possibility: if we start accounting for our ecological resources as seriously as we do for our financial assets, we can manage our ecological assets more carefully in order to secure a sustainable, better tomorrow."

Professor Dr. Emil Salim, former Indonesian Minister of the Environment, advisor to the President of Indonesia, Professor of Economy and Head of the World Bank Study of Raw Materials

Ecological accounting: How much nature do we have? How much nature do we use?

Just as investment managers would be blind without accounting, so are decision-makers unable to make choices about resource use without having a way to measure it. Since the Footprint can show us how much biologically productive land area is needed for human activities (expressed in a common unit), complex questions about resource flows can be measured and discussed. By using the Footprint we gain a different view of the value of the things we need to support our lifestyle. We

see what the "cost" of our activities really is; for example, how much biocapacity is "contained" in them. Our existence is thereby directly linked with the ecosystems of the planet. This means that material and energy flows are not somewhere "out there"; human life and the economy are part of the biosphere.
Because humanity's demand on nature currently exceeds the biosphere's supply, or regenerative capacity, we are depleting Earth's life-supporting natural capital and building up waste in the form of CO_2 in the atmosphere. Understanding this, we begin to understand that we need to rethink our development models and lifestyles so that we don't undermine our future.

Suggestions for further work:
How do you calculate your own Footprint?

Later, we will explore the components of your own Footprint, and you will have the opportunity to calculate it by answering some questions. But first let's start with the questions that you can already answer. Consider for a moment: which of your daily activities are dependent upon renewable natural resources? Which of the things that you consume or make use of in the course of a typical day do you think require the most resources or generate the most waste? What questions do you think could be posed in order to calculate your personal Ecological Footprint?
Here's a hint: the most import thing for you to know can be found at the very beginning of this part of the brochure (pg. 15). Think about which foods in your diet need more cropland area for their production than others. Consider why riding your bicycle more often might result in a lower Footprint. Think about what effect it might have if you ran around at home in a T-shirt rather than a sweater in wintertime. But don't worry if your ideas don't agree with the Footprint questionnaire – it took years to develop the right questions and make the calculation available! Nonetheless, it is certainly more exciting to think things over yourself before you know the result, isn't it?

Additional materials and information:
- www.clubofrome.org
- Meadows, D. (1972 and 2004)

How the Footprint concept came about

In the early 1990's the young Swiss Mathis Wackernagel developed the methodology for the Ecological Footprint with his doctoral advisor Professor William E. Rees at the University of British Columbia in Canada. The starting point for their work was the concept of ecological carrying capacity, a well known concept from animal biology. It describes how many individuals of a particular species can be supported by a given habitat. They were also inspired by another study on carrying capacity, or more precisely the dynamics of economic growth on a resource constrained planet. This study, released in 1972 was issued by researchers in their twenties, among them Donella Meadows, Jorgen Randers, and Dennis Meadows. It was called "Limits to Growth," and was funded by the Club of Rome. The conclusions of these young scientists from the Massachusetts Institute of Technology (MIT) were shocking: with sustained development trends (rising population, increased industrialization and food production, and a constant, high level of natural resource exploitation) the limits to growth would be reached in the 21st Century. Overuse of the Earth's resources would lead to a decline – a forced reversal of population and consumption trends. It would be similar to yeast in a sugar cup – where the yeast's own acid pollution from eating up the sugar and growing in size would eventually reverse the initial growth trends.
The central question of carrying capacity was then simply reversed by Wackernagel and Rees. Instead of asking how many people the Earth can support (carrying capacity), Wackernagel and Rees asked

"The calculation of Ecological Footprints will impress the world community and help politicians, business, engineers, and the public at large to find new and exciting paths towards sustainable development."

Professor Ernst Ulrich von Weizsäcker
Founding President of the Wuppertal Institute and former Chairman of the Ecology Committee of the German Parliament

how much land area is necessary to support the current population using current technologies. After its invention, the Footprint method was quickly adopted by cities, non-governmental organizations and academics worldwide. Then in 2003, in order to allow the community of Footprint practitioners to standardize calculation methods and collaborate on research, Wackernagel and his closest collaborators founded Global Footprint Network.

Mathis Wackernagel: Co-developer of the Ecological Footprint and co-founder of Global Footprint Network

Global Footprint Network
Advancing the Science of Sustainability

Global Footprint Network

The mission of this Network is to advance sustainability through use of the Ecological Footprint tool. By making ecological limits central to decision-making, Global Footprint Network is working to end ecological overshoot and create a society where all people can live well, within the means of one planet. Headquartered in Oakland, CA, USA with offices in Washington, D.C.; Brussels, Belgium; and Zurich, Switzerland, Global Footprint Network regards itself as an international think tank which works through a network of over 100 partner organizations. Nobel Prize winners, scientists in diverse disciplines, and well-known figures from the world of industry and politics are counted among the exceptional personalities who advise the network. Germany is represented in the Network's Advisory Board, for example, by Professor Ernst Ulrich von Weizsäcker, the founder of the renowned Wuppertal Institute and former Chairman of the Environmental Committee of the German Parliament.

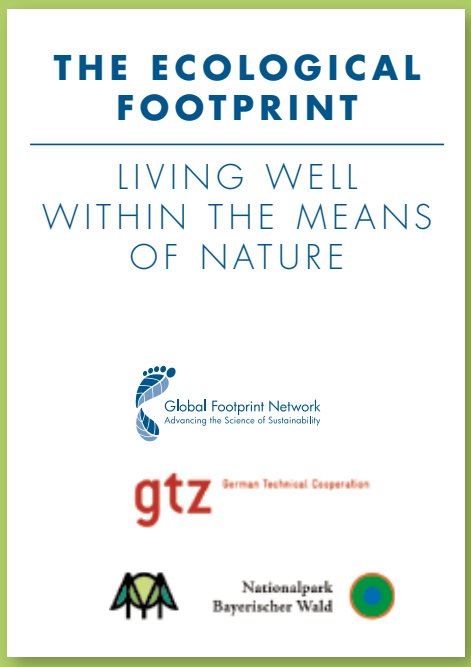
Global Footprint Network not only strengthens the scientific basis of the Ecological Footprint; it also makes the tool relevant to decision-makers in government and industry through training sessions, workshops, and consulting engagements. The photo shows Indian business representatives in conversation with Mathis Wackernagel.

Additional materials and information:
www.footprintnetwork.org

Global Footprint Network Materials

Besides its scientific work (further development and standardization of the tool) and consulting activities with decision-makers in government and industry, Global Footprint Network designs training and educational materials that make the Footprint concept accessible to the broad public, such as:

- "Ecological Footprint Accounting: Driving Competitiveness in a New Global Economy". This little booklet conveys the rules of the game for the planet Earth and answers basic questions about the Ecological Footprint. The German, English, and French versions can be found at: "Ecological Footprint Accounting: Building a Winning Hand" on the Web site www.footprintnetwork.org/en/index.php/GFN/page/publications and on the accompanying DVD of this brochure.
- "The Ecological Footprint: Living Well Within the Means of Nature". This wallet card contains the latest Footprint data from 2008 and was published jointly by Global Footprint Network, the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), and The Bavarian Forest National Park. It concisely and clearly links together the most important concepts, calculations and up-to-date statistics. The PDF file for the flyer is available on the accompanying DVD (in German and English), and printed copies can be ordered from the GTZ (i-punkt@gtz.de).
- Included with this brochure's DVD is the "Ecological Footprint Atlas 2008" as well as various factbooks with Footprint data, trends and numerous graphics for different continents, countries and cities.



The open seas and deserts are not included in calculations of biocapacity since their productivity is very low.

The scientific method

How to calculate supply and demand

The Footprint of a person, a company, a city or a country describes the demand side: what is our demand on nature? Specifically, the Footprint is a function of population size, the goods and services each person consumes, and the resource and waste intensity of these goods and services. Reductions in population, individual consumption, and the resources used or wastes emitted in producing goods and services, all result in a smaller Footprint.

But the Footprint method can do a lot more. It also answers the question: how much useful, productive land (biocapacity) do we have available to people? Specifically, biocapacity is determined by the amount of biologically productive area available and the productivity of that area.

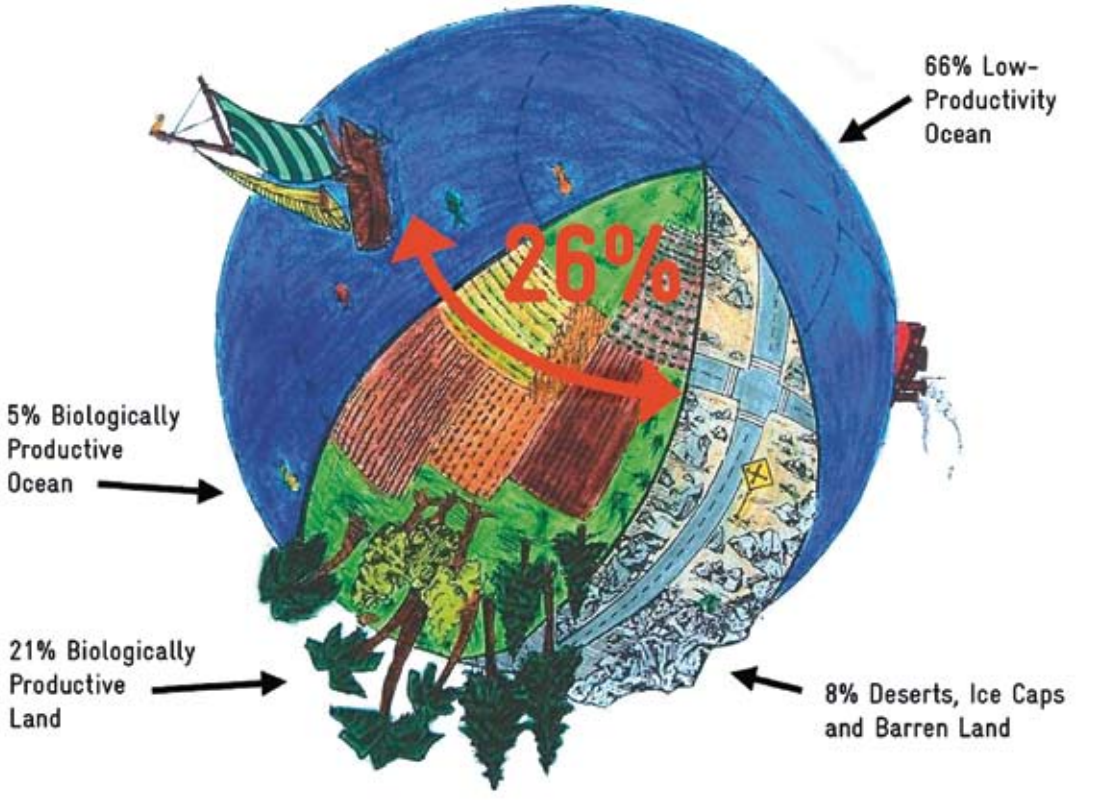
Footprint accounting looks at both sides, supply and demand for natural capital, like two sides of a financial balance sheet.

We know that only about 21 percent of the planet's surface area is bioproductive land; and 5 percent of the planet's surface is biologically productive sea space. The open seas, for example, which are far less productive and less significant for fishing, are not counted. Neither are deserts or polar ice caps. On the other hand, coastal waters, areas with nutrient-rich deep sea currents, and marshland or river deltas – which together account for 90 percent of fishing – are taken into account. Altogether, roughly 26 percent of the surface of our planet – approximately 13.4 billion global hectares – provides for the sustenance and waste disposal of humankind.

The data you will find in this brochure are taken from Global Footprint Network's National Footprint Accounts – its 2008 edition. These accounts are primarily based on international data sets published by the Food and Agriculture Organization of the United

In the brochure, the following terms are used synonymously:

- biocapacity,
- biologically productive (bioproductive) areas,
- regenerative resources or raw materials, and
- renewable natural resources or raw materials.



Source: Global Footprint Network (2009)

Only 26 percent of the Earth's surface is biologically productive enough to be used by humans – this biocapacity belongs to the supply side of the global Footprint balance sheet.

The Film "The Ecological Footprint – Accounting for a Small Planet"

In 2007, a 30 minute film on the Ecological Footprint was produced by Northcutt Productions and Global Footprint Network in collaboration with the Austrian Plattform Footprint. Mathis Wackernagel, the co-creator of the Footprint concept, explains the key concepts and facts surrounding the Ecological Footprint. The film explores the connection between climate change, environmental protection and our lifestyle and gives examples of the Footprint in action.
The German language version can be ordered at http://shop.filmladen.at and the English language version at www.bullfrogfilms.com/catalog/efoot.html or downloaded from www.epa.vic.gov.au/ecologicalfootprint/about/documentarydvd.asp. The shortened German language version (17 min.) is available on the DVD that accompanies this brochure.

Chapter overview (English version)

Chapter heading	Duration
Why Resource Accounting?	1:37
What the Footprint Measures	1:15
Balancing Supply and Demand	0:56
Supply (Biocapacity)	4:05
Demand (Ecological Footprint)	2:26
Overshoot (Exceeding Ecological Limits)	3:28
Calculating the Footprint	3:28
High vs. Low Income Countries	0:45
Footprint of Nations	1:42
The Funnel	3:29
Examples: Footprint Applications	2:41
Global Footprint Network	0:39
Opportunities	1:39
Conclusion by Former Minister Thwaites	1:00
Credits/Contact Info	1:29

The Austrian **Plattform Footprint** (www.footprint.at) is an alliance of leading environmental and development policy organizations such as Greenpeace, WWF, GLOBAL 2000, Klimabündnis Österreich, Südwind Agentur, Agenda X and Ökosoziales Forum, SERI (Sustainable Research Institute) among others, that wish to establish the Ecological Footprint as a measurement for the sustainability of our society. The brochure "Footprint. Der Ökologische Fußabdruck Österreichs" ("Footprint. Austria's Ecological Footprint") appeared in 2007 and can be downloaded at www.footprint.at/fileadmin/zf/dokumente/footprint_brosch_v3LM.pdf. The updated version, which has been adapted to Germany, "Footprint. Der ökologische Fußabdruck Deutschlands" ("Footprint. Germany's Ecological Footprint") was released in December 2008 by Greenpeace Germany and is available at www.greenpeace.de/fileadmin/gpd/user_upload/themen/wirtschaft_und_umwelt/Footprint_Deutschland_2008.pdf.

Nations, the International Energy Agency, the UN Statistics Division, and reports compiled by the Intergovernmental Panel on Climate Change. The source figures show not only how much is produced in industry, agriculture and forestry but also how many goods are exported and imported. When we ask the question "what is our demand on nature?" we are referring to both the "consumption Footprint" and the "production Footprint".
When most people talk about the Ecological Footprint, they are referring to the **consumption Footprint**. The consumption Footprint for a given country measures the biocapacity demanded by the final consumption of all the residents of the country. This includes their household consumption as well as their collective consumption, such as schools, roads, fire brigades, etc., which serve the household, but may not be directly paid for by the households. The important thing to remember is that the consumption Footprint is focused on the consumption of the residents of the country, no matter where nature's services are located.
In contrast, a country's **production Footprint**

Production Footprint
+ Biocapacity in Imports
– Biocapacity in Exports
Consumption Footprint

is the sum of the Footprints for all resources harvested and all waste generated within the country's geographical borders. For example, it would include the Footprint needed to manufacture products that are exported and consumed by people outside the country. This includes all the area within a country necessary for supporting the actual harvest of primary products (cropland, grazing land, forest land, and fishing grounds), the country's infrastructure and hydropower (built-up land), and the area needed to absorb fossil fuel carbon dioxide emissions generated within the country (Carbon Footprint).

The consumption Footprint differs from the production Footprint through **trade**: a country's consumption Footprint also contains the biocapacity of imported products and services. When biocapacity is made available to other countries through exports, this is reflected in the consumption Footprint of the importing country.

When the Footprint of a country exceeds the biocapacity of the area available within that country, it runs an **"ecological deficit"** and we call it an **"ecological debtor."** Conversely, an ecological surplus exists when the biocapacity of a region exceeds its population's Footprint. Those countries with more biocapacity at their disposal than their population uses, in net terms, have an **"ecological surplus"** and are called **"ecological creditors"**.

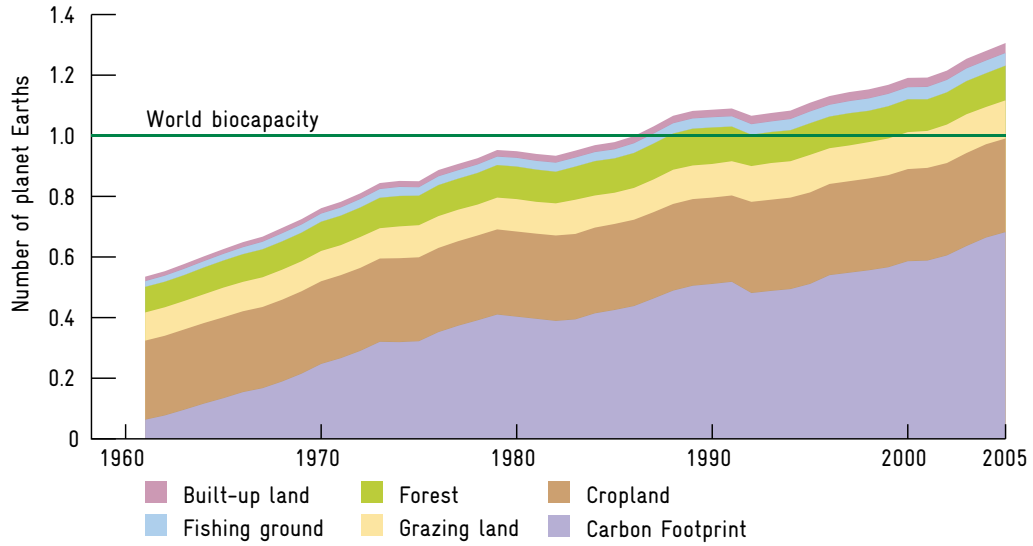
Ecological surplus or deficit is analogous to a trade surplus or deficit. In a global economy, it is important to understand whether a country has a trade surplus or deficit. In the same way, knowledge of its ecological balance sheet also reveals important information.

To maintain high-quality results when conducting Footprint analysis, Global Footprint Network and its partner organizations have developed international standards. The standards are designed to ensure that Footprint assessments are produced consistently and according to community-proposed best practices. They aim to ensure that assessments are conducted and communicated in a way that is accurate and transparent.

Land types used in Ecological Footprint accounting

The biologically productive areas of the Footprint are divided into different categories:

1 **Cropland** is the most bioproductive of all the land types and consists of areas used to produce food and fiber for human



Source: Global Footprint Network

The difference between the production Footprint and the consumption Footprint equals the trade in biocapacity.

Unless mentioned otherwise, national Footprint data in this brochure refer to the consumption Footprint.

Additional information: www.footprintstandards.org

Footprint calculations contain six different area categories for which there is a supply and demand. The Carbon Footprint has been increasing consistently since 1961.

aconsumption, feed for livestock, oil crops and rubber.

2 **Grazing land** is used to raise livestock for meat, dairy, hide and wool products.

3 **Fishing grounds** are calculated as an estimate of the maximum possible sustainable fishing catch within inland and coastal waters.

4 **Built-up land** is the land area covered by human infrastructure – transportation, housing, industrial structures and reservoirs for hydropower. Built-up land presumably occupies what would previously have been cropland. This assumption is based on the theory that human settlements are generally situated in highly fertile areas.

5 **Forest land** is calculated based on the amount of lumber, pulp, timber products and fuelwood consumed by a nation on a yearly basis. It also serves to accommodate the **Carbon Footprint**. This area is calculated as the amount of forest land required to absorb our carbon dioxide emissions. It is the largest portion of humanity's current Footprint. In low-income countries though, it is generally a minor contribution to their overall Footprint. CO_2 emissions, primarily from burning fossil fuels, are the only waste product included in the National Footprint Accounts.

The role which CO_2 plays

The Carbon Footprint, the Footprint from CO_2 emissions, accounts for more than half of the global Footprint and has grown ten-fold since 1961. During the Middle Ages, humans obtained the major portion of the energy they needed, mostly for heating and farming, almost exclusively

Burning fossil fuels releases carbon dioxide (CO_2). The Carbon Footprint indicates how much forest land area is needed to absorb the CO_2 that is not absorbed by the ocean

from the sun in the form of biomass (wood). At that time, fossil fuels were safely sequestered within the Earth's crust. Then, the discovery of coal, oil and gas for powering machines made the Industrial Revolution possible in the 18th century. The first coal-powered steam boat crossed the Atlantic in 1840.

Two issues emerge from the use of fossil fuels. First, fossil fuels are non-renewable, that is to say, there is a finite quantity in the ground. Today, humanity consumes as much coal, oil and gas in one year as the Earth formed during thousands, if not millions of years. Therefore, because remaining supplies of oil are finite and our demand is growing, there are concerns about availability. Lack of oil increases oil prices, which affect every part of our economy.

From an ecological point of view, however, a larger concern is that we emit much more CO_2 than nature can absorb. Some CO_2 is absorbed by the oceans (which are becoming increasingly acidic). Another portion is absorbed by terrestrial ecosystems. The remainder accumulates in the atmosphere, contributing to climate change.

Admittedly, the actual consumption of fossil fuels does not play a direct role in Footprint calculations because these energy sources are not part of living nature. Their use however does indeed put a demand on nature; when they are burned, carbon dioxide (CO_2) is released which must be absorbed. Until now a good portion of this CO_2 was absorbed by the oceans. An additional portion is absorbed by terrestrial ecosystems. The rest remains in the atmosphere and its concentration has been increasing – by more than a third in the past 200 years.

Footprint methodology asks how much bioproductive surface area is needed to absorb the carbon dioxide arising from energy production which is not taken up by the oceans. Research shows that an average hectare of forest can absorb the amount of carbon dioxide released by the annual burning of approximately 1,500 liters of oil.

Since the beginning of the 1960's, the global Carbon Footprint has increased ten-fold. In Germany transportation contributes to about 20 percent of total CO_2 emissions. Automobile driving and air travel comprise a full 90 percent of the transportation Footprint.

The amount of food we can eat is limited by the size of our stomach, but our appetite for fossil fuel is nearly unlimited. For instance, people can fly as much as they like, assuming they can afford it.

The competition for land use

Theoretically, if enough land was converted to forest, the planet would be able to absorb our current CO_2 output. We would then, however, discover that we do not have enough area for producing timber, corn or potatoes. The Footprint framework shows us that sustainability requires that we consider these sorts of trade-offs, realizing that solutions created in isolation might lead to unintended consequences. Biofuels, for example, have been introduced in order to help us shift away from fossil fuels. But in order to establish palm oil plantations in Brazil, large areas of rainforest are being destroyed. As a consequence, their biodiversity is lost and ecological services, provided for locals and others, can no longer be counted on. Similarly, the increase in the biofuel ethanol, which is made from corn or soy plants, is creating competition for cropland resulting in higher food prices.

How the Footprint is measured

A country's Footprint is the sum of all the cropland, grazing land, forest land and fishing grounds required to produce the food, fiber and timber its inhabitants consume; to absorb the wastes emitted when they use energy; and to provide space for their infrastructure.

One of the benefits of the Footprint is that we can compare the supply of and demand for biocapacity with the aid of a single number. However, the various land types can't be simply added together because each land type has a different "productivity." For example, cropland yields four times more biomass per hectare than grazing land. The Ecological Footprint methodology, therefore, uses **equivalence factors**, so that the productivity of a single land type can be related to the average productivity of all land types.

The yield of land types varies by country, too. The biocapacity of a country is fundamentally dependent upon geological, topographical, climatic and biotic factors. It is also affected by human activities, such as agricultural practices.

Sources and additional information:
- Greenpeace (2008)
- Greenpeace CO_2 calculator: www.greenpeace.klima-aktiv.com

Additional information about "Climate Change and Biodiversity" and "Energy" is found in volumes 8 and 9 of the series "Sustainability Has Many Faces".

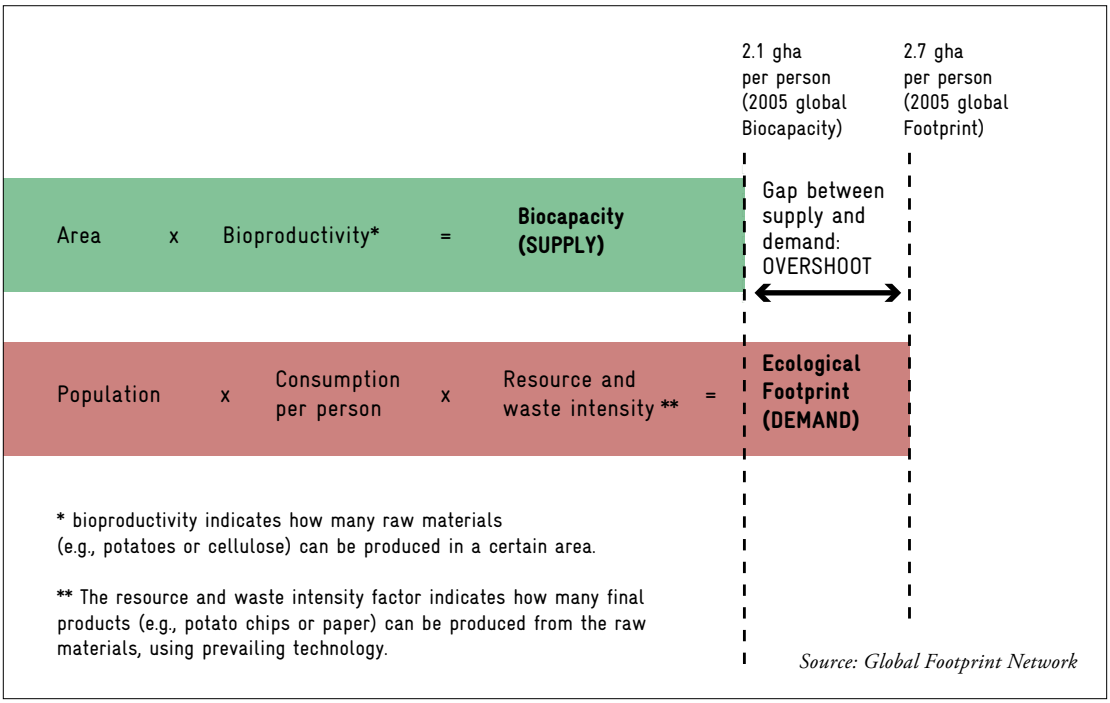
For example, arable land in Germany can bring totally different yields than fields in the Sudan because of occasional, but severe fluctuations in the water supply brought on through drought or flooding. Accordingly, a **yield factor** is calculated annually for each country and for all land types. Yield factors account for differences in productivity of a given land type between a nation and the global average in this land type.
This is how we arrive at the **global hectare** (gha) which is the unit in which the Ecological Footprint is measured. It is a productivity-weighted area used to report both the biocapacity of the earth and the demand on biocapacity (the Ecological Footprint). The global hectare is normalized to the area-weighted average productivity of biologically productive land and water in a given year. Since the global biocapacity changes slightly from year to year, through an increase in the area of productive lands, the variables for calculating the global hectare shift accordingly.
The mode of calculation may appear at first glance to be a little complicated, but by reducing consumption to the unit "gha" it becomes possible to compare the demand on biocapacity worldwide and over time. This helps politicians, economists, as well as municipal leaders and individuals to responsibly manage the capital of our planet.

How overshoot can occur

At this point, we know that the demand for natural resources must be balanced by their availability. In an individual nation that uses more biocapacity than it has within its borders, it is possible to balance this deficit by, for instance 1) overusing its own ecosystems (e.g. overharvesting of timber), 2) importing more resources from elsewhere than it exports, and 3) using the global commons, for instance by emitting CO_2 into the atmosphere beyond what its ecosystems absorb. But our earth as a whole cannot carry on trade with other planets or fall back on distant, intergalactic ecosystems. When the globally available biocapacity is exceeded, we have ecological overshoot.
According to Footprint calculations, in the middle of the last century (50 to 60 years ago), humankind used less than half of the biocapacity of the planet. In contrast, in 2005, humankind needed the resources of 1.3 Earths – or more than 130 percent of what the planet could replenish. What does this mean? To generate humanity's annual consumption, the earth needs almost a year and four months. Seen the other way around, if one estimates the amount of biocapacity produced in a year, one can set a symbolic date by which the Earth's biocapacity will be exceeded

Additional information:
- www.footprintnetwork.org/en/index.php/GFN/page/methodology/
- Ewing, B. et al. (2008): The Ecological Footprint Atlas.

Global overshoot occurs when the Footprint is larger than available biocapacity. The supply is determined by how much land we have and the bioproductivity of that land. The demand is determined by the size of our population, how much each person consumes and the efficiency (resource and waste intensity) by which consumer goods are produced.



Suggestions for further work:
How has your consumption changed?

We have just learned that human resource consumption was once within the limits of what the planet could provide, at least in our grandparents' days. During our parents' lifetimes, humanity has slipped into ecological overshoot. For the generation of people born in the 1980s and later, we've been living entirely during a time of growing ecological debt.

Do some research in your family:
What kind of resource demands did your grandmother or grandfather (or other relatives in that age group) have? Did they have their own automobile? How often and how long did they vacation and what types of transportation did they use for travel? How often did they buy new furniture or clothing? How much did they heat (or cool) their homes, and what did they use for heating? How much meat did they eat? Then interview your parents about what these things were like when they were young.
How did your grandparents and parents experience the lifestyle changes described above? What advantages and disadvantages resulted from these? Are we living better today than they were then? Exchange your experiences with other members of your group/class. Are there similar stories?

for the current year. Every year, Global Footprint Network calculates this "Earth Overshoot Day." In 2010, Earth Overshoot Day occurred on August 21st, which means that from January 1, 2010 until August 21st, humanity demanded as much biocapacity – food, energy, waste absorption – as the Earth supplied during the whole of 2010. Earth Overshoot Day tends to take place earlier each year due to global population growth and rising resource consumption. Thus we are accumulating an ecological debt. Currently each person on Earth demands an average of a 2.7 gha Footprint, as compared to the biocapacity of 2.1 gha which are available per person. If all humans were to live like Europeans, we would need more than two Earths; at US-American consumption levels we would need almost five. The problem: we have only this, single planet. Somehow we must learn to live within our budget.
Footprint calculations estimate that humanity moved into ecological overshoot in the 1980's or earlier. The last century was an era of

Sources and additional information:

- Global Footprint Network (2009): September 25 2009. Earth Overshoot Day. Media Backgrounder.
- www.footprintnetwork.org/en/index.php/GFN/page/earth_overshoot_day

Humanity would currently need 1.3 planets to satisfy its demand for renewable resources and waste absorption. If we take into consideration the needs of wild animal and plant species this number would be even larger.

unprecedented global material growth. Someone born in 1950 witnessed an almost unbelievable growth in world population: from 2.5 to 6.8 billion people in 2009. Between 1950 and 2000 this person also experienced a sevenfold growth in the global economy. Global water consumption rose threefold, carbon dioxide emissions fourfold, and the amount of fish caught fivefold. After the Second World War, broad population segments of the industrialized nations in Europe, North America and Japan experienced prosperity which in their grandparents' time was reserved for millionaires – telephones, refrigerators, permanently heated (or cooled) living spaces, their own washing machines and cars.

Many of these trends have resulted in improved living standards and quality of life for millions of people. But they also have their costs.

Ecological overshoot is the defining challenge of the 21st Century. It is unknown how far into overshoot we can get without causing critical consequences. But one thing is certain: overshoot will increasingly become a determining force.

Money makes overshoot Invisible

Overshoot has many faces. It can mean a bird species driven from its habitat, perhaps even driven to extinction, or an entire ecosystem damaged by overuse.

For affluent city dwellers, which include most Germans, the overshoot phenomenon is often only experienced aesthetically. We can see from an airplane how the cities extend further and further: more houses, more streets, and more parking lots. One used to need maybe a half and hour to walk out of a city and enjoy nature; today it takes twice as long.

But often, overshoot can be invisible, especially to people with financial means. One example is tourism: the affluent often stop travelling to regions of the world if they become impoverished, if social tensions rise or they become unpredictable

A digression: Looking back – an example of overshoot in early civilization

The first evidence of the destruction of an ecosystem comes from the Sumerians about 2400 BCE. The geology of the valley between the Tigris and Euphrates made food production especially difficult. In spring both rivers were swollen with large amounts of water; between August and October, the period when farms most need water, the rivers shrank into tiny rivulets. The Sumerians developed one of the world's first artificial irrigation systems. The productivity of the ecosystems rose as did grain harvests.

During summer it is extremely hot in this latitude, around 40 °C. The irrigation water quickly evaporated on the fields, leaving deposits of salt behind. Beginning in 2000 BCE reports grew of the earth "turning white". Ultimately, grain production collapsed due to salinization of the soil – a chief problem with irrigation even today.

The case of the Sumerians reveals the basic pattern of overshoot:

- Growth occurs and events accelerate (artificial irrigation increases the productivity in the Tigris and Euphrates valley).
- Limits are exceeded whereby the system is decisively destroyed (after a certain degree of soil salinization, plants reacted negatively and yields sank).
- Learning processes start too late to correct the problem (the Sumerians were unaware of the problem of salinization and may have never fully understood what caused the collapse).

This example shows how overshoot is a problem that often creeps up slowly; this is what makes it so dangerous. The fate of the Sumerians as a result of their unintentional mismanagement and overuse of ecosystems has repeated itself innumerable times, be it in Biblical times with the destruction of the forests on the hills of Lebanon, Roman times with extensive erosion around the Mediterranean, right up to the present day. Ecosystems are sensitive; when they lose their balance, a collapse is often not far away.

Source: Ponting, C. (2007): A New Green History of the World. The Environment and the Collapse of Great Civilisations.

Suggestions for further work:
Have you understood the principle of overshoot?

Imagine, for example, you take a second job in a bakery. You must get up every morning at 3 a.m. After a certain amount of time, your ability to perform your day job really begins to suffer, probably because you are much too tired. Is this overshoot?

Consider other situations from your everyday life, your family, your community, or on a global level in which overshoot can occur (even when we don't call it that in everyday conversation).

Let's look a bit into the future: humankind realizes that it cannot overdraw its natural capital account any longer because it is endangering its own basis for survival. Imagine that you are a minister of the environment, a mayor, or an automobile manufacturer – what do you think the basic approaches for solutions would look like in order to encourage better, more intelligent and fairer dealings with natural resources? What ideas occur to you in the face of such complex challenges? What would the different arguments look like from the perspectives of the interested parties mentioned above (or others)? For example:

- What if every person, every city, every country or business could buy or sell their "personal consumption units" similar to the trading of greenhouse gas emissions? How would this impact people's daily lives? Do you think that this approach would reduce consumption? Why, or why not? Who would likely oppose such an idea and who would support it? How could such an idea be implemented – which institution or organization would have the capability to handle such a challenging task? Where do you see risks and / or potential negative consequences?
- Some suggest that we should consider giving everybody equal access rights to global biocapacity – Is this fair? Or does biocapacity belong to the various countries? Or should we get access according to our purchasing power?
- If we lived within the means of the planet, would we all go hungry from October onwards, after the annual Overshoot Day (see pp. 24) because we had already used up our resources for the year?
- Germany's "green tax" (which, among other things, contains electricity taxes and leads to an increase in petroleum taxes) makes environmentally damaging behavior more expensive. Should this regulatory instrument be extended to other consumption sectors? Do you see ways of expand it to include biocapacity? Might it be a good model for other countries?
- What other solutions can you think of?

and dangerous.

The loss of biocapacity is most directly visible to rural people with low purchasing power. They are directly dependent on the services of their ecosystems, whether they live, for example, in Kenya or India. When water dries up in the fields there is less to eat, and life becomes more difficult. When this happens across the world, food prices rise for everyone. Those possessing sufficient purchasing power can shield themselves longer.

Loss of biocapacity is usually not perceived as an environmental problem; most see it as either poor management, an unexpected weather related event such as drought, a distribution problem, or a combination of these. But if we take a step back we can see that there are systemic reasons for it. The result of such loss leads to social tensions, and sometimes violent conflict.

The Footprint shows that in almost all countries the demand for biocapacity has risen steadily during the past 40 years. But supply has moved in the opposite direction: biocapacity available per person shrank. Most people think this is "normal" since it is happening everywhere. But the opposite is the case. Since it is happening everywhere, the trends compound each other – there is no other place to go if local ecosystems are overused.

However, there are also some positive examples from recent years where countries have turned trends around. To do so takes a conscious effort. We will examine some of these examples more closely after page 39.

What the Footprint can do – and what it cannot

The Ecological Footprint is an anthropocentric (human-centered) indicator. It measures the demand that humanity places on biocapacity and specifically does not dictate the amount of land needed by other species. The tool also does not prescribe fixed solutions; rather it presents information that can be used for decision-making. This makes it an effective communications and management tool. There are several important environmental pressures that the Footprint does not measure directly including biological diversity and toxics. For lack of data, freshwater is only measured indirectly at this point. For instance, when freshwater becomes scarce, biocapacity drops. It also does not measure the economic and social dimensions of sustainability.
We are all concerned with insuring humankind's survival and quality of life. But there are things in addition to sufficient biocapacity that are important: a stable financial system, systems to insure justice, the fair distribution of goods and resources, freedom from violence and war, ability to fight and prevent disease, the preservation of biological diversity, aesthetic urban and rural landscapes, and many others. The Footprint should be regarded as an answer to a key question for managing the human economy. But of course there are also other questions we need to consider. Therefore other indicators are needed as well. Some further indicators are introduced in Infoboxes in the course of this chapter.

> **"There have been a number of innovative research initiatives to help us get a grip on what is meant by Sustainable Development. Among the most substantive and illuminating, if not the single most helpful of all, is the work by Mathis Wackernagel and his colleagues on Ecological Footprints."**
>
> **Professor Norman Myers**, Oxford; environmental activist and one of the world's leading experts on the subject of biodiversity

When resources become scarcer, poorer people are the first to experience it.

Methane, which escapes into the atmosphere through the digestive processes of cattle and has a higher "global warming potential" than CO_2, will be taken into account in future Footprint calculations.

Continually Improving the Method

Footprint results do indeed provide useful quantitative information and can be validated and improved, but they are not "exact". For example: in calculations regarding energy-related emissions, the Footprint has thus far only taken carbon dioxide into account. In the future, additional gases relevant to the climate, such as methane, will be considered. The Footprint calculation methodology is continually being updated in line with the latest findings. To this end, Global Footprint Network works with universities and other networks on statistics, conversion ratios, and analysis of satellite imagery. Data only become part of Footprint calculations when they are sufficiently "robust", i.e., certain.

Infobox:
The Ecological Backpack

Or the **Material Input per Unit of Service (MIPS)** describes the amount of resources (biotic and abiotic) in tons necessary for generating a certain service, for example a one-kilometer car trip. In so doing, the MIPS methodology tracks resource consumption as a whole, from the extraction of raw materials from nature, through the production and utilization up to disposal phases.

The image of an ecological backpack clarifies the total quantity of raw materials which must be moved in order to produce a certain product or service. In the case of an automobile, this calculation refers not to the weight of the car but to that of the ores and of the by-products of its manufacture.

The qualities of consumed resources, for example their environmental effects, is not taken into account, however. Footprint calculations rely on material flow analyses such as those of MIPS. The Footprint adds another layer to MIPS: it shows how much biocapacity is needed for providing this material flow. This then allows us to compare human demand with nature's supply. The scientist Ernst Ulrich von Weizsäcker recommends a reduction of material flows by a factor of 4 to 5; Friedrich Schmidt-Bleek even suggests a factor of 10. The ecological backpack makes it possible to recognize and identify inefficiencies and wasted resources. As a decision-making tool, it facilitates the development of more ecologically sound alternatives.

Sources and additional information:
www.wupperinst.org/en/projects/topics_online/mips
www.factor10-institute.org
www.wupperinst.org/uploads/tx_wibeitrag/ws27d.pdf

Infobox:
A variation of the Footprint – Footprint 2.0

Some scientists and critics, for example the organization Redefining Progress, have sought to improve the Ecological Footprint by developing their own variations.
Redefining Progress' Footprint 2.0 differs from the Global Footprint Network methodology in the following ways:

- The Earth's entire surface is considered, including all oceans and the Polar Regions (thus areas which are not biologically productive).
- 13.4 percent of the world biocapacity is "reserved" for wild animal and plant species, in contrast to Global Footprint Network which does not specify how much needs to be set aside for wild species.
- Conversion factors (yield and equivalence factors) are determined based on the relative gross primary product (total planetary biomass minus the cellular respiration of plants), rather than what is called "the agro-ecological potential."

Different calculation methods lead to different results. Thus, with Footprint 2.0, the available biocapacity areas are larger per capita, but so is the area required by an individual's Footprint since the biocapacity is spread over more (less productive) hectares. Overshoot is even more dramatic using Redefining Progress's method.
A primary criticism of Redefining Progress's method is that areas which fulfill multiple functions (e.g., provide forest land products and absorb emissions) are double counted and thereby distort the results. The method is not consistent with current Ecological Footprint standards (www.footprintstandards.org).
Furthermore, some scientists regard it as arbitrary to define a specific extension of our planet's surface to be set aside for animal and plant species. Global Footprint Network leaves to the user of the data the decision of how much biocapacity should be left for the living space of animal and plant species. For example, leading biologists, such as E.O. Wilson, Harvard professor emeritus, call for as much as 50 percent to be set aside for wild plants and animals. But even this value can lead to a loss of biological diversity.

Source and additional information:
www.rprogress.org

Infobox:
The Water Footprint

The Ecological Footprint doesn't measure water use directly, although water scarcity is an increasingly important issue and one of the most significant factors for enabling biocapacity. Every agricultural and industrial process uses water, sometimes an astonishing amount. For example, the production of one kilogram of beef requires 16 thousand liters of water; a cup of coffee about 140 liters.
The Water Footprint concept and methodology has been developed by Professor Arjen Hoekstra at UNESCO-IHE and it was further developed at the University of Twente, the Netherlands. The total Water Footprint of a country includes two components: the part of the Footprint that falls inside the country (internal Water Footprint) and the part of the Footprint that occurs in other countries in the world (external Water Footprint). The distinction refers to the appropriation of domestic water resources versus the appropriation of foreign water resources.
The Water Footprint of a product (a commodity, good or service) is the volume of freshwater used to produce the product, measured at the place where the product was actually produced. It refers to the sum of the water use in the various steps of the production chain. The Water Footprint of a product is the same as its 'virtual water content'.
For better comparison, countries' water consumption is converted to annual per capita consumption. While the average member of the human race consumes 1,240m³ freshwater

(1m³ = 1,000 liters), this value stands at 702m³ for a Chinese on average and, in contrast, at 2,483m³ for an average US-American. In Germany the per capita consumption of water is 1,545m³.
These high consumption figures should be regarded critically, especially in light of the background of a rising world population and the increasing desert-like conditions in arid and semi-arid regions. Initiatives like the environmental project "virtual water" of the Deutsche Vereinigung Gewässerschutz draw attention to these problems and point out how every individual can influence them. Not very many people know that individual direct water consumption in Germany has decreased in past years thanks to education and more efficient technologies. But still, 86 percent of water consumption is used to grow the food Germans eat and other agricultural products. Germany belongs to the top ten net water importers in the world. According to UNESCO, this is due primarily to the import of water intensive agricultural products such as tea, coffee and cocoa. We can expect that the international trade in virtual water will increase further through increasing globalization.

Source and additional information:
www.virtuelles-wasser.de
www.waterfootprint.org

Infobox:
Life Cycle Assessment (LCA)

This methodology systematically observes the environmental effects of a product, from the extraction of resources to disposal. It is not only about quantitative measures, as with the MIPS methodology (see Infobox: The Ecological Backpack), but also about the characteristics of individual materials, such as their toxicity. An entire scientific discipline concerns itself with different procedures for life cycle assessments, which should be determined according to international standards.
The method functions like a cooking recipe in reverse. One looks at a finished meal and asks what is needed to make this? Life cycle assessment is simply somewhat more thorough and detailed. It is not satisfied with the information "a kilogram of flour"; it asks where the flour comes from and how many resources have already been lost in the course of its processing. Thus it follows the total history or 'life cycle' of all the ingredients through each stage of production. Life cycle assessment is the basis for calculating the Ecological Footprint of a product. The life cycle inventory of material inputs and outputs are translated into the land areas needed for creating the materials and for absorption of waste. Thus, Footprint calculations depend upon good life cycle assessments and the two tools are often used together. When life cycle assessments are extended with the Ecological Footprint method, they become even more useful for decision-making.

Source and additional information:
www.unep.fr/scp/lifecycle

The methods for calculating resource consumption are continually being improved.

How are the Footprint and biological diversity associated?

We know that approximately 26 percent of the Earth's surface provides most of the materials and ecosystem services that humans demand, and that currently there are 2.1 global hectares of biocapacity available per person on the planet. However, the Earth's biosphere does not serve a solely anthropogenic purpose; the same land that supports human existence must also support the existence of other species. If society places a value on biodiversity, we must also reserve biologically productive land and resources for other, non-domesticated species.

The Ecological Footprint does not measure biodiversity – it focuses only on the available supply of and demand for biocapacity by humans. But with the Footprint, we can quantify the pressure that humans put on the planet, and better address the root causes of biodiversity loss, including the pressure humans put on the habitat of plant and animal species. We have only one planet. Its capacity to support a thriving diversity of species, humans included, is large but fundamentally limited. When human demand on this capacity exceeds what is available – when we go into overshoot by surpassing ecological limits – we erode the health of the Earth's living systems for ourselves as well as for other species.

Who gets the fish?

Many of the threats to the Earth's biodiversity ultimately stem from human demand on the biosphere. Habitat loss, overexploitation of species

> "Even if we just wanted to save tigers and pandas, or create protected areas, we could still not succeed without addressing human pressure. Reducing humanity's impact, however, requires equity and cooperation, otherwise we would just create more conflicts. This is an important reason for monitoring human demand through the Ecological Footprint. Recognizing ecological constraints is tough, but it is a prerequisite for harmony between people and nature."
>
> **Claude Martin**, former Director-General of WWF International

The transformation of a piece of woodlands into an extensively used pasture or an intensively used field raises biocapacity available for humans, however, biodiversity is reduced.

due to fishing and hunting, pollution, the spread of invasive species or genes, and climate change, are all anthropogenic forces that put pressure on the Earth's species diversity.
The loss of crucial natural areas can be seen in both tropical and subtropical locations. In South America, large expanses of forest are being cleared. In Brazil alone, up to three million hectares of tropical forest are lost annually.
One of the largest threats to biological diversity in the coming decades is climate change. We are already seeing effects of climate change in the Polar Regions and the world's oceans, which are suffering from acidification. According to WWF's Living Planet Index, the average population of vertebrate species across all regions of the world has declined by nearly 30 percent in the past 35 years. Even reaching the modest goals of the Convention on Biological Diversity to curb the decrease in species diversity, now seems improbable.
Imagine an extensively utilized grazing area with a plethora of grass varieties growing, and within that habitat, innumerable insects and plants. This pasture land is extremely productive in terms of the ecosystems and life it supports, but from an Ecological Footprint point of view, it might be less productive than an intensively grazed pasture with few types of grass that only offer a habitat to a limited amount of species. If we transform the extensively grazed pasture land into intensively used arable land, the biocapacity increases – but simultaneously the biological diversity of this area decreases.
We find that increasing biocapacity often comes at the expense of biodiversity. This assessment is not a direct flaw of the Ecological Footprint method, but a reflection of reality. There can be trade-offs between human interests and wildlife, and it is one that we frequently forget.
In the future we will continue to lose beautiful birds, the rich diversity of wildflower meadows and the brilliant variety of plants and animals found in our coral reefs. We will lose species of mushrooms which have valuable medicinal content. We will lose primates, and perhaps even the rhinoceros. The resource struggle between

Species diversity has dropped worldwide by almost 30 percent in the past 35 years. The going trend seems to be, the bigger the Ecological Footprint the more stress put on biodiversity.

WWF *Living Planet Report* 2008

WWF has been writing about the condition of the planet Earth in its *Living Planet Report* for 10 years. Since 2000 it has linked changes in global species diversity (the *Living Planet Index*) to human resource consumption (the Ecological Footprint).
The *Living Planet Report* 2008 was developed in close partnership with Global Footprint Network and the Zoological Society of London (ZSL). It is available on the accompanying DVD, or can be downloaded online via www.panda.org/livingplanet
or more specifically at

http://assets.panda.org/downloads/lpr_08_wwf_german.pdf (German), and
http://assets.panda.org/downloads/living_planet_report_2008.pdf (English)

Suggestions for further work:
What changes occur when biological diversity decreases?

A few concepts have been introduced above. Let's consider them further:

- Count how many types of apples or grapes there are in the supermarket and how many more types are sold by fruit handlers and organic grocers. Why are there always only the same four or five types in the supermarkets? What is good or bad about this?
- Does one notice when biodiversity decreases? Are we losing partly uninvestigated, inconspicuous species or entire ecosystems every day? Are such losses being documented? To what extent can the loss of biological diversity also have serious consequences for humans? Think about crops that serve as our main source of nourishment, such as wheat, rice and corn (in India there were once 30,000 different varieties of rice!). Research the history of the potato in 19th Century Ireland. Or the pollination performance of bees. What can happen to humans if bees become extinct? How will climate change possibly change mankind's sustenance? For your research, you are welcome to take a look at the other brochures in the series "Sustainability Has Many Faces". For example, Volume 1, "Development Needs Diversity" or Volume 8, "Man & Nature in Times of Climate Change" or Volume 11 on agrobiodiversity values in China.
- Explore the relationship between biodiversity and humankind. On page 37, you will find a comprehensive diagram about the causes for the loss of biodiversity. The left side indicates how this loss is connected to human consumption. Investigate examples of threats to biological diversity (i.e., Which fishing grounds are already overfished? Which rivers in your region have been channeled? How often does a regulated river overflow its banks?). Consider with the aid of the diagram how you, your friends, your family, your community or the federal government could use the Footprint to slow down, stop, or turn around the loss of biological diversity.

Man is increasingly competing with the rest of nature.

humans and wild living plants and animals will increase. The question will become: Who gets the fish – the sea lion or the human?

Can declining population trends in species be reversed?

If we wanted to put a full stop to human activities that lead to endangered and extinct species, we would need to make drastic changes in our living habits. It would likely require taking portions of land used by humans, and returning them to their natural state. It would also require changing our eating habits significantly. We would need to protect the most ecologically valuable regions, and we might need to prioritize ecosystem health over our own comfort.
Biological diversity is not equally distributed throughout the world. Many biodiversity hotspots lie in Central America and western Amazonia, in the Cape area of South Africa, and in the mountains and plains of East Africa. Other regions rich in biodiversity include the coastal regions and islands of the Mediterranean, Southwest China, and the bordering areas from Burma to Vietnam. Large parts of Madagascar also belong to this list, as do numerous islands in the Pacific and Indian Oceans.
When faced with the extinction of valuable biodiversity, is it sufficient to view the Earth exclusively as potentially productive area for humans? Or is our planet more than a source of raw materials for human consumption and a carbon dioxide sink for human waste? To enable sustainable development, scientists, politicians and members of civil society will have to take action, individually and collectively, to protect the Earth's diversity of ecosystems, genes and species, while maintaining a high quality of life for humans.

Suggestion for further work:
A mental game

Imagine that **people** and **biodiversity** are "playing chess". Both want "the fish", the ever decreasing natural resources.
Person: "I own land once I make it inaccessible for other species." (Fences are built, stone walls, etc.)
Biodiversity: "OK, then I will relocate to other areas."
Person: "There are even more of us and we need even more room. I am extending my area once again." (More fences, stone walls and infrastructure are built).
Biodiversity: "Then all my species will have to squeeze together." (Survival of species that require more space is increasingly threatened).
Person: "I still need more room for producing food, materials, and energy. My fellow humans and I are using much more energy than we used to." (The further demands of humans, the building of roads or hydroelectric plants, and the clearing of forests have separated some of biodiversity's retreats from each other).
Biodiversity: "Now I am losing species that are dependent on one another. Caterpillars need very specific plants to survive and now they are separated from them. But we were here first. We will have to encroach on your living space because we are running out of places to live." (Wild animals push into cities, insects "bother" the humans).
Person: "Humans have toxic sprays, traps and other methods to prohibit other species from invading our space."
Biodiversity: ....
Person: ....

Where do biodiversity and people go from here? How can they coexist and thrive without doing harm to one another? Play this game with someone in your group/class. The goal is not to overpower or eliminate the other, but to find solutions for the survival of both as resources grow scarcer and humans, wild plants and animals are forced to adjust. Competition is growing. For each strategy there is a counter strategy – who do you think has the better ideas? Is the human species the most flexible creature on Earth, or one of the least adapted? Think about the relatively short time humans have been on the planet, and about the smallest organisms that have existed since the Earth's formation.

How could we, despite the scarcity of resources, live well within the means of one planet?

Download the TEEB Interim Report: www.bmu.de/english/nature/un_conference_on_biological_diversity_2008/papers/doc/41608.php

Infobox:

The economic value of biological diversity: TEEB Study

Human life greatly depends on ecosystem services, which nature provides free of charge: clean water and air, forests and fishing grounds – all of which can regenerate. Although these services, known as biocapacity, have no monetary value, they are used and their resources are consumed. This lack of valuation in the financial sense contributes in the long term to an overuse of ecosystems, and to a loss of biological diversity. The 2006 Stern Report, written by a former Chief Economist of the World Bank, Sir Nicholas Stern, stirred up a lot of dust. For the first time, an economic expert shed light on the grave economic implications of climate change for the global community. In March 2007, then-German Minister of the Environment, Sigmar Gabriel, and the EU Environmental Commissioner, commissioned a similar study of the economic effects of loss of biological diversity. A highly respected banker, Pavan Sukhdev, Head of the Global Markets Department of the Deutsche Bank, was given the commission. In 2008, during the UN Conference of the Parties to the Convention on Biological Diversity in Bonn, the research team which he led published an interim report of the first phase of the Study, which will be completed in 2010. The report, The Economics of Ecosystems and Biodiversity (TEEB) reveals the dramatic consequences of continuing with "business as usual".

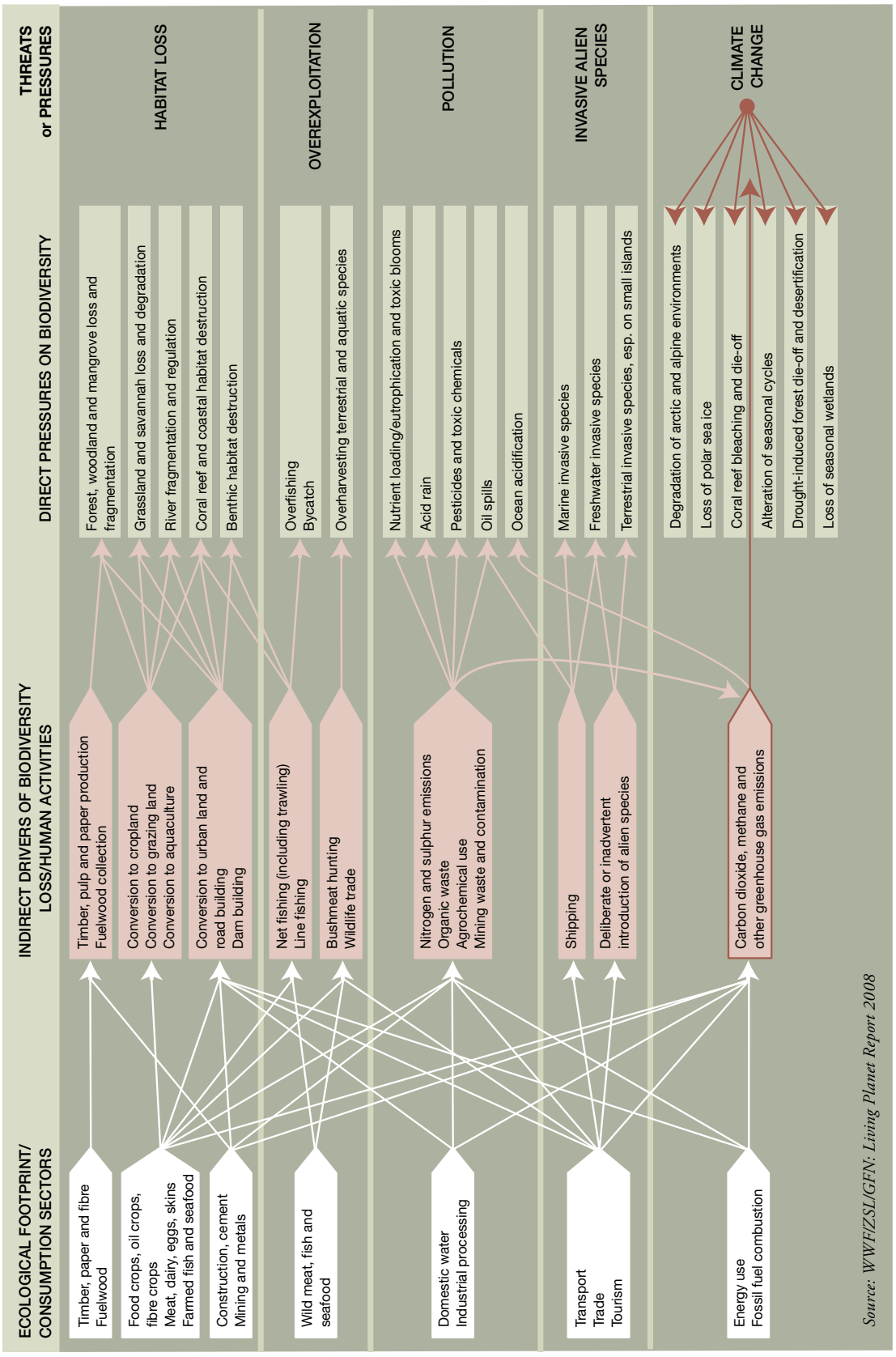
What do we risk when we continue current trends? By 2050, 11 percent of the remaining wild areas will be irrevocably lost through human interference; 40 percent of areas still used extensively will be used for intensive agriculture; and, up to 60 percent of coral reefs will disappear permanently through water pollution, climatic induced acidification, and invasive species.

Concrete estimates of the economic consequences have not yet been determined. Additionally, the researchers are tasked with highlighting the connection between biological diversity and the economic and social development of humanity. They are exploring a possible tool for the political and industrial sectors, which will enable decision-makers to factor in the preservation of species diversity in all stages of planning.

The approaches of the TEEB Study and the Ecological Footprint differ from one another primarily on one point: Whereas the Footprint views a purely bioproductive area as starting capital, independent of its biodiversity, TEEB focuses on this diversity in its economic contexts.

Source and additional information:
www.teebweb.org
www.bmu.de/un-conference2008
www.ufz.de/index.php?de=16828

Loss of biodiversity, human influence, and the Ecological Footprint



Source: WWF/ZSL/GFN: Living Planet Report 2008

If ecosystems are compared to a factory, then biological diversity is the assembly line which makes the production of natural capital possible. Biodiversity decline is strongly linked to increasing human demand of food, water, energy and materials. But what happens to a factory whose assembly lines are constantly being destroyed? When we understand the correlation between biodiversity and human action, then we can begin to slow down, stop, or reverse the loss of valuable ecosystems and living species.

Suggestions for further work:
The values of biodiversity

Can we place an economic value on a walk through nature? Or on a colorful meadow bursting with a variety of wildflowers? Even without a monetary figure, biological diversity definitely has value. Explore this idea from different perspectives: What values can biodiversity have? What value does it have for you, and for others? How do different cultural values play in?

A different approach: Let yourself be inspired by the following collection of biodiversity "values":

- Direct-use values (removal of material from nature such as timber, food or use for tourism)
- Indirect-use values (ecological services, such as protection from floods, carbon dioxide absorption)
- Option values (future generations should have the chance to decide the use of biodiversity – these will perhaps be functions that are totally unknown today)
- Cultural values (value placed on resources and landscapes that are independent of direct use through cultural, esthetic or other functions – i.e., sacred forests, totem animals, cultural landscapes)

How do you judge these categories? Find examples – if possible, from your own experience and surroundings – which confirm these different values.

On the next page you will be given different opportunities to calculate your own Ecological Footprint. How many planets would we need if all humans were to live like you? Check your results at www.footprintcalculator.org

Sub-national Footprint accounting: individuals, cities and businesses

How do we live, produce and consume?

The Footprint does not only quantify the availability and consumption of a country's natural resources, it also can measure sustainability at the personal, city, and institutional levels. There are a variety of ways to calculate a sub-national Footprint. Regional or municipal average per capita Footprints are calculated by scaling the national results up or down, based on the differences between national and local consumption patterns. This can be done using the "input-output approach" based on monetary, physical or hybrid input-output tables for allocated overall demand to consumption categories.

Sub-national Footprint accounting can raise questions about our personal actions, and it helps us make decisions for a more sustainable lifestyle. Tools, such as the Ecological Footprint personal calculator foster our creativity and test our personal consumption habits. Although national and regional policies are critical in building a sustainable economy, we as individuals can also make our mark: We elect our political representatives, choose our mode of transport, and we decide what products to consume. It is pertinent that we demand more sustainable actions from our decision makers, and ourselves, at communal, national and global levels.

In Part 5 of this brochure we will look further into national and global Ecological Footprint results. In the following text, we will examine the Footprint dimensions, calculation developments and case studies.

The personal Ecological Footprint

Do you have a car, and if yes, how much do you use it? How often do you eat meat products? In what kind of a house do you live? Is it a single-or multi-family dwelling? How much do you spend on electricity per month?

Such are the questions you will encounter when calculating your personal Ecological Footprint online. At the end of the quiz, you are presented with the number of global hectares needed to support your given lifestyle. This number is then converted into how many planet Earths would

Infobox:
Footprint calculator

There are many different Footprint calculators available, on vast numbers of Web sites. Whether you are a scientist, technician, foreign language enthusiast or a computer game aficionado, below you will find a Footprint calculator that suits your needs.

- The Global Footprint Network calculator is very user-friendly and is available for Australia, Canada, the United States of America, and Switzerland. Versions for Argentina, Brazil, China, Ecuador, India, Italy, Japan, Peru, South Africa, and Turkey are coming soon: www.footprintcalculator.org
- Austria's Ministry of Life produces a very detailed Footprint calculator, which advocates that the Footprint should become a basis for environmental protection throughout the country. Individuals can investigate their personal lifestyle and consequently correct actions that are harmful to the environment: www.mein-fussabdruck.at
- A variant of the Austrian Footprint calculator is customized to suit today's younger generation, getting them accustomed to resource-sparing behavior at an early age: www.footprintrechner.at
- Within the framework of Germany's Local Agenda 21, one can calculate his/her Footprint on the Darmstadt's city Web site: http://stadt.darmstadt.de/exedateien/da-erdenrechner.exe (executable file)
- Does your foot fit on this Earth? With the Footprint calculator of the BUNDjugend you can easily find out: www.latschlatsch.de

be needed if this same lifestyle was replicated by all of humanity. For an employed urban resident in Canada or the United States, the answer is three to four planets, or more. The results can be enlightening – and shocking. The quiz reveals that humanity is caught in a collective problem. The message of this tool is implicit: We have only one planet and we must find ways to live together within its means.

Personal Footprint calculators are usually based on Global Footprint Network's National Footprint Accounts data for selected nations. The national per-person Footprint can be allocated to different end-use categories (food, shelter, mobility, goods and services), and land types (forest, cropland, energy, fish, grazing land). This results in a matrix that uses a country's average consumption profile to distribute Ecological Footprint into these different categories.

Additional information: www.footprintnetwork.org/atlas

The personal calculator asks questions that increase or decrease different parts of this matrix, relative to national average behavior. For example, if a person indicates that they eat twice as much beef as the national average, their "beef" Footprint will double, which will be reflected in the re-calculated overall Footprint score. Likewise, someone who indicates they eat very little beef will receive a fraction of the national average beef Footprint, which will be reflected in a smaller overall Footprint.

A person's Ecological Footprint includes both personal and societal impacts. The Footprint associated with food, mobility, and goods is easier for you to directly influence through lifestyle choices (eating less meat, driving less, etc). However, a person's Footprint also includes societal impacts or "services", such as government assistance, roads and infrastructure, public services, and the military of the country that they live in. All citizens of the country are allocated their share of these societal impacts.

The Footprint of these societal impacts (i.e., the "services" category of your Footprint score) does not vary, and therefore in some nations it is not possible to reduce your Footprint to below one planet. This is why, if we want to achieve sustainability, we need to focus on two things: both our own lifestyle as well as influencing our governments. Even with significant changes in individual behavior, a large portion of a personal Footprint comes from the way national infrastructure is designed, goods are produced, and government and public services operate. In order to allow their citizens to achieve a lifestyle that fits within one planet, governments need to dramatically improve the efficiency of the built environment and invest in renewable energy and smart land-use planning. Faced with multiple economic and environmental challenges, society is becoming increasingly aware that we need international cooperation to find solutions that can provide a good quality of life for people, without compromising the ability of future generations to meet their needs. With multiple global crises including climate change, resource shortages, and the collapse of economic and financial systems, this awareness is growing among political decision makers. The attitude, to jointly explore trans-national solutions, was reflected in June 2009 when Chancellor Merkel proposed extending G8 proceedings, that only involve eight powerful high-income countries, to include states like China and India.

"In a global economy, wealthy urban centres get much of their supply from far away. They depend on ecosystems they have never seen. Hence, overused and failing ecosystems, even if distant, become a threat to the well-being of these very urban centres. Quantifying this relationship between consumers and ecosystems that support them is both politically and scientifically a demanding exercise. Yet it needs to be done."

Georgina M. Mace, Professor, Imperial College, London

Ecological accounting in cities and settlements

Let us select a random, modern city – for instance Berlin, London or New York. Above it bulges an overturned glass bowl. Nothing can penetrate this artificial biotope from the outside: no air or water, no food, no energy sources, such as oil or gas, any building materials, any stone or sand. It is completely sealed off. Even sewage, car exhaust and household garbage are locked up

Suggestions for further work:
How large is your Footprint?

- Calculate your own Footprint: How many planet Earths would we need if all humans lived like you?
- Think about what factors can increase or decrease an Ecological Footprint. You can use the land area explanations on pp. 21/22 to help you understand what components are used to calculate the Ecological Footprint. What are the most pragmatic and practical ways that you can begin to make your Footprint smaller?
- Compare the results of your Footprint calculation with that of your parents, your friends and your peers. Do you all have the same Footprint? Who is closest to 2.1 global hectares, the Earth's average amount of biocapacity per person – or perhaps even lower if we want to leave some space for other species?
- Do we have the ability to change our collective Ecological Footprint, as a community, a city, or a country? Who can influence this?
- Look at all areas of your lifestyle. Think about how you get to school, your computer, your cell phone or the things you throw away. If flying increases your Footprint, should you not travel to distant countries anymore? Or can you compensate for your Carbon Footprint in other ways? If so, how?
- Will we – without tangible financial or legal compulsion – limit our resource consumption (e.g., driving less)? Or should governments enact regulations, create incentives (e.g., through taxation)? Should these choices be left up to the individual, or should they be the responsibility of the state? Could you, as a minister, motivate people to act sustainably? What is in the interest of the nation? How important is it compared to fighting unemployment? Are there already movements and/or networks in your country or even your region that publicize sustainable lifestyles? How effective is their outreach? Do you have additional ideas for initiating campaigns that will engage people?
- Can you imagine leading a healthy, happy life with a drastically reduced Footprint? Research the case study on the Freiburg city area Vauban on pg. 45 and imagine your own life from this perspective. Could you function in your daily life without an automobile? What would change in your life if you were living in Vauban? Do you find the challenge exciting – or does it make you uneasy?
- What do we really need – as opposed to want?
- To gain perspective, compare the Ecological Footprint of an average Madagascan with that of someone in Brazil or Vietnam, and think about how the inhabitants of these countries would answer the questions of the Footprint calculators. What share could the "collective" Footprint of these countries have in the calculation of these peoples' personal Footprints? Learn more about this on the table on pp. 118 and 119, which provides quality of life data for these countries through the Human Development Index (HDI).

Distribute the roles:

Let's say you are a farmer from Saxony or the Black Forest: What does global ecological overshoot have to do with you? What is your contribution? Can you change something about it? What makes it hard for you to reduce your own Footprint? What may be opportunities? For you? For your community? For your country? And if you were a politician from Berlin: Do you want your country's population to consume less, or are you afraid that this would reduce economic growth and jobs would be lost? Or will we hurt the economy and jobs if we do not become sustainable? What political incentives could you create (taxation, subsidies, image campaigns, etc.)?
Consider different perspectives – the wholesale merchant in the export business, the welfare recipient, the single mother with four children, the self-made man who likes to travel abroad. Think about which interests each person represents. Put yourself into the different roles and discuss.

In the magazine "Konsumkultur" in the series "Aus Politik und Zeitgeschichte" (APuZ 32-33/2009), the German Federal Agency for Civic Education (Bundeszentrale für politische Bildung) talks about our consumer society, sustainable consumption patterns, and the new responsibilities of consumers: www.bpb.de/publikationen/ORDKRY

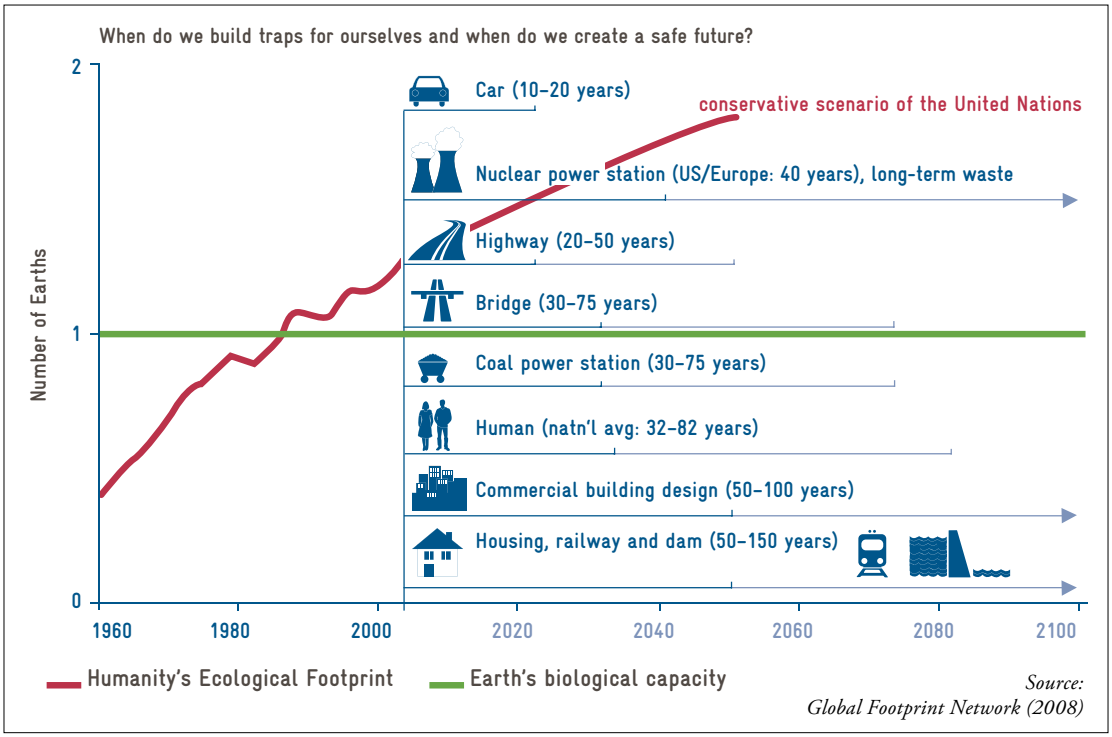
under the glass dome. Only sunlight has access to the futuristic city. With the sunshine a certain amount of energy enters – which is all there is to power the city.
Though hypothetical, this approach somewhat reflects that of the Footprint. How large must the glass dome be – how much farm land, how many forests and other areas must it encompass for the city to be viable? Of course one can't simply imagine each city in isolation. The areas from which urban centers import their resources are distributed across large parts of the world, and, in times of globalization, cities compete for the global supply of natural capital. A city which provides a comparable quality of life with a smaller per capita Footprint is also less dependent upon imports, and therefore more competitive.
If today the majority of people live in cities, then that is exactly where the future of civilization will be decided. The Footprint helps in adjusting infrastructure and urban planning for the future. Take traffic for example. As complex as discussions are about transportation and infrastructure, the Footprint can reduce the information to a single number each time: the required area. This is crucial when making investment decisions, be it for building roads, tracks, bridges, harbors or entire settlements. Infrastructure and planning decisions will shape the way residents live for years to come; the Footprint can help decision-makers balance the needs of citizens with a growing concern about the city's use of natural resources.

Additional information:
www.footprintnetwork.org/en/index.php/GFN/page/case_stories/#local

Case study: Berlin extends to the Baltic Sea
According to a study by Matthias Schnauss, the average Berliner needs 4.4 gha, about six football fields of biologically active land, to maintain his consumption level and to dispose of his waste. Berlin's population, in total, uses biocapacity that requires an area 168 times the city's size. This equals nearly half of the entire Federal Republic of Germany!
About a third of the Footprint of the average Berliner is spent on food (1.7 gha), which means that the food being consumed must be cultivated in a much larger area than is available in Berlin.

The Footprint of a city (in this case, Paris) is the measurement of the area needed to make the city viable. Thus, it is also suitable for use in urban planning.

To maintain the standard of living of its residents, the city of Berlin needs an area the size of half of Germany.



The Footprint is primarily useful as a planning tool when facing decisions concerning long-term investments. A highway has a lifespan of 20 to 50 years; nuclear power plants in the USA and Europe are in operation for about 40 years – and produce long-term, radioactive waste. A person born in Germany or the USA has a life expectancy of 75 years or more. In the course of a lifetime he will experience the consequences of these investment-decisions taken.

Living space is measured on a similar scale (1.4 gha per capita). Considerably more than half of the per capita Footprint originates through carbon dioxide emissions, i.e., through the energy used for transportation, manufacturing and heating. A great potential for energy efficiency can be deduced from these numbers. For instance: the Footprint of a normal Berlin rental property could be reduced by approximately four global hectares by insulating its facades. That is an area the size of the Nicolas Lake in the district of Zehlendorf – for one single house.

Comparing the results for different forms of transportation is especially compelling. Someone who uses the subway to get to work requires 200 times less area than someone who sits alone in his car. In other words, there is considerable room for making Berlin more livable and more competitive internationally through improving the technical aspects of its buildings, urban planning and infrastructure design.

Materials of Local Agenda 21 Berlin

Materials in the form of PowerPoint presentations, overhead foils, accompanying text, and calculation tables can be downloaded at the project's Web site (www.agenda21berlin.de/fussabdruck) Concrete action recommendations for a reduction of the Ecological Footprint are communicated in a user-friendly way through the character Öfi, the Ecological Footprint of a Berlin inhabitant. Öfi requires 4.4 gha to support his lifestyle, and wants to reduce his "weight" on the planet. He does this by "eco body shaping" (well-directed fitness training), which trims his figure.

Additional Information: Schnauss, M. (2001)

Case study: BedZED – heavenly residential and living forms

Beddington Zero Energy Development (BedZED) is the UK's largest mixed-use sustainable community. It was designed to create a thriving community in which residents could enjoy a high quality of life, while living a "One Planet" lifestyle. The three-story construction comprises 100 living units with southern exposures, offices facing north, exhibition areas, and a kindergarten. BedZED's design is regarded as a successful model

BedZed is an "affordable, attractive, and resource efficient" residential and office project in South London. The colorful roof spires are part of the highly efficient ventilation system. Air exchange uses renewable energy: the wind.

for an affordable, attractive, resource-friendly living complex. The facility boasts a lot of glass and color, as well as innovative architectural designs, including grassy roofs.
The design principles for the project were as follows:

- Zero energy – The project was designed to use only energy from renewable sources generated on site. Tree waste fuels the development's cogeneration plant to provide district heating and electricity.
- Energy-efficient – The houses face south for maximum solar gain, are triple-glazed, and have high-thermal insulation.
- Water-efficient – Most rain water falling on the site is collected and reused. Appliances are water-efficient and use recycled water when possible.
- Low-impact materials – Building materials were selected from renewable or recycled sources within 35 miles of the site, to minimize the energy required for transportation.
- Waste recycling – Refuse-collection facilities are designed to support recycling.
- Transport – The development works in partnership with the United Kingdom's leading car-sharing operator, City Car Club. Residents are encouraged to use this environmentally friendly alternative to car ownership; an onsite selection of vehicles is available for use.
- Encourage eco-friendly transport – Electric and liquefied-petroleum-gas cars have priority over cars that burn petrol and diesel, and electricity is provided in parking spaces for charging electric cars.

"It is not original, but it works", said Bill Dunster, the architect. His philosophy is that an ecological lifestyle should be attractive.

Case study: Vauban – living ecologically in southwestern Germany

The Freiburg district Vauban is very similar to UK's BedZED. The city supports car-free living; there are a variety of convenient public transport connections, car sharing, a bicycle store and repair shop. With an automobile density of about 150 cars per 1,000 residents, this part of the city lies significantly below the national average of 450 cars per 1,000. More than half of the residents sold their cars when they moved to Vauban.
Low-energy building methods with less than 65 kWh/m² per year are mandatory for all building projects in the area. For many home builders, this is not enough and there are also houses with improved low energy techniques, and passive and plus-energy houses. In the eastern part of the quarter, a solar settlement was built with 148 flats. The district heating comes from a station fired with wood pellets for the cogeneration of heat and power. Rainwater is collected for toilet flushing, clothes washing, and for watering plants, among other purposes.
The stores of the quarter offer regional and ecological products. There are diverse leisure facilities, an elementary school, three child-care centers, an after-school care center for school children, and various associations and forums dedicated to ecological issues. Even nature doesn't come up short: Besides extensive green areas and a large stand of mature trees, the village brook has proven to be an especially valuable biotope.
On May 11, 2009, this part of Freiburg was featured on the front page of the New York Times. In the Article "In German Suburb, Life Goes On Without Cars" Elisabeth Rosenthal describes Vauban as "maybe the most advanced experiment in low-car suburban life."

Case study: Cooling with the sun – regenerative energy production in Masdar City

The per capita Ecological Footprint of the United Arab Emirates (UAE) is currently the highest in the world, at 9.5 gha per person. As part of UAE's sustainability strategy, it created Masdar City which is an eco-city currently in the construction phase.
The city, billed as the world's first car-free, zero-carbon, zero-waste urban community, will ultimately house 1,500 clean-tech companies and 50,000 residents. The streets and buildings are designed to funnel hot desert air upward, creating breezes to cool the city, and concentrating heat in wind tunnels to be sent to the onsite desalinization system. This synergistic design will reduce the energy needed for air-conditioning and the production of fresh water. Processed water will be used to maintain green areas within the city and farming acreage in outlying areas. The city will use 100 percent renewable energy, much of

Sources and additional information:

- www.freiburg.de/servlet/PB/menu/1167123_l1/index.html
- www.werkstatt-stadt.de/de/projekte/54/
- Rosenthal, E. (2009)

Additional information:

- www.zedfactory.com
- www.bioregional.com

Masdar City: The ecological future of the United Arab Emirates?

it generated onsite. A train connects Masdar City with the capital of the Emirates, Abu Dhabi. The city will encourage foot transportation and an all-electric, automated personal rapid transit system will ferry people around. This pioneering, CO_2-neutral city is expected to be completed in 2015. It was designed by the British architect Lord Norman Foster.

Additional information:
- www.masdarcity.ae
- www.oneplanetliving.org

Suggestions for further work: The Footprint in your city?

- Now you have a general picture of how the Ecological Footprint can be used to develop sustainable cities. Imagine that the city council in your city convenes and considers whether to build a new beltway or invest otherwise. How could the Footprint influence communal policy decision-making processes?
- In your opinion, which urban planning measures are sensible for the "city of the future"? What would an ideal residential environment look like? What criteria are important to achieve this?
- Imagine being an architect: You are being offered a large sum of money to create an original plan that will reduce a specific Footprint (of a building, a development, etc). Besides the measures already mentioned, what other creative ideas do you have?

The Footprint in the economy: companies and products

The Footprint motivates individuals to reconsider their consumption and mobility habits. It is an important tool for planning investments in cities and settlements. To what extent can it influence commercial enterprises in developing more sustainable business models, or affect the production of their goods and services?

Case study: Small Footprint – high-profitability shopping centers in Australia

Real estate firm GPT Group is focused on the ownership, management and development of Australian real estate. GPT is active in several locations including, the USA, UK and Europe. The company was interested in adopting a standardized method of measuring the environmental impact of its properties. They wanted to meet operational

sustainability targets of 20 percent impact reduction by 2009 for its retail division.
Specifically, GPT asked for the ability to compare the impact of different buildings and interior design choices during remodeling.
To meet this need, Global Footprint Network worked with the company to develop a calculator that GPT's tenants use as a required part of the leasing process. Using detailed raw materials data for different categories of stores (fashion retailers, restaurants/food vendors, etc.), Global Footprint Network developed specific and easy-to-use questionnaires that calculate the Footprint implications of different design choices and encourages its tenants to select low-Footprint elements for their shop.
The retail calculator developed for GPT provides a tangible, standardized metric by which the impact of different possibilities can be compared. It translates commercial design elements into detailed accounts of material use and waste generation, and leads to cost and impact saving solutions. The calculator allows GPT to identify target areas for major ecological performance improvement and has allowed the company to measure progress towards its sustainability goal in terms of Footprint reductions.

Case study: Business Vision 2050

The World Business Council for Sustainable Development (WBCSD), an organization that represents many of the world's most influential corporations, has launched Vision 2050 to identify the pathways toward a one-planet economy in the next four decades.
Global Footprint Network participated in a yearlong process to provide a framework for thinking about resource constraints, as well as to quantify whether the proposed pathways and scenarios are robust enough to achieve a one-planet economy by 2050.
In collaboration with companies such as Boeing, Syngenta and Weyerhaeuser (which are providing data on energy, cropland efficiency and forest productivity, respectively) Global Footprint Network developed a calculator to test whether the solutions and innovations proposed by the group of 35 participating companies are up to scale with the level of change needed.
The emerging consensus was that the pathways toward a sustainable world will require fundamental changes in governance structures, economic frameworks, business and human behavior. The companies found that not only are these changes necessary, they are feasible and offer tremendous business opportunities for those companies that incorporate sustainability into their strategies. For example, companies can develop new green products and energy technologies that humanity will need in the future.

The mission of the World Business Council for Sustainable Development

"Our mission is to provide business leadership as a catalyst for change toward sustainable development, and to support the business license to operate, innovate and grow in a world increasingly shaped by sustainable development issues."

Sourcees and additional information: www.wbcsd.org

Case study: Business and Biodiversity

Under the catch phrase "Biodiversity in Good Company", the German Federal Ministry of the Environment launched the initiative Business and Biodiversity in 2008. Since then over 40 companies from all over the world have joined this campaign, including companies such as Volkswagen, Bionade, Fujitsu and MARS.
With the signing of the Leadership Declaration companies have voluntarily committed to better protect nature and to contribute to the preservation of biological diversity. This is not about the perfect company, but about companies who are ready to join in a process of being more active in nature conservation. The process is not always easy and presents companies with great challenges. That is why they are being supported by this initiative, which is being carried out by GTZ on behalf of the Ministry of the Environment, by, among other things, the creation of a manual for corporate biodiversity management. This practical guidebook provides companies with a simple and easy to use entry into the topic of biological diversity. In the process, nature conservation is always linked to business objectives. For instance, more efficient production can not only spare resources and nature but also costs – which is totally Footprint minded.

Additional information: www.gpt.com.au

For more information on the topic of Business and Biodiversity and the initiative: www.business-and-biodiversity.org

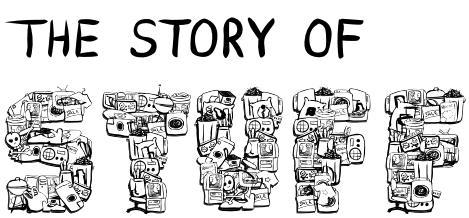
Additional information:
www.wzw.tum.de

Case Study: Tell me what you eat and I'll tell you who you are...

Nutrition contributes substantially to human resource consumption. A working group at the Technical University of Munich is working on the question of how we can organize our food supply to be as nature-compatible and resource-friendly as possible. Cross border trade with products and the global impact of our dietary habits make a global view necessary. From an ecological standpoint, central issues are: climate, area requirements for food production, e.g., for maintaining specific dietary customs, as well the virtual water contained in products (see Infobox on page 31). As part of the research activities, the Ecological Footprint is used to calculate the area necessary for the production selected food products.

The film "The Story of Stuff"

Every product has its own story. It begins with the removal of raw materials and continues through an entire manufacturing process, including distribution of the finished product. Every product story peaks when we make our decision to buy it, and then consume it – but it certainly doesn't end when the packaging is thrown away.
Annie Leonard gives us a behind-the-scenes look of product stories in her fast-paced short film The Story of Stuff. The film, which is full of both humor and facts, gives us a chance to understand the social and ecological consequences of our purchasing decisions. The English language version is available on the accompanying DVD or can be downloaded at these Web sites:



- www.storyofstuff.com (Original English version)
- www.storyofstuff.com/international/ (Original English version with subtitles)
- www.utopia.de/wissen/bildungsluecken/the-story-of-stuff (dubbed in German)

Suggestions for further work: A product passport for better guidance?

Perhaps it will soon be easier to find out how much biocapacity is needed to produce the food you eat every day for breakfast, lunch and dinner. A network of different non-government organizations and research institutes (the TU Munich, Greenpeace Hamburg, the Plattform Footprint Austria, the University of Augsburg, the Wuppertal Institute, fleXinfo, i.a.,) is committed to having such information appear on different products. This "product passport" of sorts can function like the information on energy efficiency, obligatory in Germany for many electrical devices, and make sustainable consumption easier for the consumer.
What do you think of this idea? What could such a product passport look like? Would it be as helpful as the nutritional information posted on food products? Would you take the time to study this additional label or table information before putting an article in your shopping cart?

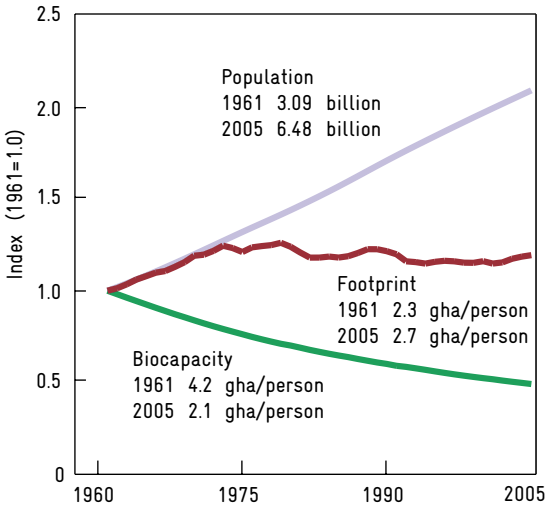
The condition of our planet

What can the Footprint tell us about the condition of Earth as a whole? Does it take a position on global questions of justice? Does the indicator convey underlying messages for high-income and low-income countries?
As mentioned, humanity probably first went into overshoot in the 1980s. Before that time, the global community consumed resources and produced carbon dioxide at a rate consistent with what the planet could produce and reabsorb.
By the mid 1990's humanity was already using approximately 15 percent more resources in a year than the planet could supply. The following tables and country comparisons reference the timeframe 1961-2005. Since the year 1961, the United Nations has published complete data records for more than 170 countries, which document not only harvest yields but also import and export data. Footprint data in this brochure referes to the "2008 edition" which uses data from 2005. Every two years footprint data is updated by means of improved methodology.
As human population continues to increase, the more land and water area is needed to produce the

Suggestions for further work:
How has the condition of our planet developed in the past 50 years?

One can extract much information from the small table and from the graph on this page. Consider the following:

- When you calculate the percentage growth of the total Footprint (in millions gha) compared to that of the world population, your Footprint result will be higher. Why is this case? (Hint: Think about your grandparents on pg. 25).
- Can you imagine why the total biocapacity increased globally, but decreased per capita?



Source: WWF/ZSL/GFN: Living Planet Report 2008

Global development of population, biocapacity, and Footprint (per capita values).
For a direct comparison of global data with those of high-, medium-, and low-income countries, these graphics are printed together on pg. 27 of the WWF Living Planet Report 2008 (available as a PDF File on the accompanying DVD).

	1961	2005	Change from 1961 to 2005
World Population	3.09 billion	6.47 billion	+ 109%
Footprint	6,974	17,444	+ 150%
Biocapacity	13,011	13,361	+ 3%
Deficit (-) or Reserve (+) (in millions gha)	+ 6,037	- 3,900	
Footprint	2,3	2,7	+ 19%
Biocapacity	4,2	2,1	- 51%
Deficit (-) or Reserve (+) (in gha/per capita)	+ 1,9	- 0,6	

Sources: Ewing, B. et al. (2008): The Ecological Footprint Atlas; WWF/ZSL/GFN: Living Planet Report 2008;
www.footprintnetwork.org/en/index.php/GFN/page/world_footprint/

The condition of our planet: global ecological accounting (1961 and 2005).

Infobox:
Concepts and terminological discussions on "developing countries", emerging countries and low-income countries

There is no official definition of a **"developing country"**. Traditionally, development specialists associate the term "developing countries" with low living standards, specified by the following characteristics:

- insufficient food supply for large population groups,
- poor health conditions across broad levels of the population,
- insufficient educational opportunities,
- high unemployment,
- often also: extremely unequal distribution of available goods and services.

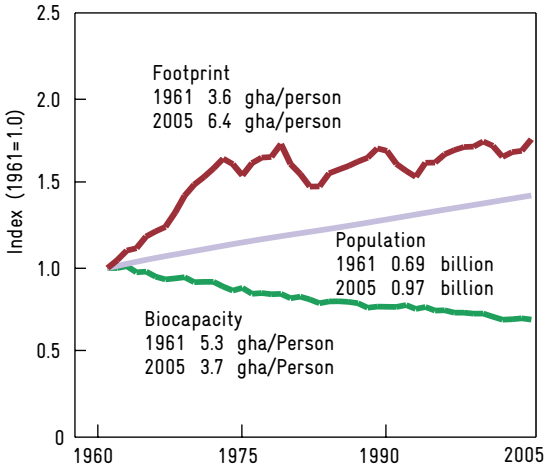
This can correlate with low income – but not always. Therefore, focusing development mainly on increasing income levels can be counterproductive to other aspects of human wellbeing, for example, the need to protect the resource base. This is clearly documented in several newer studies of international relevance, i.e., the French President's "Stiglitz" report, which analyzes the shortcomings of focusing policies on GDP alone ("Stiglitz Report" is formally called "Report of the Commission on the Measurement of Economic Performance and Social Progress"). Still, most official documents, including UN publications continue, to use the terms "developing and developed" countries.
More and more people are beginning to question the use of the term 'developing country' since it is based on an outdated development model. It implies that the goal for all countries is to become like Germany or the US ("developed countries"). But if the entire human population followed their development model, we'd need three to four planets. Further, "development" is often confused with economic growth.
Real development, however, means improving people's well-being in lasting ways. When you look at it from this perspective, Germany and the US have huge development needs since their level of resource demand cannot be sustained. In other words, the distinction "developing" and "developed" countries may have outlived its usefulness and may even be counterproductive.
For the purpose of comparison, it can be useful to instead, categorize countries according to their income levels. For instance, "low income country" is a description, based on measurable levels of GDP, while "developing" can sometimes be used as a judgment, based on certain conceptions about what is supposedly superior or inferior.
In the context of public development cooperation (Official Development Assistance, ODA), the income-based country listings of the Development Assistance Committee (DAC), and the OECD (Development Committee of the Organization for Economic Cooperation and Development) are used. Like the World Bank, the DAC uses per-capita income to determine classifications for countries. For instance, the latest DAC list contains 61 countries with low per-capita income, 47 countries with lower-middle per-capita income, and 43 countries with upper-middle per-capita income.
Some low-income countries have also been called "Least Developed Countries" (LDC), a category introduced by the United Nations in 1971. These countries with persistently low per-capita income and extremely low human health levels receive significantly more favorable terms in cooperation with the United Nations than other countries. Differences, however, do exist between the World Bank's and DAC's country categorization. They emerge because the World Bank updates its list every year, whereas the DAC list is revised every three years. Additionally, the World Bank considers only those countries having more than 30,000 inhabitants, while the DAC list also contains smaller island states, but lacks countries with which there is no development cooperation (e.g., Russia).
A number of countries with middle per-capita income, such as Brazil, China, India, Mexico, or South Africa, are sometimes called **"emerging countries"**. This conveys to their rapid industrialization. The two essential criteria for calling a country "emerging" are its relative economic size and its rising per-capita income.
The concepts **"partner country"** and **"anchor**

Sources and additional information:

- BMZ (2009): Medienhandbuch Entwicklungspolitik 2008/2009, pp. 447.
- www.bmz.de/en/countries (List of partner countries of the Federal Republic of Germany)
- www.oecd.org/dac/stats/daclist (DAC-List of developing countries)
- www.stiglitz-sen-fitoussi.fr/en/index.htm

country" are often used in German development cooperation. The term "partner countries" refers to states with which the German government directly cooperates on financial and technical projects through governmental agreements. "Anchor countries" play a pivotal role in the economic and political stability in their regions, and increasingly help shape international norms. In the face of global challenges such as climate change, resource degradation, and sustainable development, their voices are becoming more important. Important anchor countries for Germany development cooperation include China, India, Indonesia, Pakistan, Egypt, Nigeria, South Africa, Brazil, and Mexico.

resources it consumes and to absorb its waste. As we all know, however, the size of the planet does not increase; therefore, resources grow increasingly scarce. In a world of growing resource constraints, development that ignores ecological limits simply will not last. For a time, wealthier countries may be able to obtain increasingly expensive resources by importing them from other countries. Less wealthy countries will not have this option, and may need to depend more on their own biocapacity. But globally, when humanity's Footprint exceeds the planet's biocapacity, buying our way out is not an option, as there is no one else with whom to trade. The result of this overshoot is two-fold: an accumulation of wastes such as carbon dioxide in the atmosphere, and the liquidation of ecosystem stocks (trees in the forest, fish in the ocean) that have gradually amassed over time. In this chapter countries are divided into those with high, middle and low incomes, based on data from Global Footprint Network and the Living Planet Report, as well as the income threshold values of the World Bank in respect to their gross national incomes. For example, Japan represents a high-income country; Mexico, middle-income; and Mauritania, low-income.



Source: WWF/ZSL/GFN: Living Planet Report 2008

Time series of per person Footprint, per person biocapacity, and population in high-income countries (indexed against 1961).

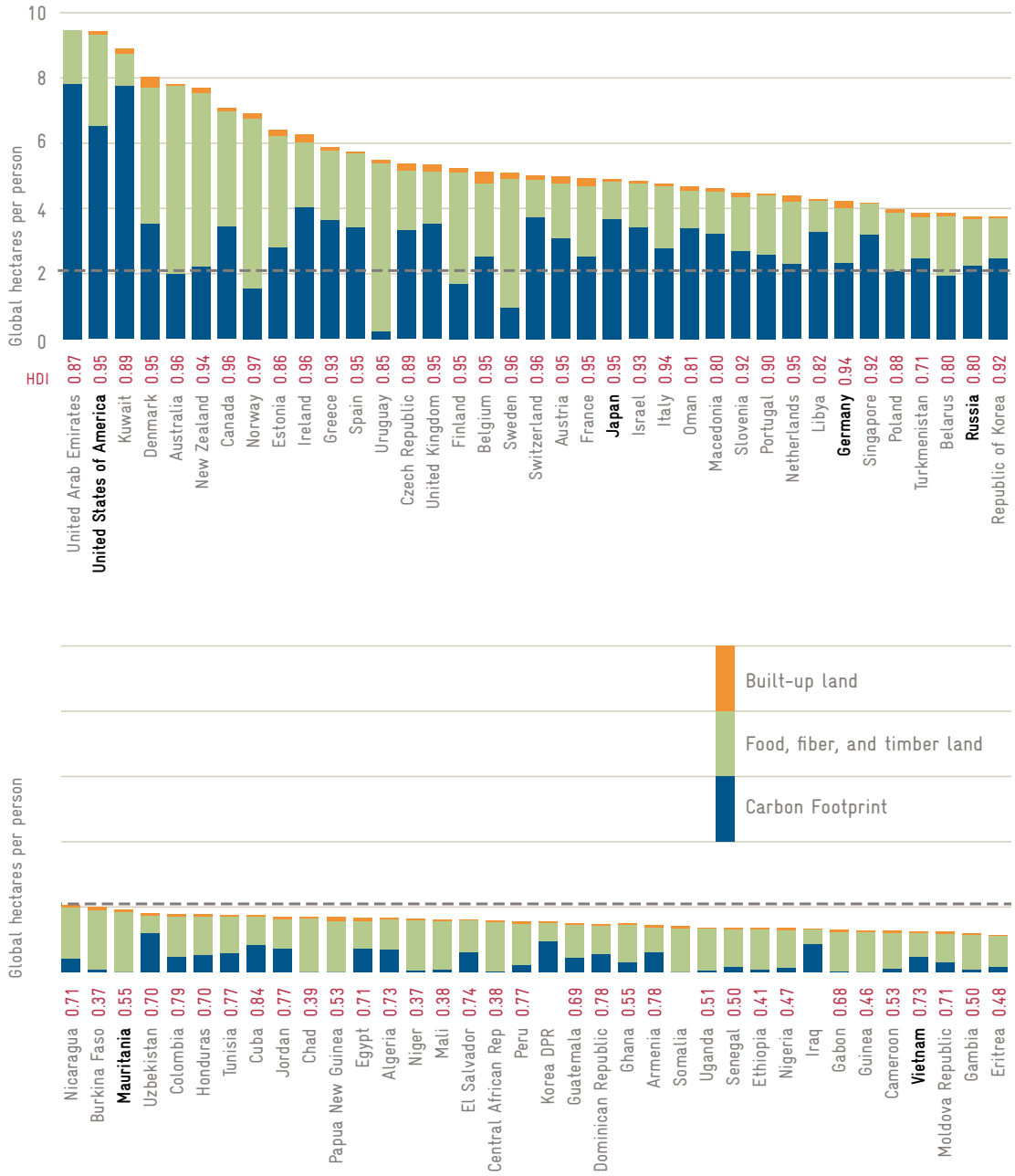
"Prosperity" in high-income countries

High-income countries generally have a high rate of resource consumption, far exceeding the global average Footprint of 2.7 gha per person. In Europe, the demand for biocapacity is twice as great as the region's supply. In Footprint terms: The average European biocapacity (supply) is 2.3 gha per person, while the average Footprint (demand) is 4.7 gha per person. In the global context, Europe's population (to be exact, the

Source:
www.worldbank.org

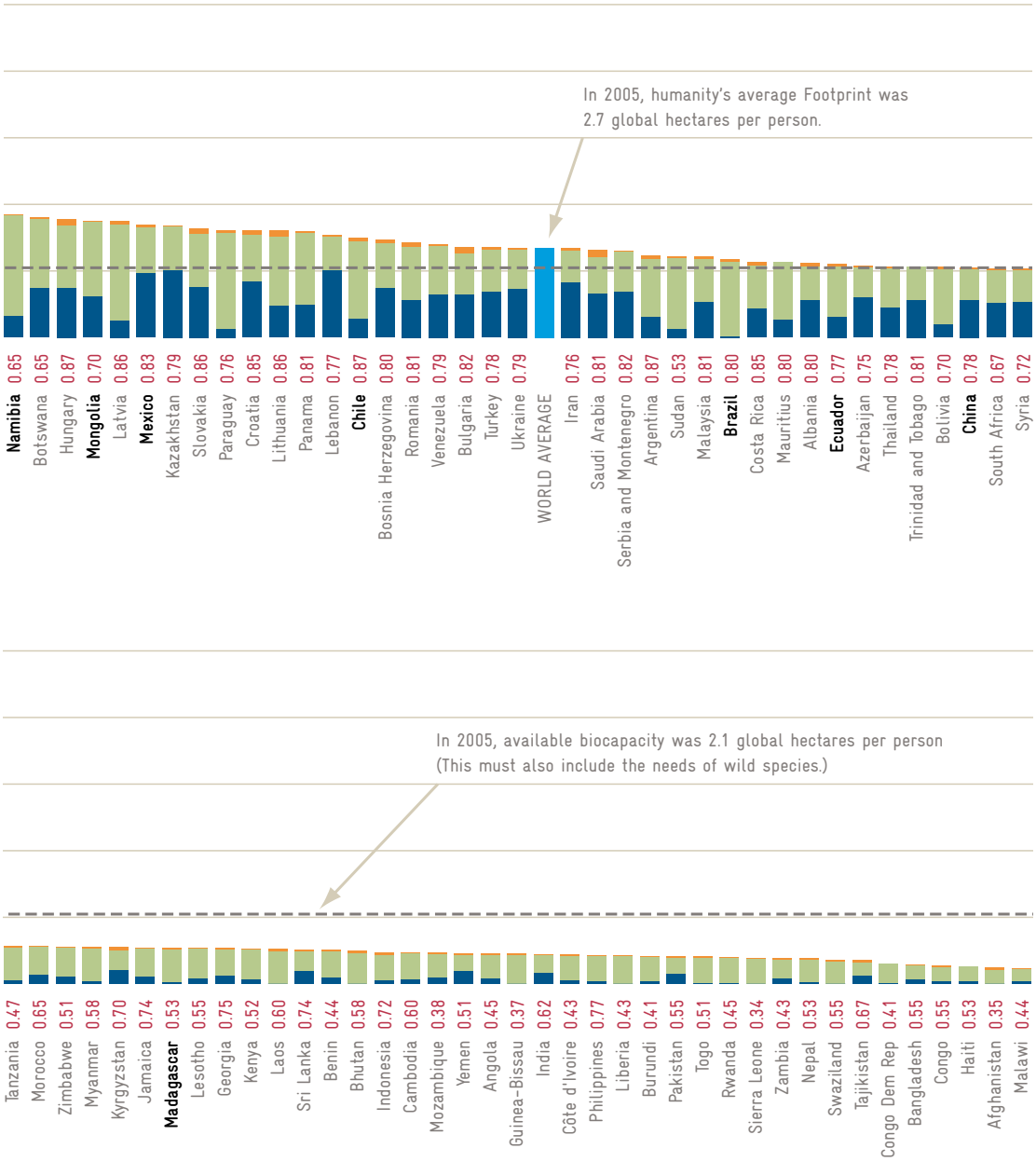
Although population growth in most high-income countries (apart from the US) is comparatively slow, these countries are placing increasing demands on the biosphere. The cause is the rise of the per person Footprint due to ever higher levels of consumption and more energy intensive lifestyles of the people living there.

The Ecological Footprint of nations (per capita, 2005)



Who has the largest Footprint? In which country does the Carbon Footprint play a large role, in which a secondary role? Who's lifestyles are replicable world wide considering the natural limits of our planet? Who has already passed over the threshold to a "high human development" with a Human Development (HDI) value of over 0.8?

The graph (2005 data) also displays the international Footprint rankings of the countries presented in Part 6 (**boldface**).



Source: Global Footprint Network (2008)

A PDF Template for large format print of the graph (in German and English) is available on the accompanying DVD.

population of the European Union with its 27 member states) uses just short of 17 percent of the biocapacity available worldwide, while containing just over seven percent of the world's population. The average Footprint of an American is 9.4 gha, approximately twice as large as that of a European. Consider the many suburban developments in North America. The daily routine for many of its residents include driving a single occupant car through traffic in the morning and returning home every evening. All this has a price, whether measured in Dollars or by Footprint. The case studies following page 42 show there are alternatives to this routine.

Almost more critical and alarming than the actual numbers, is the rate at which the per

Suggestions for further work:
What can governments prepare their country for a resource-constrained future?
How will they secure human wellbeing without depleting their ecological assets?

Imagine you are the environmental minister of your country. Together with your fellow cabinet members you are developing a blueprint for the future. You want to offer people the opportunity to live satisfying, prosperous lives. But maintaining this standard of living may mean going into ecological deficit. Running such an ecological deficit in a resource-constrained world is becoming an increasing risk factor, and as economists now ponder about the optimal inflation or unemployment rate, each region may need to consider what its optimum resource consumption is.

How can you convince your fellow cabinet members to take resource issues seriously? How can you make the case that managing resource demand is core to securing human well-being? What kind of counterarguments might they throw back at you (ministers for health, economy, energy, foreign affairs, or defense)?

If you accept ecological constraints, then, logically, every population, whether for a project, a region or a country, has to determine for itself what its ideal or optimal resource consumption is. Too low of a consumption rate can lead to inadequate food, shelter and health services. Too high of a consumption rate can put the population at risk since ecological deficits in a world with significant ecological overshoot will become an increasing liability to economies.

Optimal resource consumption depends therefore on three factors any region needs to consider: How much biocapacity does your region have? How much is there in the world? What is your purchasing power compared to world average? If the region's purchasing power is below the worldwide average, then it is unlikely the region can maintain a positive biocapacity trade balance. Countries with low purchasing power will not be able to access more biocapacity from elsewhere. Instead, countries with higher purchasing power may be drawing resources from the region. Managing resources is not so different from managing finances.

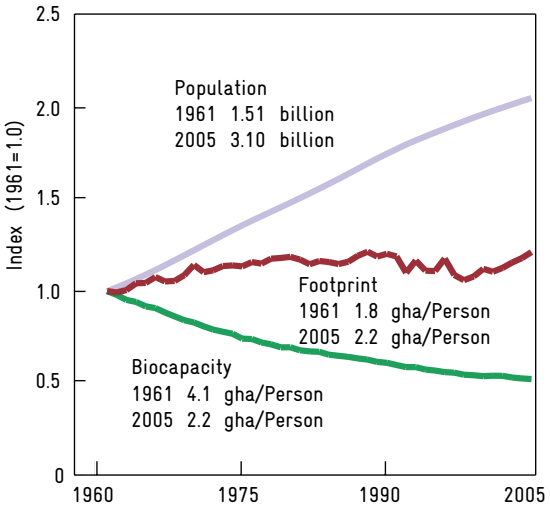
- What do you think is the optimal resource consumption for your country?
- Do you believe your arguments could scare off voters? Or does a new orientation offer even more attractive perspectives for certain groups?
- Could the current financial and economic crisis provide you with opportunities to suggest and pioneer new, more sustainable development paths? Have you heard about UNEP's New Green Deal in this context? Do some research about this.

Perhaps it is helpful for you to think about and note down the interests of the different political departments or ministries and collect ideas as to what extent a smaller Footprint would support these interests, or at least not work against them.

For related exercises: check the planning games developed by the co-author of the study of the Club of Rome, Dennis Meadows, for instance Fishbanks, the limits of our economic growth. In Strategem, you, as cabinet minister of a country, are challenged to make ecologically responsible decisions.

Additional information:
- www.ed.gov/pubs/EPTW/eptw7/eptw7d.html
- www.bpa.gov/Corporate/KR/ed/step/fishing_game/fishing.shtml

capita Footprint grew in high-income countries between 1961 and 2005. This increase (by almost 80 percent to 6.4 gha per person) is due mainly to a nine fold increase in the Carbon Footprint. Parallel to the increase in resource consumption, biocapacity per person in high-income countries has steadily decreased since 1961 by about one third. With 3.7 gha per person, it is almost half as small as these countries' per capita Footprint. Most of these industrialized nations, therefore, have a significant ecological deficit. There are three ways to compensate for a deficit: 1) by drawing down domestic ecosystems, 2) net-importing biocapacity from elsewhere, and 3) relying on ecological services from others, such as depending on tropical rainforests for sequestring the country's CO_2 emissions or fishing international oceans.



Source: WWF/ZSL/GFN: Living Planet Report 2008

Time series of per person Footprint, per person biocapacity, and population in medium-income countries (indexed against 1961).

An economic boom in middle-income countries

Explosive economic growth and a steep increase in the consumption of fossil energy and natural resources characterize some middle-income countries; including many so-called "emerging countries" (see Infobox, pg. 50). The problem is that when many people raise their demand for biocapacity – even slightly – the overall impact can be significant.

Many of these countries, such as Mexico, Brazil and Chile, are in **Latin America**. In 2005, the average Footprint of a Latin American was 2.4 gha per capita, slightly below the global average of 2.7 gha. The extensive tropical forest of the Amazon Basin is reflected in the high biocapacity value of the region (4.8 gha per capita, on

In medium-income countries, such as China, both population growth and an increasing Footprint contribute to growing demands on the biosphere. In 2005, medium-income countries had a 39 percent share of the global Ecological Footprint.

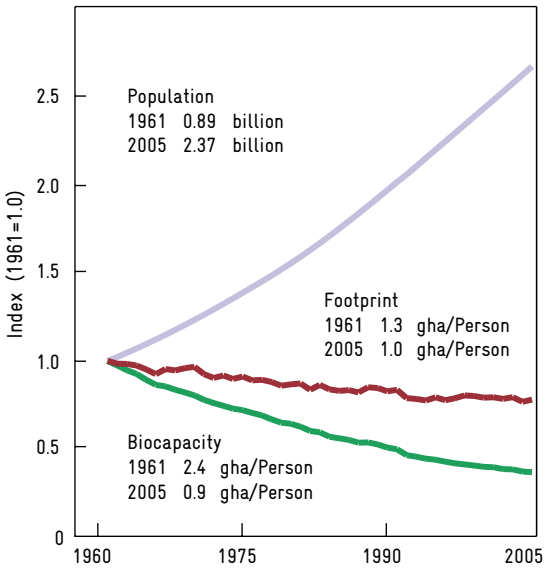
average); Brazil, Peru and other Latin American countries are therefore still ecological creditors, with more biocapacity than Footprint. The Amazon forest functions as an important CO_2 sink, i.e., sequestering atmospheric CO_2 in plant tissue and providing freshwater. The Amazon Basin is considered to be a biodiversity hotspot, with an enormous wealth of species, whose overall value remains largely undiscovered. It provides various indigenous cultures with living space and livelihood. Protection of these unique tropical forest areas will help to ensure the well-being of these indigenous peoples and other local communities, offer opportunity values to future generations, and help mitigate global climate change.

In recent decades the **East Asian-Pacific Region** has experienced dynamic economic development and large population growth; 55 percent of the world's population lived in this region in 2005. The per capita Footprint of an Asian inhabitant increased only minimally during the past decades and, at 1.6 gha, is still considerably lower than the world average. Slight increases in demand add up, of course, especially when total population numbers steadily rise. At the same time, disparities in consumption standards are increasingly visible. Australia and Japan do indeed have some of the highest per capita Footprints in the world.

The population of China has doubled since 1961; every fifth inhabitant of the Earth is Chinese. In the early 1960s, China's per capita Footprint ranked 114th in the international listing. It now ranks 74th. As a consequence, the country currently demands more than twice as much biocapacity as its own ecosystems can supply, i.e., it needs an area equivalent to "two Chinas" in order to satisfy human demand. Even though the per capita Footprint of a single Chinese is smaller than world average at 2.1 gha, given the country's population, there is only one country on Earth that demands more biocapacity in absolute terms than China, and that is the United States.

Additional information: WWF (2008): Hong Kong. Ecological Footprint Report 2008 (available as a PDF file on the accompanying DVD).

Time series of per person Footprint, per person biocapacity, and population in low-income countries (indexed against 1961).



Source: WWF/ZSL/GFN: Living Planet Report 2008

> **"I have the dream that one day regions will not only report on their economic performance, but also on the happiness that this activity generates for its citizens. And furthermore – that one day regions will also report on the burden they place on nature while achieving this human happiness."**
>
> **Professor Jorgen Randers**, Norwegian School of Management, coauthor of the Club of Rome study of the condition of man: "Limits to Growth"

The growing gap between rich and poor

People in many low-income countries have smaller Ecological Footprints today than in 1961, meaning they are demanding less biocapacity per person. Many developing countries fall far below the 2.1 gha per person mark, the average amount of biocapacity globally available per capita. This discrepancy can be explained by the growing population of these countries. When the population grows, there are fewer natural resources available to each individual. In less than 50 year's time (the period during which Ecological Footprints are calculated) available per capita biocapacity has decreased by approximately one-third.

Africa: This diverse continent provides the starkest contrast to the profile of high-income countries. Due to its bioproductive tropical forest areas and its small average per capita Footprints,

Infobox:
***Happy Planet Index* (HPI)**

The HPI is an innovative measure that shows the ecological efficiency with which human well-being is delivered around the world. It is the first ever index to combine environmental impact with well-being to measure the environmental efficiency with which country by country, people live long and happy lives.
The index was introduced by the New Economics Foundation (NEF) in July 2006. The HPI is based on general utilitarian principles – that most people want to live long and fulfilling lives, and the country that is doing the best is the one that allows its citizens to do so, whilst avoiding infringing on the opportunity of future people and people in other countries to do the same.
The concept of gross national happiness, which the King of Bhutan coined in a 1972 interview, was scientifically developed further, made quantifiable, and supplemented with an index number for the sustainability of resource utilization. HPI expresses how many happy life-years are squeezed out of each hectare of Ecological Footprint. Therefore the HPI is calculated by dividing longevity, adjusted by average subjective, by Ecological Footprint per capita numbers.

$$\text{HPI} = \frac{\text{Life Expectancy} \times \text{Life Satisfaction}}{\text{Ecological Footprint}}$$

While life expectancy can be derived from international population statistics and the Ecological Footprint is available from Global Footprint Network, life satisfaction (subjective human well-being) does not have fully standardized measures. HPI takes those data sets from the World Values Survey and World Database of Happiness.

Source and additional information:
www.happyplanetindex.org, www.neweconomics.org

Suggestions for further work:
How happy are we?

The second compilation of the global HPI was published in July 2009. The map (at www.happyplanetindex.org/explore/global/) shows the overall scores from the second global compilation of the Happy Planet Index. The report (www.happyplanetindex.org/public-data/files/happy-planet-index-2-0.pdf) presents the results for 143 countries around the world – representing 99 percent of the world's population. Interestingly, on the "world ranking list of happiness" industrialized nations, such as Germany and Japan, are in the midfield, with the United States even lower on the list. Many Latin American and Asian countries lead the list, including Costa Rica and Colombia, Vietnam and China. In the table on pp. 118/119 you will find the HPI of the countries presented in this brochure.

- Why do you think that some of the countries with low average income are among the "happiest" according to the HPI? Research the rank of the countries that will be presented in more detail in Part 6 of this brochure (starting on pg. 96). Rank them from "happy" to "less happy" and compare this ranking order with the rank order of their gross domestic product or another indicator of your choice. Interpret the connections.
- You can calculate your own Happiness Index at http://survey.happyplanetindex.org/. What elements are keys to a happy life? What roles do friendship and education, faith or cultural roots play? What clothes, objects, and furniture in your room could you do without? And what is most valuable to you? Does a comparison with the possessions of others play a role?
- If you won the lottery, what would you spend the money on? Assume winnings of 10 Euro, 1,000 Euro, and 1 million Euro.

in 2005 Africa had an ecological reserve of 0.4 gha per person. The reserve will likely not persist, however, as the per capita biocapacity of Africa decreased by about one-fifth between 1990 and 2003 alone, driven by an expanding population. Despite its share of over 14 percent of the world's population the African continent contributed only 6 percent to the global Footprint. The average Footprint of an African measured 1.4 gha in 2005, a reduction of 20 percent since 1961, and is the smallest of all the world's regions.
Africa has the highest annual deforestation rate in the world and this loss of forest cover leads to soil erosion. In addition, water scarcity, catastrophic droughts and the effects of climate change put many African communities under significant stress. Poverty and local environmental conditions are tightly linked on the African continent since many live subsistence lives.

Haiti: With a Human Development Index (HDI, see Infobox pg. 71) of 0.5, the Caribbean island state ranks last in Latin America in terms of standard-of-living. What the nation's ecosystems provide no longer suffices to feed the local population even though the demand of a Haitian is relatively small: per capita biocapacity production of 0.3 gha compared to an average Footprint (or biocapacity demand) of 0.5 gha. This means that about half of Haiti's already small Footprint can be covered through domestic production, while the remainder must be made up from imports, aid supplies or by further degradation of the local ecosystems. At the same time, the government has fewer means for importing goods, aggravated by the trend of rising food prices on the world market. This leads to disruptive social conflict putting more stress on an already dire situation. This scenario is being repeated in many areas of the world; already similar crises exist in Darfur, Rwanda and Bangladesh.

The biocapacity embodied in trade

The Footprints of the industrialized countries of Europe and North America are consistently larger than their national biocapacity. In 1961, only 26 nations showed an ecological deficit; in 2005, 90 nations were in deficit and the trend is steadily growing. Even the United States, China and India, three of the eight countries with the greatest total biocapacity, are **economic debtors**.
Among the largest **ecological creditors** (nations with a Footprint lower than their biocapacity) are South American countries, including: Brazil, Argentina, Peru, Bolivia, Colombia and Paraguay. Many African countries are also ecological creditors: Mauritania, Guinea Bissau, Liberia, Angola, Congo, Gabon, Zambia, Mozambique

Due to population growth in some low-income countries, less biocapacity is available per person, which, due to lack of wealth to purchase imports, typically translates into increased pressure on local natural resources.

Many ecological debtor countries import ecological services from other countries in order to satisfy their hunger for resources and energy. The limits of the system are, however, determined by the resources available on our planet.

and Madagascar. In Asia and the Pacific Region, Mongolia, Laos and Papua New Guinea contain more biocapacity than their residents currently demand for their Footprint. Among the few industrialized countries in the creditor category are relatively sparsely settled nations, including: Australia, Canada, Sweden and New Zealand. This is not necessarily because they manage their ecosystems carefully. Sometimes historical reasons play a role, including low population density (e.g., Mongolia), voluntary or involuntary low resource consumption (e.g., Guinea Bissau, Congo) or highly productive and/or inaccessible ecosystems (e.g., Brazil, Canada).

From a Footprint perspective, countries can carry a deficit through net-imports, by depleting their own biocapacity, and using ecological services from elsewhere, for instance by emitting CO_2 into the global commons. As we have shown, a nation's Footprint includes the biocapacity acquired via imported products and services. Conversely, renewable resources used for the production of goods and services for export are included as part of the importing country's Footprint.

For example, the Ecological Footprint of Germany includes not only imports of raw materials, such as tropical wood or food (e.g., tropical fruits), but also the resources used to manufacture imported products, for example, T-Shirts. Using another example, when a Spanish citizen purchases a German car, the Footprint is allocated not to Germany, but to Spain.

In the future, nations with biocapacity reserves will likely play an ever larger role in international negotiations (here at the UN Conference of the Parties to the Convention on Biological Diversity in Bonn, 2008).

We should note that nations do not literally trade biocapacity. Rather, goods and services have "embodied" biocapacity associated with them. In other words, the production of the goods and services we consume place a demand on biocapacity, which is what the Footprint actually measures.

In 1961, the Footprint of all goods and services traded throughout the world amounted to eight percent of the global Footprint. In 2005, this value had grown to 40 percent. This indicates not only the enormous streams of resources flowing between countries in this globalized era, but illustrates the connection between local consumption and the demand for ecological capital elsewhere in the world.

In **countries with high per capita income**, 61 percent of their consumption Footprint came from imported biocapacity in 2005. One historical explanation for the economic position of high-income countries is that many accumulated financial capital in times when natural capital was not as scarce as it is today. These countries have the financial assets to import biocapacity and thus have been able to expand their economies.

By contrast, **middle-income countries**, such as China or India, whose Footprint of imports has

"The world will no longer be divided by the ideologies of 'left' and 'right', but by those who accept ecological limits and those who don't."

Wolfgang Sachs, Head of the cross-section project "Globalization and Sustainability" at the Wuppertal Institute for Climate, Environment, Energy

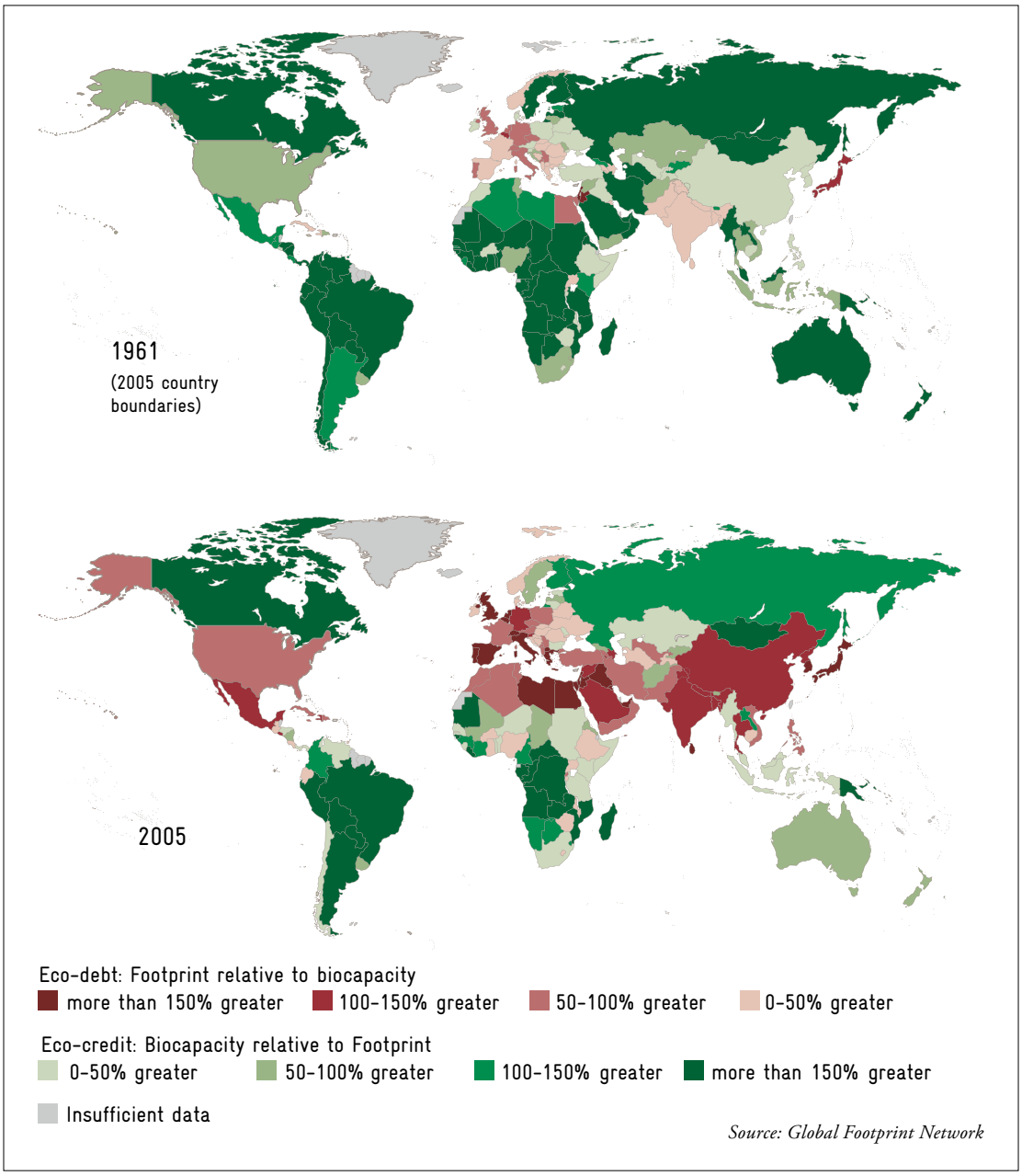
Infobox:

***Ecological debt* – clarifying the term**

The terms "ecological debt" or "ecological debtors" have various meanings. In the context of Footprint discussions, ecological debtors are countries running an ecological deficit, i.e., countries that have a larger consumption Footprint than biocapacity. Ecological debt is the accumulation of the ecological deficit over time.

Ecological debt can also have a slightly different meaning in the development debate. Some authors use it to describe the historical debt, that they feel the north owes the south for past uses of ecological assets such as biodiversity, cropland, forests or mines, or the shipping of toxic waste to low-income regions. Also in the Copenhagen context some discussions focused on historic CO_2 emissions and likened this to a debt.

For more in debt discussions on ecological debt in the development debate, you may want to consult Andrew Simms' book "Ecological Debt: the Health of the Planet and the Wealth of Nations", published in 2005 and 2009 by Pluto Press.



The two maps show the ecological debtor and creditor countries in 1961 and 2005. Note that the 1961 map shows country borders from 2005 for ease of comparison.

grown to 30 percent since 1961, are only now laying down the foundations for their industrialization. They are expending high amounts of material and energy to build roads, airports and manufacturing complexes. It is crucial for such states to make efficient investments in infrastructure in order to minimize the growing global demand for biocapacity. In times of increasing scarcity of raw materials and ecological services, growing deficits will prove to be disadvantageous. Nations whose investments have not been well-planned from an energy and resources standpoint could soon feel the effects in terms of social unrest, conflict and instability.

In a world of growing demand for increasingly scare resources, what happens to **low-income countries**? This group includes both resource-rich countries, such as the Central African Republic, as well as resource-poor countries like Bangladesh. Imports of biocapacity by these countries have risen since 1961 but are nonetheless significantly lower than high- and middle-income countries, corresponding to only 13 percent of the total Footprint of these countries in 2005.

Sources und Additional information:

- www.footprintnetwork.org/gfn_sub.php?content=national_footprints
- www.footprintnetwork.org/en/index.php/GFN/page/ecological_debtors_and_creditors/

Suggestions for further work: Ecological creditors and debtors

Look at the world maps with the ecological debtors and creditors of 1961 and 2005 on pg. 61. What changes do you see? What do you think led to these changes?

- Take Spain, for instance. From an economic perspective, the country is one of the success stories of the European Union. In the past 40 years its population has remained largely constant. Which factors may have caused Spain to become an ecological debtor? Why does life continue to "function" there?
- Or Japan, where the population of the relatively densely populated islands is dependent upon the import of biocapacity. What are the advantages and disadvantages of depending on large resource flow from elsewhere? What would you do if you were in the Japanese government's position?
- North Korea. Following the collapse of the Soviet Union, Korea's imports of oil and coal were significantly reduced. Moreover, China could not supply sufficient quantities of rice. Reductions in supplies of fossil fuel also led to reductions in biocapacity because North Koreans had less fertilizer, could not fuel their tractors, and were not able to produce as much food as in the past. Review how this dramatic situation affected the Footprint. The Footprint curves show the significant reduction in consumed food. Some estimate that about two million people may have died due to lack of food. What role does the poverty and political isolation of a country play, and what role do ecological constraints play?
- Would you have thought that counties like Canada or Sweden would belong to the ecological creditor nations? After all, Canada's per capita Footprint is 7.1 gha and Sweden's 5.1! Nevertheless, their bioproductive area is even larger. In comparison, look at Nigeria on the African continent, plagued for 10 years by civil war. Although it has a per capita Footprint of 1.0 gha, it is an ecological debtor. How should Canada or Sweden begin thinking about managing their biocapacity? How would this management be influenced by the rapidly changing economic and environmental realities? Which strategies could a country like Nigeria use to better position itself for success in future decades?
- How do you assess the trends for worldwide development? Think about different scenarios: What will the future look like if things continue as they are now? How will things change if, in terms of the Footprint, positive or negative developments happen in important key countries across the planet? Consider the different scenarios on pp. 22-23 of the Living Planet Report (WWF/ZSL/GFN, 2008)!

More on the ecology of trade

Let's have a closer look at the import of natural resources. Between the beginning of 2007 and mid-2008, food prices rose sharply on a global basis – soya and rice became 130 percent more expensive. In response, some countries, including Argentina, raised export duties so that prices would not rise internally. Subsequently, some merchants preferred to sell their goods internally. However, these goods were now absent on the world market. Countries that were dependent on food imports went empty-handed. What should be done in such conditions? In an article entitled "Buying Farmland Abroad: Outsourcing's Third Wave", May 21, 2009, The Economist describes a new strategy for a country to secure necessary resources now and in the future. A country buys or leases fertile land in other states, raises grain or other crops for its own population, and ships the harvest back home. Juliane von Mittelstaedt of Spiegel-Online interviewed the UN Special Reporter on the right to food, Olivier de Schutter, on this subject in 2009. The article is titled "Neocolonialism in Africa: Large investors displace local farmers" (www.spiegel.de/wirtschaft/0,1518,638435,00.html).

What do you think of this trend? Can you think of alternative strategies? Some questions to consider:

- Has it always been the case that investors farm fertile land in other countries? Have

you ever heard of so called "banana republics" or "cash crops" in this context"? What is new about the strategy depicted in The Economist?

- Foreign capital may be attractive to countries where fields are available to lease. Capital can be invested in further developing agriculture (new seeds, better jobs, new technologies), or invested in schools, hospitals, and roads. What do you think? Who should get the newly created jobs? For instance, some Chinese investors also bring along Chinese farm workers. What consequences can this have?
- Some people have been living on land where livestock is grazed or fields are cultivated. What happens to them when the State leases or sells these areas to foreign investors?
- South Korea recently acquired 689,000 ha of land in Sudan. The United Arab Emirates has reserved 400,000 ha in the same country. Libya is growing wheat in Mali. How can low-income countries, which can no longer feed themselves and lack the funds for investing in new agricultural technologies, overcome such problems?
- In Sudan, investors export 70 percent of the harvest while, at the same time, the country is the largest recipient of international food donations. Or: Between 2007 and 2011 the World Food Program of the United Nations will spend the same amount for aid deliveries to Ethiopians threatened with hunger as foreign investors have paid for land acquired there. How does this fit with the previous examples?

You can see that these situations are complex and the issues are intricately linked. Suppose you have the job, as a negotiator for the United Nations, to create a win-win situation out of this. How can both sides, the investing nations and the nations selling their land, profit from equitable trade agreements? Develop ideas, approaches, and rules which could lead to such a situation? You will enter into negotiations with both parties. Prepare yourself: Which of your suggestions are imperative in the face of an increasingly resource-constrained world?

The ideal world is not a Footprint world – an interview with Mathis Wackernagel

The complete interview with Dr. Mathis Wackernagel (29 min., in German) can be found as an MP3 File on the accompanying DVD.

Mathis Wackernagel, born 1962, in Basel, Switzerland, is President of Global Footprint Network, headquartered in Oakland, California, USA. In the early 1990s he and his doctoral advisor, William E. Rees, developed the Ecological Footprint.

What can the Footprint do? What can't it do?
Clearly, the Footprint can't tell us if we are happy. It only gives us an answer to a specific question: How much biocapacity do we have, how much do we use? It tells us how much biocapacity is necessary to sustain human activities, for example my own life.

From monetary dimensions to ecological services

The Footprint is like a pair of glasses. With them you see certain things more clearly, while other things can look blurry. What can someone do with the tool?
The Footprint is an accounting system for a world in which ecological issues are gaining importance. This differentiates the 20th from the 21st century. Previously, it may have been adequate just to focus on financial capital because that form of capital was the most limiting production factor. That was the era of the Gross Domestic Product. In the 21st century resources will become increasingly scarce. For this reason we need more complete

information. We need accounting systems, not merely for the monetary dimension, but for ecological services as well, so that we can better manage our natural capital. Just like in a business: If the books show that expenditures exceed income, the risk of bankruptcy increases. We need to understand our ecological performance for same reasons as we want to know our financial situation.

Winners and losers

The accountant in a firm is not normally the manager. What can the Footprint tell managers?

Information for a resource scarce world

The goal of Footprint accounts is to provide robust and credible information. It does not tell people what to do – it merely provides context and shows the link between choices and consequences. Then the managers can decide what is in their best interest. But it shows: How large is the Footprint – the demand for biocapacity – in Germany? This exposes where there are risks and where we might want to invest. We also want to know how much biocapacity the country has. How much does the world have? What are the trends? Our message to policy makers is that we want their country to succeed. What do these trends mean for keeping Germany competitive? What do they mean for domestic policy, for international policy, for quality of life viewed in the long term? Which cities need to be more resource efficient in order to be able to operate in the future? Countries with a growing ecological deficit are becoming more and more vulnerable. For them it is increasingly expensive and risky to maintain their resource throughput.

What are the most important guidelines that the Footprint can currently offer?

The big picture

There are a number of countries where purchasing power is not as high as in Germany. A bigger portion of their population lives subsistence lives. When resources become scarce in these countries, it immediately translates into less food or fewer chances to cut timber. Water shortages appear, et cetera. So what is the defining problem for the country's future? Some point at water, for others it is biodiversity, yet others name climate change or soil degradation. The point is that these problems are related. They are symptoms of the same dynamic: our growing hunger for resources.

What can a politician in a city, a finance minister of a country, an executive heading a company do with your numbers?

When we talk with policy makers, we show them diagrams. For example this one (see figure pg. 72): On one axis it describes how high the quality of life is in a particular countries. On the other axis it shows how many resources were consumed in each country to maintain that quality of life. Then we ask: Where is your country or your customer on this diagram? With this background they can evaluate where they may want to invest to ensure their quality of life. Cities and countries offering a high quality of life with minimal resource consumption will be among the winners in a world of scarce resources.

Where can one begin?

Population is an important factor

There are two central points for intervention. And both make lives better. One of the greatest opportunities to increase human wellbeing is to slow down and eventually reverse population growth. This does not require coercive measures, in fact non-coercive ones are far more effective. And even more importantly, those investments make lives better, particularly for those who live in more fragile conditions today. Above all, this is the chance to invest in women, by giving them access to schooling, but also to family planning. This helps women to be more in control of their lives, and to contribute more effectively, for instance as community leaders or entrepreneurs. In many poorer parts of Africa, girls are excluded due to immediate economic hardship, and as a result poverty persists. When women attend school, they also have better chances of finding work and shaping their own lives. Their quality of life increases, as does that of their children and all other members of their family, men and women. Also, families become smaller. As a result there is more capacity for everyone living on limited resources. In the global economy it is beneficial for a country to have a gradually shrinking population. Many people think the opposite is true. They believe that competitiveness increases with a growing population. In an ecologically scarce world this no longer holds true.

Does the second point concern urban structure?
Yes, in fact. The way a city is built, how it functions, how spread out or compact it is, how efficient or resource-sparing the energy provision is, all determines the resource efficiency for a city. Urban structure determines at least 80 percent of its residents' Footprint. The Footprint is dependent on where food comes from, how mobile people are, what people buy. Take Houston as an example, a very spread out city in Texas. Its houses are not energy efficient compared to European standards and are poorly insulated. In addition, the houses are widely scattered requiring car trips for even simple errands like getting milk or a newspaper. The residents of Houston use about 12 global hectares of ecologically productive area per person. If someone from Houston moved to Siena, Italy, they would require one-third or quarter of this Footprint to support the same quality of life, because one can reach many places by foot in Siena. Besides, the houses are smaller and more compact. The food is more local and seasonally oriented. In general, Siena offers a charming and attractive life for which one only needs a quarter or a third of the resources. The interesting thing is this: people in Siena don't need to be instructed in having a lower Footprint. It happens because the city structure invites them to live a particular lifestyle. If we enhance Siena with the technological possibilities that we currently have on this planet, even larger Footprint savings would result. For instance, in Italy, a large portion of energy is still produced by coal burning power plants. If this energy were to be produced renewably, or with cleaner technology, Siena's Footprint would shrink without people in Siena having to change anything about their lifestyles.

The Footprint doesn't seem to offer good news. The global supply of biocapacity amounts to 2.1 global hectares per capita, demand is 2.7. Besides, distribution, viewed globally, is unequal if not unfair. This is with an increasing population. How does Global Footprint Network deal with these realities?
We have calculated how the Footprint and the per capita supply of biocapacity developed over the past 40 to 50 years. We presented these data. We can show results for nations, cities or individuals, or we can group results for instance for high-, medium-, and low-income countries. Then it is up to the readers to interpret what this means. But consider this: In low-income countries the population tripled in the time period mentioned. Currently, there are 2.3 billion people living in those countries. Over the last 50 years, the average per capita Footprint in these countries declined. This decline was not voluntary, and put a significant strain on those populations' quality of life. Also, these Footprint trends are merely average numbers. Because among these 2.3 billion live 50 – 100 million Indians who have over this time period become as affluent as Europeans. And in spite of this affluent Indian population that has tremendously increased its income, the average Footprint is still getting smaller in India and in low-income countries. I find this Footprint decline quite concerning.

High quality of life with fewer resources

What does the Footprint then offer as possible solutions?
Three points: The first is accounting. If we don't know where we are – how much we use and how much we have – if we don't do serious book keeping of our key assets, then we cannot react effectively. We offer an accounting tool for natural capital, for biocapacity, to complement traditional measures such as Gross Domestic Product (GDP). Having clarity about our biocapacity situation is becoming fundamental for succeeding in the 21st Century.
The second point is to focus on the stocks we put in place today: housing, roads, energy infrastructure, or people being born today, for example. These assets have a life expectancy of 50, 75, 100 years. They will shape our resource consumption patterns for that long. The way we shape our cities today determines the resource demand for a long time. The question is: Are we building ourselves traps or new opportunities? For instance, people born today live for 75 years or even longer. They will consume resources for over 75 years. A coal plant built today will emit carbon for 50 years if we use it over its possible lifespan. Windmills produced today will generate low-Footprint electricity for decades. Decisions we make today have very long-term effects. Overshoot is already underway and if trends continue, we could find ourselves in stormy seas in 20 or 30 years. We

Ecological traps

The poor become poorer

A terrific life on a global hectare

used to think that sustainability was something for the next generation – so let's build that new highway! I do not buy the argument that we are not able to deal with sustainability because it is long term and elections are held every four to six years. The fact is that these same elected officials are expected to build bridges that last 50 years, make educational policies that will only show effects 25 years later, and pension funds which people will maintain over decades. All of these are broad time spans and large sums. Therefore, we absolutely have the capacity to address resource scarcity by reconsidering the stocks we put in place today. It is the tracks we build today for the future that are the most significant intervention point.

The third point is innovation. What is fascinating about humans is that they can be unbelievably innovative and entrepreneurial. We must call on all these abilities to encourage sustainability. Perhaps Paul Hawken is correct when saying that we are great at reaching goals, but not so good at setting them. Thus we need a clear goal for sustainability. Simply put: How can we lead an exhilarating life on something like one and a half global hectares of ecologically productive area per person? That is the ultimate challenge we stand before and for which we still don't have an answer.

Returning again more specifically to the method – what can it do and can it not do? Where is the inexactitude you are working on?

In order to calculate how much biocapacity a country uses and how much it has, we now apply over 6,000 data points per country and year – nearly all from UN data sources. That may sound like a lot, but considering how significant the information is, and how detailed we must become in order to be as relevant as possible, these are still too few data points. We need better data about changing ecological productivity in the context of climate changes. We need a better understanding of the carbon dioxide absorption of land areas – whether it is increasing or decreasing. We need more knowledge about fish stocks and how productive they really are. There are many open questions there. We also need more capacity to break down overall results, so we can attribute Footprints to particular activities. But this is not only a problem for Global Footprint Network, but of the UN statistics agencies too. In the 21st Century, it will become more significant for a country to understand its biocapacity than to know how much gold is stored in the national bank. Ignorance will become increasingly dangerous.

A criticism of the Footprint: environmental toxins are not taken into account

There are a number of points which are repeatedly raised as criticism of the Footprint method. One dimension that the Footprint doesn't have on its radar screen is the toxicity of materials. Why not?

Environmental impacts can be divided into two large categories. One area concerns biocapacity questions, or questions of the human material metabolism or its throughput. This is the material exchange between people and nature. In this domain, we run up against quantitative limits. Examples are climate change, freshwater scarcity, or fisheries collapses for instance. The other area of concern is human health: unsafe or polluted environments become a threat to human health and wellbeing. Examples are air or water pollution or heavy metals in soils. This second domain has more of a qualitative dimension: small amounts of the wrong substances affect people's quality of life. Both these environmental impact dimensions are significant, but mixing them up would confuse us. Since they represent different dynamics, they need to be monitored and addressed separately. Therefore the Footprint, a measure of the first domain, needs to be complemented with measures for the second domain. In addition, ecological impact measures need to be accompanied by social and economic information.

The only greenhouse gas the Footprint considers is CO_2

Another criticism: Climate. Until now Footprint calculations have exclusively taken carbon dioxide into account. At the same time there are other, very effective green house gases such as methane. In this respect the Footprint is blind.

Yes some aspects are still excluded. Particularly if we feel that current data sets are not yet sufficiently strong. The omission of some aspects strengthens our claim that we are in global overshoot. In absence of solid knowledge, our research philosophy is to underestimate the Footprint and overestimate biocapacity in order not to exaggerate overshoot. But the question of

adding other categories to the Footprint is on our research agenda and something we can integrate into later versions. Other greenhouse gasses are not currently included in the method for various reasons. There are no consistent data sets for all nations on the globe that consistently document emissions of non-CO_2 gases and how these emissions link to final consumption. This is one of a number of research and information gaps, and we hope to close in the not so distant future.

So the Footprint doesn't describe the entire overshoot phenomenon?
We do indeed underestimate overshoot. As mentioned, certain climate gases remain outside our calculations. Also, soil loss has not yet entered our national estimates. In the long term we hope all these aspects can be included adequately and robustly, which would further increase the usefulness of the Footprint.

During the so called green revolution of the past years and decades massive amounts of artificial fertilizer was put on fields throughout the world which led to higher biocapacity. But ultimately that is fossil energy, because fertilizer is produced from natural gas. The criticism is; fossil energy sources are finite. The harvests are therefore unsustainable, consequently, the Footprint is calculating with unrealistic numbers.
We measure the amount of biocapacity that the Earth provides every year. If the biocapacity decreases because the inputs are no longer there or the soils are leached out or not enough water is available, then these will be shown in future accounts – through declining biocapacity. Our numbers are not predictive; rather, we document the way things are, year by year. Our analysis could be supplemented with more detailed in-country data, or by evaluating how much of today's biocapacity might become fragile in the future due to fossil fuel shortages, soil depletion or freshwater shortages. This more granular knowledge is fundamental for our long-term security, and is also part of our research agenda.

The Footprint does not describe ecosystems as such, forests or oceans for example. Instead, according to its approach, it tells how much biocapacity is created and how much is removed per year – is this a weak point of the method?
It is true that many basic things upon which our economy depends are poorly documented – the biocapacity of forests, for example. There are no reliable time series, not even robust data about how productive they actually are. We have huge knowledge deficits. Although fishing grounds collapse, we have difficulty tracking this phenomenon in our accounts using the numbers we receive each year from the Food and Agricultural Organization of the United Nations.
The large data gaps is in my opinion a reflection of how severely we underestimate how essential these resources are for our economy. Our accounts can be improved significantly. It requires a significant effort to measure resource productivity, since ecosystems are far more complex than bank accounts.

Where will the Footprint be in 10 or 20 years, assuming it develops as you hope?
In the short term we want to have the Footprint take hold in all countries, just like the Gross Domestic Product. Ministers should sweat when they hear that their ecological deficit is increasing. Just as we sweat today when the jobless numbers climb or the treasury accounts are empty. But I also hope that someday we will no longer need the Footprint. The ideal world is not a Footprint world. If we follow the Footprint calculations and act accordingly, the world will be a better place than it is today. But ultimately, the Footprint is a tool for the transition to this world. It is a tool which underscores the significance of natural capital, hopefully not for us alone, but also for every plant and animal species with which we share this planet. Maybe we will even be able to build an economy that can operate below the planet's biological capacity, leaving great opportunities for non-human life as well. We will see that it is not merely more stabile and secure, but also more satisfying.

The data is not perfect

overshoot is really even larger

The Footprint, a transformational tool

Mathis Wackernagel is portrayed at length by Dr. Stefan Giljum in the article "Mathis Wackernagel. The Ecological Footprint. Development on a limited planet" which appeared in the newspaper EINS (available as a PDF file on the accompanying DVD, in German).

Part 3
The Footprint and development cooperation

The goal of development cooperation is to work with partner countries to sustainably improve people's living conditions. The Footprint can be a valuable tool for accomplishing both these human and environmental objectives simultaneously.

Development cooperation primarily seeks to lift people out of poverty. Its goal is to improve the living conditions and health of populations in low-income countries around the world. Access to natural resources is a significant factor for enabling healthy and productive lives. That access varies starkly from region to region: Some countries are running ecological deficits, with Footprints larger than their own biological capacity. Others depend heavily on resources from elsewhere, which are under increasing pressure. Therefore, international development cooperation rightly puts significant attention on trade, which has become an ever-more important factor of the global economy. So, just as it is important to know if a country is running an economic trade deficit, we also need to understand a country's ecological balance sheet when assessing the viability of its development path.

Without the necessary purchasing power to secure imports, low-income countries that run ecological deficits often end up depleting their own ecological assets. The overuse of domestic biocapacity leads to the degradation of ecosystems and results in further deterioration of local living conditions. In areas of the world that cannot afford significant resource inputs from elsewhere, the implications of ecological deficits can be devastating, leading to resource loss, ecosystem collapse, debt, poverty, famine and war.

Rapidly industrializing countries, such as China and India, with high economic growth rates are also increasing their resource demand. Resource constraints could therefore also become a threat to their current development path. With increasing demand on ecological services, those countries who have ecological remainders will gain a competitive advantage, particularly if they are able to maintain this remainder, i.e., can avoid moving into a deficit situation.

German development cooperation seeks to improve the living conditions and outlook for the people living in partner countries. How can the Footprint support this effort? Can it productively inform countries on their way toward lasting development success? Does it provide a compass for political and economic planning processes?

A foreign workday

Silke Leonhard's alarm clock rings at 6 a.m. in the warm, tropical country she has come to for work. She is a staff member of the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), an international cooperation enterprise for sustainable development. She has a long day ahead of her: She and her team must devise a plan as they prepare to advise government officials on environmental issues.

She has a driver and can use the time to work in the backseat of the car; still, the traffic is frustrating. Despite the close proximity, the drive to her workplace can often take up to three hours, depending on traffic. The car's air conditioner purrs and makes the commute more bearable, though outside a thick blanket of smog blankets the city.

The development of this urban center in which she lives and works is moving ahead rapidly. Just a few years ago, the streets were half empty. The city is spreading out and the population is

growing, as is their resource consumption. The masses of emissions, posing health hazards and affecting the climate, can no longer be ignored.

Questions on the way to work

Despite the comforts of her chauffeured, air-conditioned car, many questions swirl through Silke's mind: What will her host country look like 10 or 30 years from now? What might be the unintended consequences of current development efforts? Is the economy becoming more stable as it expands, or more fragile, as it also starts to depend on ever higher resource flows? Can current, and future, levels of resource demands be met by the country? If not, will the country have the resilience to react to resource shocks? How can she and her counterparts better understand the trade-offs and possible choices for making development efforts last? How can potential future ecological constraints be made relevant to today's decisions? What are the options? Are the popular options serving the country, and if not, can they be modified without losing their appeal?

These are the questions that Silke's team wants to tackle today. Together with representatives of her partner organization, she wants to promote sustainable development, as opposed to chasing short-term development gains. After all, the core task of development cooperation is to make any improvement last.

This mission led to the project team's decision to introduce the Ecological Footprint to their onsite partners. This tool can help consolidate information and evaluate current trends. The Footprint can also help people think about optimal levels of resource consumption. If the consumption is very low, this often is an indicator for people lacking food and shelter; if it is too high, it puts the country at risk since it may not be able to sustain that level of resource throughput forever. National governments must ask themselves three key questions when determining what the optimal level of resource consumption is: How much biocapacity is available within the country? How much is available in the world? What is the relative purchasing power of the country compared to the world average?

The economic and social ramifications of these questions are intimately linked with any development strategy. With the Footprint methodology, valuable information can be generated that can feed into public discussions, educational campaigns as well as government planning processes. Additionally, the Footprint can enrich dialogues between various social groups and provide a solid context for exploring the significance of ecological limits. If it were to be established as an indicator within the framework of environmental monitoring, the tool could help guide a country's policy decisions. Not least of all, it could provide impulses to the country's strategies when participating in global negotiation processes.

In the evening on her way back home, Silke reviews her day. The presentation and discussions with her colleagues went well. It is too soon to tell, but she has a good feeling – the partners are interested in the Footprint. The next step will be to jointly discover where the tool could be applied first to show its utility and produce a successful project. Nothing wins people over more quickly than collaborating on and producing a success.

"We can use the Footprint in development cooperation to help us evaluate the effectiveness of our activities – to get a more accurate picture of whether developments are moving us in the right direction or, from an ecological perspective, we must make course corrections. We can support and accompany our partners in thinking about these questions."

Susanne Willner, staff member in the GTZ-sector project Rioplus

Additional information concerning the work of GTZ: www.gtz.de/en

The complete interview with GTZ staff member Susanne Willner (9:53 minutes) can be found in MP3 format on the accompanying DVD (in German).

Application opportunities for the Footprint

How exactly can the Footprint support development cooperation? At the national level, the Footprint can evaluate a country's supply and consumption of biocapacity. At the project level, the Footprint can help ensure the most efficient allocation of funds for improving people's lives while maintaining, rather than liquidating, ecological assets. At the local level, the Footprint can help residents understand options for taking action. An important starting point is education. With the Footprint, even children can find an entry point into exciting discussions about lifestyle and values.

Finally, businesses in developing countries and elsewhere can use the Footprint to measure impacts: How much carbon dioxide and other wastes are we producing? Which of the resources that we depend upon are under pressure? Are our economic activities exceeding our means, or are we operating within ecological limits?

Whether a business practice is "sustainable" depends on the context. But what the Footprint can measure is the biocapacity demand of any activity. Many activities are associated with business practice. Take the manufacturing of an automobile, for example. Are we focusing only on the resource consumption during the production of the automobile, or are we considering the many stages in pre-production: steel, plastic and rubber for the tires? We might also consider the use of the car, such as fuel consumption. But if we want to consider all environmental effects, we also need to consider the infrastructure necessary to support auto use: the roads and bridges which also consume resources. An important question to ask in determining if something is sustainable is: Is the activity globally replicable? Or can the activity last – i.e., does the population have sufficient access to biocapacity to maintain this activity? Because the Footprint is operational at all scales, from the individual to the global, it can provide answers on many levels. But to use the tool for specific development projects, we should focus on two primary questions:

- **Where are we now?** What does the global and regional context look like with respect to natural resources? What are the challenges for a country, region, or for a project? What roles do the participants play in the process, whether they are government and business representatives, farmers, protected area managers, or the citizens of the country? How do they see themselves? Do they perceive their ecological context and potential limiting factors?
- **Where do we want to go?** What approaches and strategies will enhance quality of life while maintaining natural capital as a source of ongoing wealth for the people? What are some reasonable short-, medium- and long-term goals?

Using this approach, sustainable development is no longer merely a concept; it becomes a process. It also becomes more specific: Sustainable development can be concretely described and specifically measured. It becomes operational.

National-level data – which is widely available – sets the context for the process. On a more micro-level, the Footprint enables analysis on individual projects or regional developments. For example, the data is key to determining whether investments in specific industrial sectors will lead to sustainable benefits for people; and whether resources required for a particular development path are available in sufficient quantity, regionally, nationally, or internationally, and in the medium- and long-term.

Consider the building of a highway. Highways ease transport, but they also come with many costs. Will they serve everybody, or just the small percentage of car owners? Who has to pay for them? Does it lock the country into a

In Mongolia the administrators of protected areas and environmental training centers discuss the Footprint of different nations. Where do we stand, and why? What does it mean for our work, our communities, our government, and for setting future political, economic and social goals?

high-resource demand, thereby weakening its competitiveness? If funds are spent on highways, what other potential investments will the funds be taken from? Are we preparing ourselves for a resource-constrained future or are we building ecological traps?

"I wonder whether low- income countries are in a position to gather and manage the necessary data sets for measuring their own Footprint and also for interpreting the results. This is still an unanswered question for me, personally."

Susanne Willner, staff member in the GTZ-sector project Rioplus

Development for whom?

In the end, development that ignores the availability and limits of natural resources does so at the expense of the poor, who often suffer first and most tragically when humanity's demand on nature exceeds what nature can provide.
To understand the relationship between human development and ecological constraints, it is helpful to use the United Nations Human Development Index (HDI, see Infobox) in conjunction with the Ecological Footprint.

The HDI measures not only a country's economic development, but also education and life expectancy.
Expanding analysis beyond the economic sector is important if we are to get a fuller picture of human well-being. For example, Swaziland and Sri Lanka have comparable average incomes, but with respect to life expectancy and the ability of the population to read and write, there are large differences between the two countries. Sri Lanka, which has a more advanced educational system, and has a much lower number of HIV/AIDS-related deaths, has a higher HDI value than Swaziland.
Sustainable human development will occur when all humans can have fulfilling lives without degrading the planet. This, we believe, is the ultimate goal. As individuals, organizations, countries and regions work on advancing sustainability and human development, decision-makers need data and metrics in order to set goals and track progress. Measures such as the Ecological Footprint and the HDI are critical to setting targets and managing development projects. Ecological Footprint data tells us that, given current population and available land area, an Ecological Footprint of less than 2.1 global hectares per person makes a country's resource demands globally replicable.
The United Nations' Human Development Index (HDI) – which measures a country's average achievements in the areas of health, knowledge,

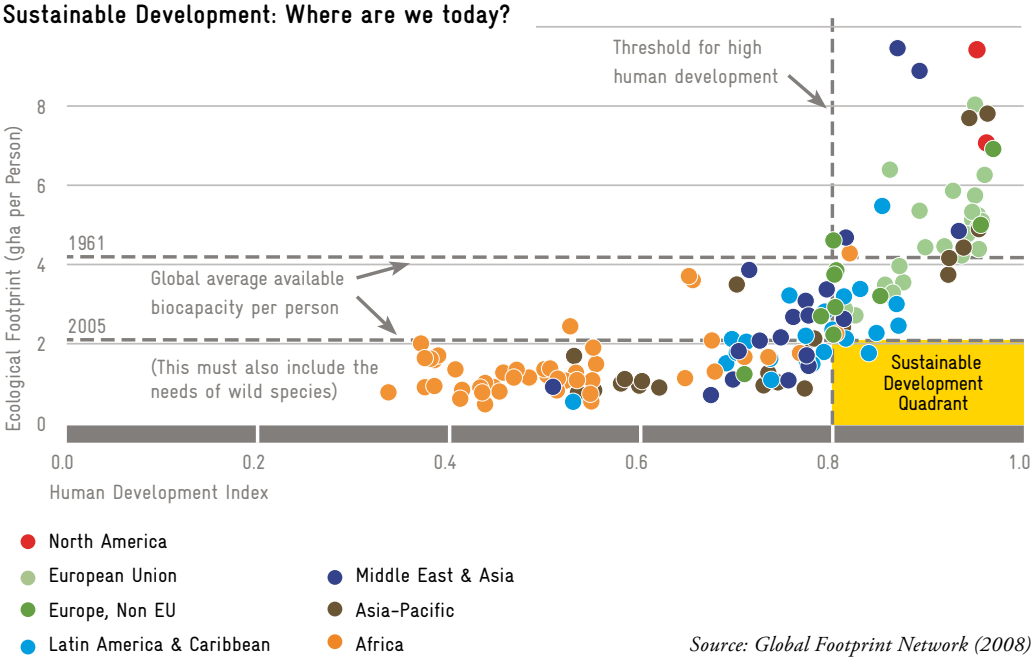
Infobox:
HDI – Human Development Index

Starting in 1990, the United Nations Development Program (UNDP) began computing the Human Development Index (HDI). In addition to the indicator of real purchasing power per person (per capita income), two additional fundamental areas of human development are captured: life expectancy at birth, and the level of a population's literacy. The HDI of a country lies between 0 and 1. The UNDP assumes that an HDI value of 0.8 or higher represents "high development". Of the 182 countries assessed, 83 countries meet this criterion. These include not only high-income countries such as Germany, the United States and Japan, but also emerging nations, such as Brazil, Mexico and Ecuador. Seventy-five countries are considered to have medium human development, and 24, most of which are African states, are considered to have low human development.

In contrast, another system, the DAC List of developing countries, is oriented to public sector development cooperation (see pg. 50), and highlights mainly economic aspects of development.

Source and additional information:
http://hdr.undp.org/en/statistics/

Combined Index for Human Development (HDI) and national per capita Footprint (data from 2005). A PDF file for large format printing of the graphs (in German and English) is available on the accompanying DVD.



Source: Global Footprint Network (2008)

and standard of living – tells us that an HDI higher than 0.8 is considered "high human development."
Combining these two indicators gives clear minimum conditions for sustainable human development and shows how much more we need to "think inside the box."

The goal, then, of human development can be framed as finding ways to increase human development within nature's limits, and moving countries in the direction of the "yellow box".
Referring to the diagram above, three types of country profiles and potential lessons emerge:

1 Countries which lie in the lower left quadrant. Their Footprint range is within the global per capita biocapacity limits but the living standard (as measured by HDI) is mostly very low.
2 Countries which lie in the upper right quadrant. They have high human development, but their demand on nature is not sustainably replicable worldwide.
3 Countries which are situated in the lower right quadrant, the yellow "global sustainable development box". Countries in this quadrant provide high human development (according to the HDI measure) with a resource demand that could be replicated globally.

The bulk of the countries in the Asian Pacific region (brown) in the Middle East (dark blue) and in Latin America (light blue) have typically average Footprints of under 3 global hectares per person while still having a high Human Development Index.
European countries (green) have high HDI scores but their resource consumption is high. The United Arab Emirates and Kuwait (dark blue), the USA (red), Denmark (green), Australia and New Zealand (brown) are at the top of the charts for their highest per capita Footprints.
Over time, nature's budget (measured on a per-capita basis) has been decreasing. In 1961, our budget was 4 gha per capita. However, currently, due to contributing factors such as population growth, our per-capita budget is only 2.1 gha on average. What will it mean if population reaches 9 billion as some foresee? Make the calculation.
Arguably the greatest challenge of sustainable development can be identified as enabling an adequate standard of living for everyone within the natural limits of the planet.
Development cooperation supports its partner countries in achieving just that: How can we support development that allows for the success of weaker states without undermining their long-term prospects?

The participants in the Footprint workshops on Vilm Island and in Mongolia rehearse for an emergency: Are there enough resources for all of us? Do we all fit on one planet? How will we deal with one another when resources become scarce?

Suggestions for further work:
Standards of livings and the Footprint

Examine the graph with the colored country dots more closely:

- Over time, the HDI numbers of African countries have been increasing. Discuss: Which development strategies might have been most effective at increasing HDI with no or small increases in resource consumption?
- For higher Footprint countries, such as the USA, what strategies could help reduce resource consumption without sacrificing HDI?
- For countries closer to the "yellow box", what strategies might have been successful at achieving high human development with modest per capita Footprints?

Now let us look into one example:

- In 2005, one country alone lay within the global sustainable development quadrant at the bottom right. According to the United Nations' classification, this country achieves high development (HDI >0.8) without consuming more ecological services than are available on average per person on Earth. In other words, their lifestyle would be replicable worldwide (Footprint <2.1 gha per person).
- What country do you think this is? You can find out using the table on page 52/53 in which all country Footprint and HDI data are listed. Note that being in the box does not mean that the country is sustainable. It just means that they achieved high human development with a level of resource consumption that could be replicated worldwide. They may still be an ecological debtor country – and people may not be satisfied. In other words, being in the yellow box is a necessary, but not sufficient, condition for global sustainable development.
- List five countries you are familiar with and identify their position on the graph in comparison with this country.
- What historical reasons could be responsible for the situation of this country within the yellow box? A little background information will give a better understanding: This island nation had been dependent for a long time on food and energy imports. But with the collapse of the Soviet Union, the population needed to find creative ways to meet human needs within increasing resource constraints. As a result, new agricultural, transportation and energy practices were developed to cope with the lower resource availability. The lower resource availability obviously means a lower Footprint – but not by voluntary means. The main point is that they were able to cope with this reduction without losing on the human development scale.
- How do Germany or the USA look in comparison?
- Try to find a balance: What do you find positive in this "sustainability land" and what do you find rather difficult compared to your everyday life?

Part 4
The Footprint's role in education for sustainable development

The man with experience in development cooperation, Dr. Rolf-Peter Mack values the Footprint because it reduces the complexity of global relationships.

One strength of the Footprint is its ability to quantify whether we are living within or beyond our ecological limits. It can be instrumental for future planning and investments, be it on a local, regional, national, or international level. By presenting complex data in a graphic, easily understood manner, it is also an effective tool for educational and communication activities. In the following section we want to present the use of the Footprint in the educational work of GTZ. But we will also cast light on how it is employed as an essential component and source of inspiration for the discussions and creative activities of the International Youth Summit "Go 4 BioDiv" and in diverse environmental education facilities and institutions in Germany and Austria.

A world that works for people and nature

Sustainability and biodiversity – these are the overarching themes for GTZ events with pupils directed by staff member Rolf-Peter Mack. These are not easy topics, as he himself admits, but he considers them to be extremely important for the individual and collective future of our youth. The senior planning officer of development cooperation appreciates the Footprint because it reduces the complexity of global conditions and makes them tangible. When pupils see the per capita Footprint of different countries, it becomes an ideal starting point for discussions. "A Madagascan lives on roughly one global hectare and a German on four" explains Mack. "We start with this without further explanations. In our view, curiosity is the most important part of learning. Afterwards we explain the Footprint." Young people are quick to ask "So what?" Or, as Mack puts it: "What does this have to do with my own life?" A good example is meat consumption. There, we see what a big impact it has on one's Footprint. Another example is a cheap flight. It may be quickly booked and conveniently priced, but how does that flight affect one's Footprint? In these cases, the pupils' "So what?" question becomes: "What can I personally do in my everyday life?"
Mack starts with classic answers to such questions: green power, organic food, turning down the heat.

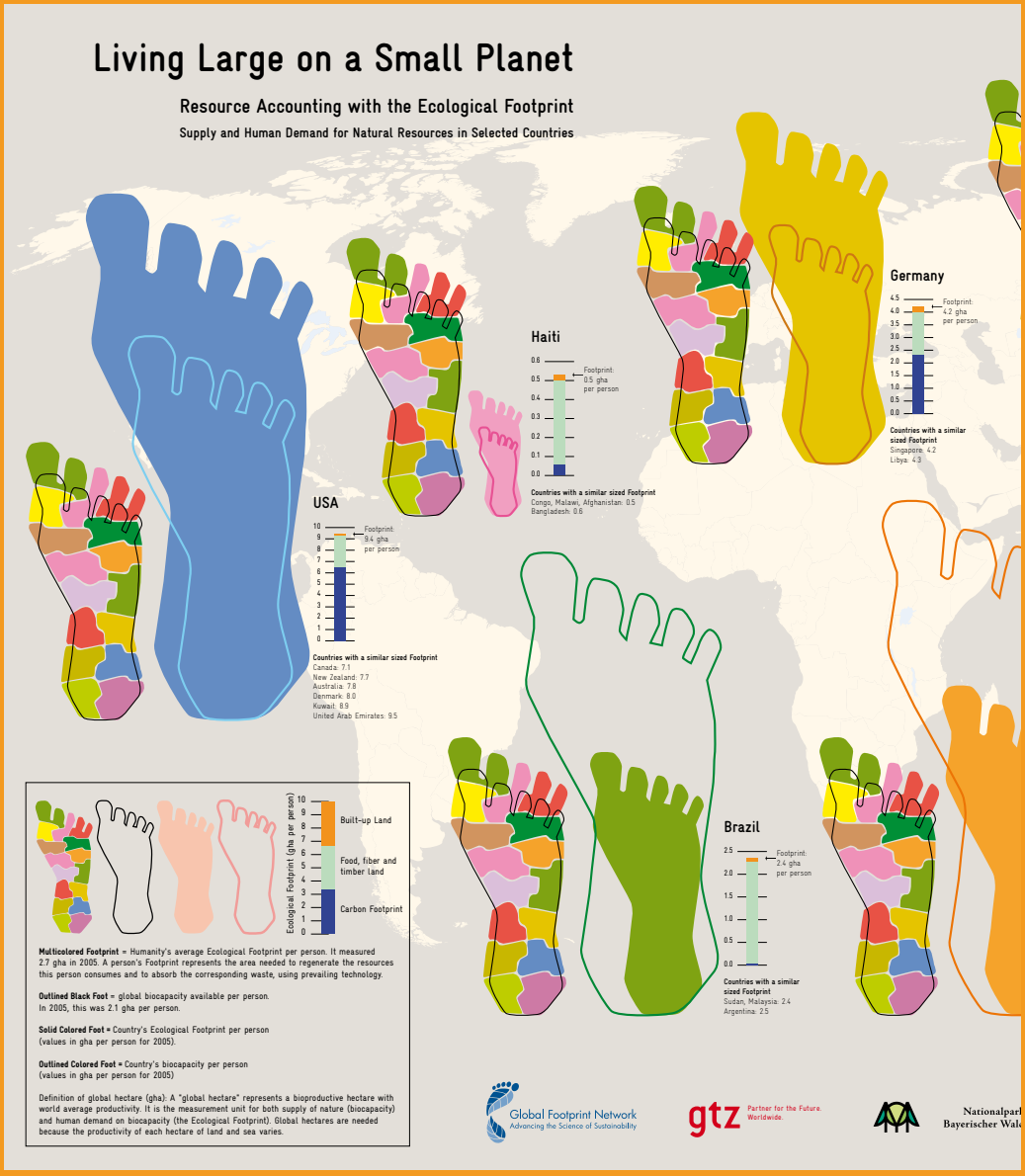
But what is really important to him: "We must offer examples because it makes no sense just to keep issuing appeals, such as, 'we must, and we should,'" he said. "Of course, we can't change the social model with a few in-house training sessions in school. But I give the students a chance to contribute something."
In past years, Mack has been on the move, attending and participating in numerous events in the regions of Frankfurt and Bonn. His insights from those trips:

- "The Footprint plays a central role in schools and in exhibitions we present. References to resource consumption and overconsumption are a key part of these presentations."
- "Many people begin to truly understand the interrelationships of the globalized world through the Ecological Footprint. The tool is able to highlight inequities around the globe. Our mission is to use this information to urge individual responsibility. "
- "Students pose difficult questions, such as: 'Why are we giving development aid if we

Materials:
Feet of different sizes

The **GTZ** uses varying "foot" sizes to illustrate the Ecological Footprint of countries in Europe, Asia and Africa. The participants of the International Youth Summit "Go 4 BioDiv" were given the opportunity to walk over and explore the various Footprints, as were the Madagascan president and German President Horst Köhler. The enormous differences in size caused many to think deeper about their meaning, and served as a catalyst for a series of multifaceted discussions.

The **Financial Times** Online also relied upon different sized feet to represent global Footprint differences. In their February, 28, 2009, edition (www.ft.com/cms/s/2/07c5d230-0154-11de-8f6e-000077b07658.html)) the per capita Footprints of five countries depicted those with the greatest resource consumption and those with the least proportional to their sizes. Next to the gigantic Footprints of the United Arab Emirates, the USA, Denmark and Australia those of Haiti, Afghanistan, and Malawi are infinitesimally small – you have to look very closely to recognize them at all.



A PDF Template for large format print of the graph (in German and English) is available on the accompanying DVD.

know that we are already living far beyond our means? Shouldn't we be erecting a wall to keep our world habitable for us?' Questions about our own societies and consumption behaviors quickly come up."

- "Of course our message is not to return to the Stone Age. Should I turn off all the electricity now? Should I scrap the car? Not necessarily. Rather, reasonable and responsible behaviors are crucial. The solution must be reached through a combination of behavior change and technology."
- "The Footprint gives us an advantage in knowledge; it gives us possibilities and allows us to take concrete action."

The complete interview with Dr. Rolf-Peter Mack of the GTZ (15:36 minutes, in German) can be found as an MP3 file on the accompanying DVD.

"The Ecological Footprint is a great communication tool. It can help explain a complex challenge for the planet to any audience. It can then empower people because it doesn't say you must do this. It says: Here's the challenge that we all share on the planet. You can make your choice. That's very powerful for us."

Terry A'Hearn, Head of the Department of Sustainable Development, EPA Victoria, Australia

Unity in diversity: The International Youth Summit "Go 4 BioDiv"

Regardless of the country you live in, the Ecological Footprint is a universal concept, and deals with issues that affect all of us in our daily lives. The 50 young people – between 18 and 35 years old – from 18 countries, were sharing this experience at the International Youth Summit "Go 4 BioDiv". The event was held during the 9th UN Conference of the Parties to the Convention on Biological Diversity (COP 9 of the CBD) from May 16th to 31st, 2008, in the International Wilderness Camp in the Bavarian Forest National Park and in Bonn. Their collaboration "without limits" made it clear that our natural resources – in the global scheme – recognize no borders. Many of the participants are involved in the preservation of biological diversity as rangers, oceanographers, biologists or ecology students in their native countries.
"Go 4 BioDiv" was a joint project of the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), the Bavarian State Ministry for the Environment and Health, the City of Bonn, the Bavarian Forest National Park, and the Deutsche Bundesstiftung Umwelt (DBU).

Additional information:
www.go4biodiv.org

The GTZ does not only use the Footprint for their educational work in Germany – it became a central theme at the International Youth Summit "Go 4 BioDiv" with participants from 18 industrialized and developing nations.

Footprint @ Go 4 BioDiv

Two German participants, Tatjana Puschkarsky and Verena Treber report on their experiences at the Youth Summit:

The conversations were sometimes heated, sometimes full of enthusiasm and energy, then quiet, perplexed and sad, and then defiant and courageous. The subject involved justice, our future, life and respect – important matters. And again and again one word came up: Footprint. What is the meaning of this? The many muddy footprints at the entry to the International Wilderness Camp in the Bavarian National Park were often very easy to recognize. But could 50 young people from 18 nations really discuss cleanliness for days with such passion and commitment? Probably not. For us, at least, the conversations had nothing to do with mud, grass and water puddles but were about the Ecological Footprint. We had come together to do something about the loss of biological diversity on our Earth. And anyone who wants to change something should be well-versed in its causes, right down to the last detail – on this point we all agreed.

In our time together during the COP 9, the Footprint served as a scientific measuring instrument on which we could base our thoughts about global relationships, justice, old mistakes and new pathways. We used it as a starting point for considering our own resource consumption, for kicking off discussions about justice between North and South, and for the questioning what kind of world we want to live in, and in what direction we should develop.

But the Footprint also became a symbol, a sign which we could all understand and that made us allies, and still does. It even became part of our message to the general public and decision-makers. The more we appreciated it in our discussions about resource consumption and global (in-)justice, the more we wanted to share it with others.

We all had a vision when we arrived on the first evening in the country cabins at the International Wilderness Camp in the Bavarian Forest: to stop the loss of biological diversity and the cultural values which are so closely coupled with it. This is a vision which connected, and continues to connect, 50 young people from all over the world. The International Youth Summit "Go 4 BioDiv" was therefore much more than a political gathering. The time we spent in the International Wilderness Camp and in nature allowed us to see and observe the threats to biodiversity from a completely different perspective. To sleep in a Chilean Ruka log cabin, a Mongolian yurt, or a Vietnamese long house, and to try on the traditional clothing from the Andes or Madagascar, to try out for myself the artistry of glass blowing, and to talk with El Hacen, the participant from Mauritania, about his personal relationship with a camel – all this gave us a very special feeling of diversity. The diversity of cultures and its value for our world's future development was one of the first points covered in our Declaration. We worked hard on this "Go 4 BioDiv" Declaration, often far into the night, until we succeeded in clearly formulating our shared visions into political statements and demands.

"What's fantastic about the Ecological Footprint is that it is based on very complex research but can be explained easily and clearly. [...] since I participated in the Youth Summit and became acquainted with the Ecological Footprint, I take shorter showers, put on a sweater instead of turning up the heat, eat much less meat and take care to buy regional products."

Birgit Heraeus from Germany, economics student and "Go 4 BioDiv" participant

"We all had a vision when we arrived on the first evening in the International Wilderness Camp in the Bavarian Forest: to stop the loss of biological diversity and the cultural values, which are so closely coupled with it."

"We used the Footprint) as a starting point for considering our own resource consumption, for kicking off discussions about justice between North and South, for questioning what kind of world we want to live in, and in what direction we should be developing."

The Declaration was a hefty piece of luggage, which we were able to take with us on our way to the COP 9 in Bonn. We took many other things, too, which had been created during our 10 days together in the International Wilderness Camp, a dance for example. This dance was an aesthetic reflection of the themes that preoccupied us during the summit and in our individual lives. We also brought a lot of new knowledge with us – knowledge about the Bavarian National Park and its problems, for example, but also about the poachers in the national parks in Benin, or about the work of a park ranger in Namibia. We also had our song – a song that the musicians among us played during quiet hours in the evenings. It sounded so beautifully sad, but still somehow hopeful that we wanted to hear it again and again. On the downside, we also developed colds – the nights being too cold for some southerners, and in a hammock to boot. We took along many photos of laughing new friends, but there was also courage and rage: rage about the way things are, and courage to change things all together, piece by piece, step by step. And we had our Footprints with us, large and small, made of paper or glass. Thus "armed" we set out for Bonn to bring home our vision of diversity and its protection to our host families, to the many curious passersby, to other "fighters" – not least of all to the politicians. Behind us in the International Wilderness Camp we left traces of muddy hiking boots worn by Chilean, Bolivian, Brazilian, Ecuadorean, Venezuelan, Mexican, Mauritanian, Beninese, Namibian, Madagascan, Philippine, Chinese, Mongolian, Vietnamese, Uzbek, Russian, Czech, and German feet. In Bonn we also wanted to leave traces behind – traces similar to the ones that our discussions with the other participants at the Youth Summit had left with us.

But what do Footprints really tell us? They tell us something about the size of a person's foot, but also about his bearing. If he places his feet down with pressure, the tracks will be deep and memorable. In English, the word "footprint" connotes this interpretation especially well: To imprint his stamp on something, to leave a message behind. Our bearing can be different; even someone with large feet can step lightly, carefully and considerately. One can also act out his anger and walk off with his entire weight,

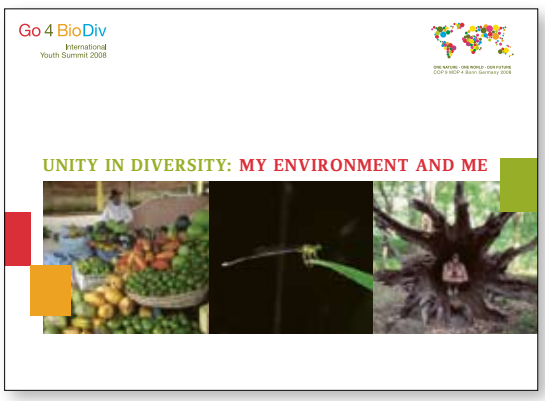
The Brazilian...

stamping down everything – every tiny creature trying to protect itself from his step.
The Footprint as a tool for political education possesses all these capabilities – it creates networks and sparks collaboration, makes people think, thus making a deep impression. As an index of the resource consumption of a population, the Footprint brings data together that have not previously been correlated. In this sense, it provides the possibility for comparing the lifestyles of varied nations. In a way it lays us bare, it exposes our behavior and focuses attention on us and our relation to nature. It reveals to us how many resources we have, and how much we use – it lays out the data in a transparent manner and sheds light on global interrelationships.
Transparent, clear, insightful, to get things into perspective – that was also our motto. So we decided to use glass as the material for the Crystal Footprint. Glass symbolizes not only transparency, but creative freedom, room for colors and individuality. We also associate this symbol with the different possibilities for developing ourselves. For every society and every individual, there are different actions we can take to make a positive impact. Our different environments, cultures and beliefs all influence us differently. But what is most important is that we work

...and the German Flying Footprints – two of the hanging display cases that marked the way from the entrance of the Bonn "Expo of Diversity" to the Youth Summit exhibit stand. Whereas the Brazilian Footprint (white foot, top right in the picture) leaves a lot of room for representing diversity, the larger German Footprint (large white foot in the background) limits the space or room for design considerably.

together to reverse the current trends at a global scale. Going in a common direction and looking forward is symbolized by the 3 x 2 meter artistic syntheses of The Crystal Footprint or The Puzzle of Biodiv. For this, we designed a large foot in a glassblowing workshop in the Bavarian Forest out of puzzle pieces whose colors and forms were inspired by the topography or cultural uniqueness of our respective homes. The national Ecological Footprint was later engraved next to the name of the participating country, proportional in its size to the average resource consumption of its population.
During conversations with the interested public at our exhibition grounds, the principle of the Ecological Footprint could be clearly illustrated

with the Crystal Footprint; the larger the country's foot, the less space for nature, plants and animals, colorful life, nature-compatible cultural practices, and forms of expression. The concept seemed illuminating to everyone, from pupils, to the Mongolian environment minister, to a representative of an Amazonian indigenous organization dressed with feather jewelry. It stimulated lively, in-depth discussions. For this reason, the great glass artwork shall now tour the world and carry the thoughts of the Ecological Footprint further. The mayors of the conference Cities for Biodiversity, which ran in parallel to COP 9, expressed great interest in exhibiting the Crystal Footprint in their cities and in coordinating discussion events and workshops for schools with Youth Summit participants.
Besides the great glass puzzle of the Crystal Footprint, each participating country designed a glass display case to offer a glimpse into the biological and cultural diversity of the country. These were hung on a steel construction as



The photography exhibition "Unity in Diversity: my environment and me" and the short film "Send Samauma's Call Around the World", a continuation of the Brazilian film "Samauma's Call" were also counted among the creative contributions of the Summit's participants.

The bigger the engraved Footprint, the smaller the diversity; each individual puzzle piece of the Crystal Footprint symbolizes the ecological and cultural wealth of a country. The glass Footprint set out on its journey around the world from the Bavarian Forest via Bonn and the Center for Environmental Communication of the German Federal Foundation for the Environment DBU (Deutsche Bundesstiftung Umwelt) in Osnabruck.

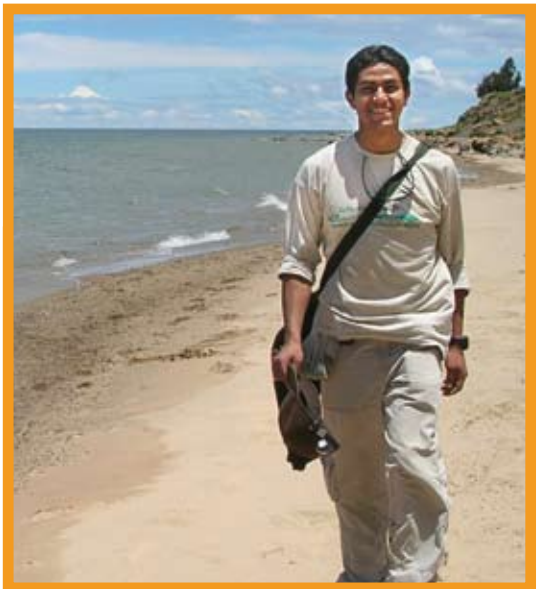
Flying Footprints. After these "treasure boxes" had been fashioned with ecological and cultural elements from the respective country, they, too, were engraved in a prominent spot with the country-specific Footprint. Those sandblasted, frosted Footprint-sections of the glass displays no longer allowed appreciating the "treasures" of each specific country: The larger the Footprint was, the less visual leeway was left to the designers of the display case – and thus to the inhabitants of that patch of the Earth. The proportional Footprint of the United States was so large that it extended far beyond the display case. Faced with the COP 9 organizers' fears of a diplomatic imbroglio arising from such a visually blatant "resource overuse" by the US, the North American Flying Footprint was moved away from its originally planned location directly in front of the entrance to the conference building to a much less visited place. Nevertheless, the other display cases distributed around the entire exhibition area delighted many visitors and delegates and stimulated curious questions and intense discussions.

As a memento of the Footprint, we gave glass Footprint pendants to visitors of our stand and to our host families. Standing glass Footprints the size of a human foot, which can be used as a paper weight, were personally handed to the General Secretary of the Convention on Biodiversity, Dr. Ahmed Djoghlaf, German President at that time Horst Köhler, and the two German ministers at that time Sigmar Gabriel (BMU) and Heidemarie Wieczorek-Zeul (BMZ), as well as ministers for the environment of the participating countries, the mayor of the city of Bonn and the delegates to the mayoral conference. The co-founder of the Ecological Footprint, Dr. Mathis Wackernagel, as well as the Executive Director of the UN Environmental Program (UNEP), Achim Steiner, were also sent glass Footprints together with our Declaration.

The Footprint idea also inspired our dance performance. We developed a modern dance on this theme in the course of a week with two choreographers from Columbia and India/Germany. With a very different synthesis of the arts arising

With their expressive dance theater 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.

from group dynamics, accentuated in small groups and individual performances, we were able to fill the audiences in the Bavarian Forest and in Bonn with enthusiasm for our ideas.
Participants of the Youth Summit left with a distinct realization of our planet's limited resources and the ramifications of humanity's ongoing demands on the Earth. This would not have been possible without the Ecological Footprint.
For us, as young adults, the hope remains for a future in which the diversity of life is more strongly respected than is the case today. A future in which we will all have developed further – even and especially the "developed" nations, whose Footprints today are unbearably large and forceful. Looking back on the muddy footprints in the Bavarian Forest, we can recognize that the earth under our feet did not distinguish whether it was a Vietnamese, Bolivian, or German walking on it. They were all human. The earth does not differentiate between old industrialized nations, emerging nations and the so-called developing countries. Everyone has a responsibility to respect the earth under their feet and to live in harmony with nature.
We participants in the International Youth Summit "Go 4 BioDiv" are filled with courage



"For me the best way for communicating the concept of the Footprint is through art in all its forms and expressions. Writing newspaper articles and holding workshops at schools and universities is also very important."

Gabriel Zeballos Castellón from Bolivia, Biologist and "Go 4 BioDiv" participant

The accompanying DVD provides many materials about the Youth Summit:

- The short film "Send Samauma's Call around the World"
- A video recording produced by DBU of the dance theater on the main stage in Bonn
- The brochure accompanying the photographic exhibition "Unity in Diversity"
- Information about the Crystal Footprint
- Additional photos from the International Youth Summit

"We are all developing nations – we need new models for development! […] Our great opportunity is unity in diversity!" The Final Declaration of the summit was based on a draft of participants' statements and translated into many different languages (available as a PDF file on the accompanying DVD).

"For me the best ways for communicating the Footprint are mass media, the initiatives of young people and, above all, environmental education. Only in this way will people comprehend that they will destroy their own future and that of the next generation if they themselves do not take measures to protect the natural bases for life."

Pham Thi Ly from Vietnam, translator, "Go 4 BioDiv" participant and GTZ staff member after the Youth Summit

and drive. We are bound together by memories, visions, and the comforting knowledge that, when back in our home countries, we will continue to broadcast the Footprint's message, and that we will all, step by step, walk a path in the right direction.

We are the Future!

Guided by the awareness that today's youth must bear the consequences of the global community's current actions, the participants in the Youth Summit presented their Declaration, which they had worked hard on in the International Wilderness Camp, to politicians and delegates

Not only could the participants in the Youth Summit present their concerns to a broader public, they also met with high-ranking politicians such as German President Horst Köhler, then-Minister for the Environment, Sigmar Gabriel, and then-Development Minister, Heidemarie Wieczorek-Zeul.

A conversation with Tatjana and Verena – nine months after the Youth Summit

Tatjana Puschkarsky (26 years old, Germany)

When we now look back to the Youth Summit in May, 2008, the topics were the Footprint and biodiversity. Verena and Tatjana, you were there. What were your impressions? How did people react? Did you get your message across?

Tatjana: Yes, I do have the feeling that the message came across. We had discussions with many decision-makers and with many teachers, too, who came by with their school classes. I think that interest in the Footprint concept is very high.

Verena: I also had the experience that it came across. The Footprint is something that people can quickly identify with. It is somewhere between a logo and something highly scientific. What I also thought was terrific was that all of us, of all nations, created the Crystal Footprint together. Nature conservation can only be successful when everyone does his share.

How were the conversations with the other participants from different countries?

Tatjana: The Footprint gave us a very good starting point for discussing distributive justice in the world. The discussions showed that there are different approaches but that we also share a common vision, namely to give future generations the possibility to develop while being able to remain within our natural limits.

You grappled with the Footprint creatively and communicatively. There it had less to do with scientific aspects than with the big questions: How do we implement things and get conversations going? Does the Footprint work in this respect?

Tatjana: Our dance theater was a very metaphorical representation of environmental destruction and excessive resource consumption. I had the feeling that a great deal was communicated to the audience. People understood that we are destroying our basis for life if we continue with business as usual. And that nature provides us with certain services such as clean water, intact forests, and a basic food supply. By the Footprint, this was portrayed in a very nice way.

Verena: I also think that this creative, symbolic function of the Footprint was put to good use. It was the spark for all our discussions about what we can do in our own life. We often talked about very practical issues like meat consumption. In conversations, it became apparent that cultural questions lie in the background. There are already many vegetarians among us Germans, for instance.

What were the arguments of the other young participants from different countries?

Verena: Well, I know that in some African countries, having meat at the table goes with having money. Likewise, there was a discussion with two Chinese girls about genetically modified food. Cultural backgrounds play a role, probably also because of the local media landscape. We had discussions on different levels. Maybe because we hadn't all studied the same thing or were not equally familiar with the topic.

Verena Treber
(25 years old, Germany)

What effect did your work with the Footprint have on you?

Tatjana: I have the feeling that it changed my personal behavior. For example, I am trying not to eat meat and not to fly within Europe. I want to have a smaller Footprint than the average German because I don't want to take resources away from other countries or from future generations. But I also think differently now about sustainability in connection with transnational ethics and justice. During the Summit, cultural diversity was a wonderful catchword. Such a tolerant, respectful discourse about the need for new development models that we held in our diverse group appears to be something very rare at official world conferences. Hence, the impact of such a youth summit is immense, when young people meet, have similar goals and political visions and, most of all wish to collaborate. That makes it different from other world conferences which are usually more about negotiating than cooperating.

Verena: Well, I think I can answer this on three levels. The first level is that, with the Footprint, I found a communication tool with which I can compare and contrast things. The first time I had the chance to evaluate something practically using the Footprint was at the COP 9 in Bonn. How many politicians flew there and what an effort was expended! I thought to myself that the total expenditure, this negative influence which arose from the conference should be calculated and weighed against the decisions that were reached there. Was the number of positive decisions at least worth so many flights by the politicians? Secondly, the Footprint helped me explain for example in Madagascar, where I have been twice, that things are not going so wonderfully here in Germany. This is not so easy since many people have an idealized picture of Germany. The Footprint played a role even in personal conversations with friends about the fact that they can develop and maybe advance as far as we have in Germany. We here in Germany think that we may have risked too much or gone in the wrong direction. We look at you in Madagascar and say that theoretically, in terms of resource consumption, we must be like you. And that you can be proud of yourselves even if things are not so great in some respects. Despite my 24 years, the third level lies between hope and hopelessness. How will highly developed countries like Germany, the USA, or Switzerland achieve such a small Footprint as Madagascar? I think that the steps that we are taking are so small. We are trying to move in the right direction but the solution is still far away.

Verena just raised the point that the Footprint's testimony can be pretty frustrating.

Tatjana: For me personally the journey is the destination. Even when it is difficult to throttle down our resource consumption, it is important to get started. It's never too late. And above all, it's not just about restrictions – it's about finding new and better ways of living within ecological limits. A good and happy life for all and everyone– that's what drives me.

The entire interview with Tatjana and Verena (14:58 minutes, in German) can be found as an MP3 file in the accompanying DVD.

Suggestions for further work: Go 4 BioDiv!

- How does "Go 4 BioDiv" affect you? The energy of the Youth Summit people was quite infectious. Would you have liked to be there? How would you have represented Germany and its biological diversity, its natural resource consumption – on stage, in the form of a glass artwork, or something else? What about the other participants would have caught your interest? Would you have rather been part of the dancing or would the work on the Declaration have appealed to you?
- How does the interview with the German participants Tatjana and Verena affect you, for example the part where they describe changes in their daily lives or how they feel about people from countries with a smaller Footprint?
- Have you ever taken part in such an event? If yes, give a small report in your group/class about it. If not, could you imagine to participate in such an event?

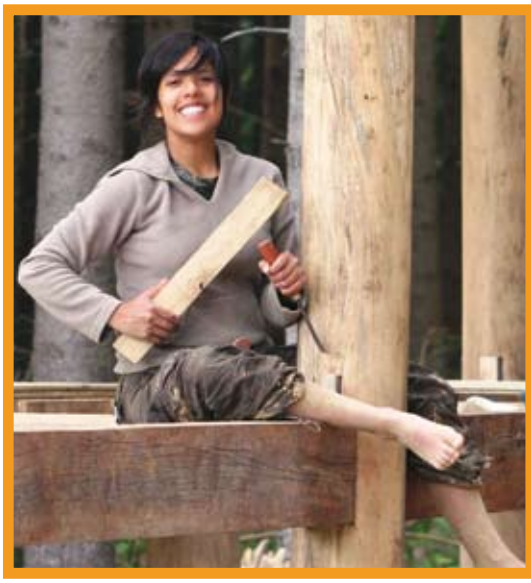
gathered in Bonn. It was translated by the youth themselves into nine languages. In their Statement, they demand, among other things, innovative development models that can show the industrialized nations new ways of reducing their Ecological Footprint, and at the same time give the majority of the world's population a chance to improve their standards of living without further negative effects on our planet. Moreover, they advocate just distribution of the profits originating from the use of natural resources, the countering of the root causes of the loss of biodiversity – ignorance, poverty, population growth, and unsustainable consumption habits – and free, high-quality environmental education and information for everyone.

An intercultural network

Through their intensely personal exchanges, the participants in the International Youth Summit "Go 4 BioDiv" built a network that remains even after their departure from Germany. They share ideas and encourage one another to induce change in their home countries. After their return, many of them benefit from the motivation, the enthusiasm, and the readiness to act, which they experienced during the Youth Summit. As disseminators of the Ecological Footprint, they spread the message and encourage others to support both nature and resource conservation, and the preservation of the cultural diversity upon which it is based. As they set down in their Declaration, they measure their political decision-makers on how they put their words and international agreements into action.

The story continues: "Go 4 BioDiv" goes on

The second International Youth Forum "Go 4 BioDiv" took place in parallel to COP 10 in Nagoya, Japan, in October 2010. Continuing with the spirit of the last "Go 4 BioDiv" in Bonn, Germany, in 2008, the young people inspired international decision-makers and showed them who should sit at the negotiation table with them: the young generation, committed, enthusiastic people, including indigenous peoples and minorities, and people directly affected by climate change and in charge of biodiversity conservation in their region. While carrying on the symbol of the last Youth Forum (the small glass Footprints symbolizing the steps and actions everybody can take to contribute to the necessary changes), the second International Youth Forum focused on natural World Heritage sites as the flagships of biodiversity conservation.
The 34 participants came from 25 World Heritage sites all over the world, including such outstanding places like the Great Barrier Reef in Australia, Mount Everest in Nepal, the Greenlandic Icefjord, Mount Kilimanjaro in Tanzania or the Galápagos Islands in Ecuador. Having spent ten days at Mount Fuji, an iconic and sacred place to discuss the special relationship between nature and human beings, the young participants were well prepared to meet the challenge at the COP 10 conference in Nagoya. With their video statements, dance performances, side events, their exhibition and treasure box, they



"I believe in the simple, small things that each of us can do – we can all become active and turn things around! When we talk with our friends about the possibility for action, they will tell others who will tell others in turn. To communicate the Footprint concept to the broader public is also a "must", of course – with creative initiatives, through art and in cooperation with schools, universities and businesses. Thus the Footprint philosophy will take a place in peoples' daily lives."

Elsa Leticia Esquer Ovalle from Mexico, student of natural resource management and "Go 4 BioDiv" participant

called upon decision-makers to halt biodiversity loss and conserve their precious sites.
The video statements proved to be a convincing medium to engage people. Avaaraq from Greenland opened the floor by introducing the endeavor, truly speaking with her heart: "Take a look at me. Take a look at my friends. Our homelands are suffering the consequences of climate change. We are not just another story in the news. We are the ones who need action now. This is personal!" As a consequence to the diverse youth activities at COP 10, the CBD Executive Secretary, Dr. Ahmed Djoghlaf, committed the CBD Secretariat to establish a permanent focal point for youth in Montreal.
"Go 4 BioDiv" 2010 was a joint initiative by GTZ, IUCN, UNESCO World Heritage Center, Tsukuba University (Japan) and the CBD.

Part 6 of the brochure presents the ecological balance sheets and future trends of the USA, Japan and the 12 countries which were represented at the Youth Summit. These include comprehensive graphic and numerical data.

The International Youth Summit "Go 4 BioDiv" has made an impact on many participants. Political decision-makers want to make it a permanent feature of the Conferences of the Parties to the Convention on Biological Diversity.

The "Footprint week" in the International Wilderness Camp

Preparations for the Youth Summit took place in the country cabins and other traditional dwellings in the International Wilderness Camp in the Bavarian Forest National Park. With the support of the GTZ and the Deutsche Bundesstiftung Umwelt (DBU, see the Infobox on pg. 90) and a network of cooperation partners, the International Wilderness Camp was built as a place for sustainable development educational activities. It conveys an impression of the diverse ways of life in our world. The summit participants were accommodated in lodgings that are typical for the National Park's partner conservation programs in Benin, Brazil, Chile, Venezuela, Vietnam, Siberia, the Czech Republic, and Mongolia. Within 10 days in the International Wilderness Camp, the young people developed the political messages and creative artistic contributions that were introduced above.

But the Footprint was not only a central theme during the Youth Summit. Just like other over-arching topics such as climate change and resource consumption, it forms a regular part of the week-long educational programs for school classes and youth groups. These take place in the country cabins of the International Wilderness Camp. The students, who live in the traditional dwellings, try to understand the topics from the perspectives of their "host countries" or the conservation areas which are partners of the Bavarian Forest National Park.

The central questions of the week-long program, which is conceived for students in their 10th to 13th school year, are: What is behind the idea of the Footprint? How large is our country's Footprint and those of other countries? What does this all have to do with nature preservation and conservation areas? What role does each of us play in this? "Living well within the means of one planet" – Is this at all possible? If yes, how?

The "Chair Metaphor", the "Loop Game" or the "Quotation Line" serve as educational starting points.

Activity: The chair metaphor or planet game

A group of 25 to 30 students is assigned to place themselves all together on two or three chairs without touching the ground. During this activity, the students should gain an understanding of the pressure bearing down on living areas and resources. Thus it becomes easier to underscore the necessity of distributing our Earth's limited resources – it is easy to imagine that the fight for the chairs isn't always a just one. As a variation to the "Chair Metaphor", the entry point to the Footprint theme can be to paint the Earth on two or three pieces of cloth. The participants must fit themselves on these. If this leads to a difficult balancing act, you can imagine how things go when the number of available planet-cloths is reduced.

Activity: Loop game

This game is similar to the Chair Metaphor game. Rope loops of varying sizes are laid down. As long as there is singing or music playing, everyone must keep moving. When the music stops, both feet must be within a loop. As in "musical chairs", whoever doesn't find a place is eliminated. During the course of the game, more and more loops are taken away and the chance of finding a spot thus becomes slimmer and slimmer. Besides the active participants, there can be a group of neutral observers who watch the reactions to the shrinking numbers of loops (shrinking resources), note them down, and report them back to the group later. The reactions are frequently very similar but can vary according to the age, imagination and agility of the participants. The first comments are mostly "it's getting tight". Then the group tries to keep everyone in the game with the exception of some "individual egoists" asserting themselves or "innovative solutions are sought" (like sitting outside but keeping the feet within the loops, helping others, untying small loops and making new, bigger ones with more space, etc.). In this animated game it is crucial to discuss the question "what does this have to do with us and the situation of our planet?"

Two PDF files are available (for different group sizes) on the accompanying DVD for printing large format planet Earths.

The Footprint is already an established didactic component of the week long program in the International Wilderness Camp in the Bavarian Forest National Park.

Activity: Quotation line

The following are quotations from well-known figures calling attention to themes connected directly or indirectly with the Ecological Footprint. Hang them on a clothes line with wooden pegs, or on branches of trees or bushes. Then the students can select a quotation from a series which they agree with or wish to examine in more detail. They then justify their selection and discuss it in the group.

Some excerpts from the quotation list:

- "For in the final analysis, our most basic common link is that we all inhabit this small planet, we all breathe the same air, we all cherish our children's futures, and we are all mortal." (John F. Kennedy, US President 1961-1963)
- "We have only borrowed the world from our children." (Native American saying)
- "Only when you have felled the last tree and caught the last fish will you know that you cannot eat money…but he, who can pay the most, will bet the last fish." (Variation of a Native American saying)
- "When a system cannot be extrapolated, it reaches its end." (H.P. Dürr, b. 1929, German physician)
- "Only when the brave become wise and the wise become brave will we feel what has often been falsely claimed: human progress." (Erich Kästner, 1899-1974, German author)
- "The future of mankind no longer depends on what we commit but, more than ever, on what we omit." (John Irving, b. 1942, American author)
- "It is not about dictating what others should do to reduce their Footprint but about how we can live better." (Mathis Wackernagel, b. 1962, president of Global Footprint Network)
- "It does not depend on giving people in the Third World more, but on stealing less from them." (Jean Ziegler, b. 1934, Swiss sociologist and politician)
- "Be the change which you want to make." (Mahatma Ghandi, 1869-1948, spiritual leader of the Indian independence movement)
- "You see things and ask: why? I dream of things and ask: why not?" (George Bernard Shaw, 1856-1950, Irish playwright)

Additional information about the International Wilderness Camp can be found at www.wildniscamp.de and in the brochure "Nature and Mankind facing Climate Change" (in English and German) which appears as volume 8 of the series "Sustainability has Many Faces".

Infobox:
The promoter of innovative projects: the Deutsche Bundesstiftung Umwelt (DBU)

As one of Europe's largest foundations, the DBU plays a central role in sustainable development projects in Germany. It was founded in 1989 on the initiative of the German Federal Government, which wished to use the proceeds from the privatization of the former steel group Salzgitter AG for the promotion of a future-oriented, ecologically responsible market economy and began its operations in 1991. Since that time the DBU has supported more than 7,400 innovative and exemplary projects with a total value of approximately € 1.3 billion. Its promotional activIties – environmental education measures, development and use of environmentally friendly technology, and the maintenance and restoration of the national natural heritage – are oriented toward the fundamentals of education for sustainable development. These should make it possible for people to perceive global problems, to face them, and to solve them. The Foundation wishes to encourage cooperation between nature preservation organizations and German development cooperation in such activities as the building of the International Wilderness Camp am Falkenstein in the Bavarian Forest National Park and the International Youth Summit "Go 4 BioDiv". The concept of the Ecological Footprint can play a constructive role in projects as an educational tool. Thus, the Crystal Footprint which was created by the "Go 4 BioDiv" participants made the first stop of its journey at the DBU's Center for Environmental Communication in Osnabruck.

Additional materials and information: www.dbu.de/359.html

"Having to revolutionize our entire lifestyle and way of thinking appeared to be an uncomfortable truth for many of the participants in the "Sustainability Week" during my course of studies in international business. […] I believe that a tool like the Footprint would have been very useful in this week of seminars. It could have provided a basic understanding about subject matter, the challenges, and possible solutions on the path toward sustainability."

Verena Treber from Germany, student of international business and "Go 4 BioDiv" participant

A selection of additional educational material and initiatives

The Bavarian State Office for the Environment

In 2009 the Bavarian State Office for the Environment created an informational brochure and educational material on the Footprint for school curricula as part of its series "UmweltWissen" ("Environmental Knowledge", in German). These can be accessed on the Internet at:

- www.lfu.bayern.de/umweltwissen/doc/uw_86_oekologischer_fussabruck.pdf
- www.lfu.bayern.de/umweltwissen/doc/uw_87_oekologischer_fussabruck_im_unterricht.pdf

(available as PDF files on the accompanying DVD) In collaboration with the University of Augsburg Chair for the Didactics of Geography additional educational material was published which also is available on the accompanying DVD. The latest version can be downloaded from www.lfu.bayern.de/umweltwissen/doc/uw_bm_01_schuelerblaetter_oekologischer_fussabruck.zip

KATE e.V.

The independent, nonprofit organization KATE – contact point for the environment and development – in cooperation with the registered Berlin Association of Development Policy Groups (BER e.V.) developed a campaign manual "Nachhaltiger Konsum and Entwicklungszusammenhang" ("The campaign manual for sustainable consumption and development", in German). This is an aid for designing interactive learning for development and environmental policy groups and for schools. Five different topics are described as activity units for sustainable development (clothing, sugar, coffee, the climate breakfast, and the Ecological Footprint). Background and working materials with their Web links make the application user-friendly. The initiative handbook is part of an EU-sponsored project "FAIRhandeln lernen" (Learning Fair Trade) which KATE e.V. is carrying out with other development policy organizations.

The Campaign handbook can be ordered at www.kate-berlin.de/bestellung-aktionshandbuch-de.html

FORUM Umweltbildung Österreich (Environmental Education FORUM of Austria)

This Internet portal is an initiative of the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management and the Austrian Federal Ministry for Education, the Arts and Culture. The lead partner is the Umweltdachverband GmbH. The forum presents comprehensive information on its Web site with links, education material and the brochure "Der Ökologische Fußabdruck in der Schule – Impulse, Szenarien und Übungen für die Sekundarstufe" (available as a PDF file on the DVD) at www.umweltbildung.at/cgi-bin/cms/af.pl?ref=en

The Federation of German Consumer Organizations

The German Verbraucherzentrale (Federation of German Consumer Organizations) publishes expert information for interdisciplinary studies from primary to secondary school levels and for vocational schools:

- (in English): The Ecological Footprint and Sustainable Consumption. Educational material by Dr. Philip Devlin (2003). www.verbraucherbildung.de/projekt01/media/pdf/UE_Oekologischer_Fuss_Schnauss_0803.pdf
- (in German): Big-footed-sustainable behavior on the model of the Ecological Footprint. Lesson unit with educational materials by Matthias Schnauss (2003). www.verbraucherbildung.de/projekt01/media/pdf/UE_Oekologischer_Fuss_Schnauss_0803.pdf
- (in German): The Ecological Footprint – a Contribution to the Topic of Sustainability. Expert contribution with background materials by Matthias Schnauss (2003) www.verbraucherbildung.de/projekt01/media/pdf/FB_Fussabdruck_Schnauss_0803.pdf

Part 5
Outlook

"Optimism is the best partner of a good idea. And a lot depends on us personally – but we are well on our way!"

Gabriel Zeballos Castellón from Bolivia, Biologist and "Go 4 BioDiv" participant

The Ecological Footprint is like a pair of glasses. The blurs and shadows you see without the lenses become clear and distinct: How much nature do we have? How much do we use? Some things are brought closer while others tend to fade into the background.

With the Footprint, we are able to see the pressures created by the growing demand on nature's resources from different parts of the world.

The Footprint measures how much material is moved back and forth between countries in our global economy. This occurs through trade, fishing of international waters, and from emissions from one country to another. If the population of a country uses more biocapacity for their Footprint than is available in their country, it runs an ecological deficit. Those who use less than their ecosystems can renew are ecological creditors.

This representation of the world indicates differences and interconnections. It represents the current reality and stimulates discussions about human demand on nature and our common future. This does not mean, however, that countries "should" move towards self-sufficiency and only use resources from within their own borders, and therefore not engage in global trade. Essentially, we are looking here at the net-effect of trade: to what extent, a county is importing or exporting biocapacity. It is up to the country to decide what serves its interests best. Footprint analyses are structurally not that different from financial analysis. Just as a monetary trade deficit can be a liability, so can a biocapacity deficit be if, because of that deficit, a country finds itself at risk of depleting its own natural capital, incurring higher costs for resources imported from elsewhere, or being exposed to supply disruptions. Despite the relatively low demand on biocapacity in Africa and Asia, the overall demand is growing there as well. This increase is driven primarily by increasing populations. The overall picture is a nearly exponentially growing global demand, while biocapacity is not increasing at the same rate. This accentuates the challenge, since resource consumption on this planet is not only vastly unequal, but is, on the whole, already much too high. Overshoot in 2009 stood at about 40 percent. The dramatic spiral of overuse of resources, long term degradation of the environment and increasing poverty is moving faster and faster. There is an urgent imperative to pursue new development paths.

German development cooperation wishes to support its partners in this effort. This requires new ideas, analyses, tools – but also concrete opportunities for implementing the new concepts. Resource accounting aided by the Footprint opens exciting perspectives.

To start with, anyone can now determine their own Footprint through a personal Footprint calculator on the Internet. A person who flies a lot has a larger Footprint – as does one who lives in a large, poorly insulated house. It is consistently surprising how seemingly trivial things, eating meat for instance, affect the personal Footprint. While the tool does not advocate for specific lifestyle changes, the results can be enlightening. For example, someone may think twice about her number of flights, or may stop flying altogether. Everyone can start by taking individual action. A fulfilled life on a small Footprint is possible. The point of the Footprint is not to impose such a life on others. Rather, it is to help people anticipate change and act before ecological reality imposes uncomfortable choices upon us.

Individually reducing the amount of biocapacity we use is only a part of the solution to the challenges we face. It may be even more significant to intervene at the societal level, such as in municipalities. Footprint studies demonstrate that

a large part of a city dweller's demand on nature is determined by the way the city is designed, for example, what kind of infrastructure is available. Thereby it is not only a question of individual consumption (What do I eat? What do I wear? What car do I drive?), but one of mobility patterns (How far is it to work? How do I get there?), or of energy (How much do I use? What is the source of the energy?). Resource accounting is in the self-interest of every city, region and country. If a government can offer a high-quality of life with a relatively low demand on nature, that would reduce its dependence on resources and increase its competitiveness.

One of the central capacity questions relates to the number of people on the planet because more inhabitants simply need more biocapacity. Addressing population numbers is not about blaming but about looking into the future – where do we need to invest in order to produce highest quality of life for all? Even if the world population continues to rise for the moment, it will in the long term have to sink – whether we like it or not. The question is whether this will be due to higher mortality rates or reduced birth rates. This is up to us.

Going beyond the carrying capacity of our ecosystems, has especially dramatic and more immediate consequences for financially weaker nations. Neither can they fulfill the needs of their industries, communities or individual households, nor are they in a position to compensate for their deficits through trade or additional purchases. Nevertheless, negative trends can be changed. There are already numerous positive developments. Vietnam shows increasing per capita biocapacity; and Ecuador – a megadiverse tropical country that despite its large forest areas was on the verge of crossing the threshold from being an ecological creditor to being an ecological debtor – recently has become the first country in the world to set a national Footprint goal: After being presented with its very critical Footprint data, the national government made a public commitment to reverse the trends by 2013.

In the near future, countries' ecological and Footprint accounts will become increasingly decisive for setting political agendas and economic directions. In many countries, an important, strategic intervention point is to support the advancement of women. Many development cooperation projects are helping women gain access to family planning, health care, and the job market, for instance. Just a few years of school have proven to have many positive effects; population growth decreases and educational opportunities rise. Therefore, supporting women in development cooperation goes beyond helping one gender. Such investments help the society as a whole.

According to the logic of the Footprint framework, there are also many opportunities to strengthen the supply side of the resource equation such as improved forestry and agricultural practices, including enhanced irrigation systems and the prevention of soil erosion. The Footprint's lenses are, however, not suited for all vistas. Depending on the problem other tools may have an advantage, for example life cycle assessment.

Is resource accounting enough? Certainly not. In the end, we will need new economic frameworks that are better aligned with the global socio-ecological realities of a new era. As the participants in the International Youth Summit expressed so appropriately in their Declaration, all countries, whether rich or poor, are in the end "developing countries." The question is, in which direction are we developing, and who is determining the course? The Footprint is a simple tool that shows us that a rich and fulfilling life is certainly possible within nature's limits.

"In a world of shrinking resources, those who first recognize the need for sustainability and adopt appropriate strategies will succeed best in future global competition."

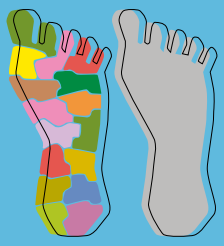
Yves Manfrini, fund manager at Union Bancaire Privée, Switzerland

The Footprint supports positive action – people can learn to live fulfilling lives within nature's limits.

Part 6
National Footprints: living on large feet and on small

The country profiles are based on Footprint data which is shown on pp. 118-119. The per capita data are given in gha/ per capita, global values in million gha.

The feet that follow in the margins represent:



Left
- multicolored: global Footprint
- outlined: global biocapacity

Right
- solid colored: Footprint of the respective country
- outlined colored: biocapacity of the respective country

[2005 values in gha per capita]

Country profiles address questions such as: "What is the relationship between supply of and demand for biocapacity?"

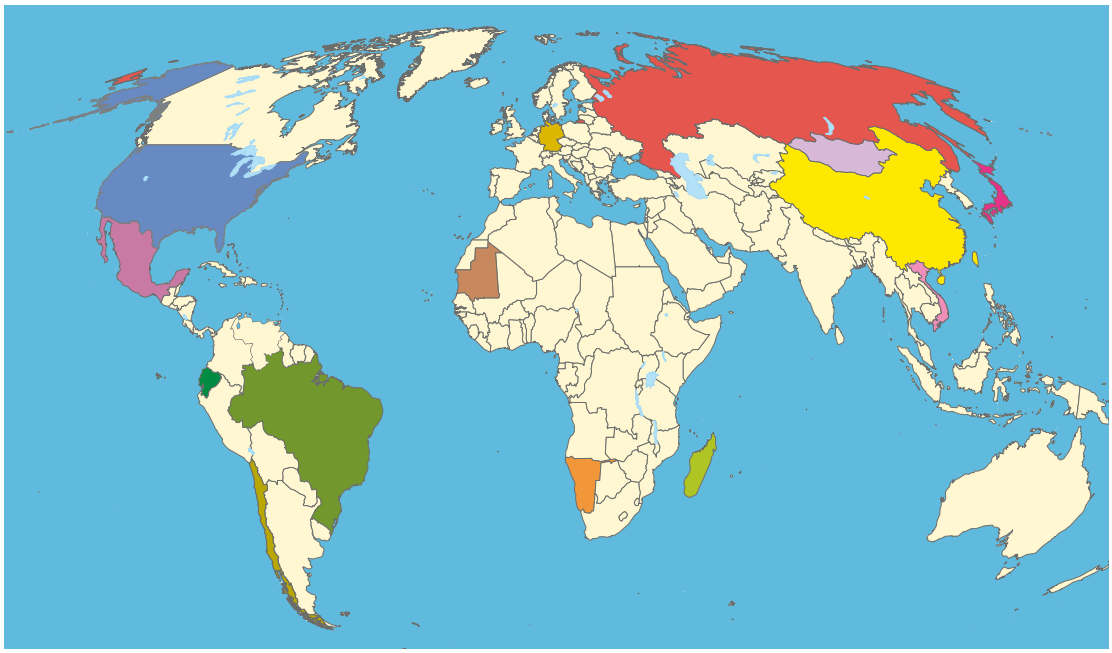
> **"I often think back on our discussions during the Youth Summit and when we finally agreed that all the world's countries are developing countries and that we all must change. Some have to be allowed to raise their standard of living; others must reduce their terribly large Footprints. [...] This way of seeing things raises many new questions for international politics. I too changed my attitude."**
>
> **Verena Treber** from Germany, Student of International Business and "Go 4 BioDiv" participant

Eighteen countries were represented at the International Youth Summit "Go 4 BioDiv". They all had different cultural, economic, social, political, and ecological profiles – and these differences offered the opportunity for fruitful discussions among the participants. The spectrum stretched from high- to middle- to low-income countries, from tropical to arid to temperate climates, from countries in turmoil shaken by crisis to politically stable democracies. It included ecological creditors, just as it did countries with biocapacity deficits (you can refer to the bar chart "The Ecological Footprint of Nations" pp. 52-53, in which the countries represented at the summit are marked).

What follows are descriptions of the ecological balance sheets of the Youth Summit countries Brazil, Chile, Ecuador, Mexico, Madagascar, Mauritania, Namibia, China, Mongolia, Vietnam, Russia, as well as a comparison of Germany and China. In addition to these countries the analysis includes Japan, the host country for the next UN Conference of the Parties to the Convention on Biological Diversity (COP 10), and the United States, the country with one of the largest per capita Footprints.

In order to evaluate the current situation and future trends of these countries, we must take ask a variety of in-depth questions, such as:

- Where do the countries stand in terms of their resource consumption, in comparison to the rest of the world, and to the other countries presented here?
- What is the relationship between ecological supply (biocapacity) and demand (Footprint) for this country? Is the country an ecological creditor or debtor?
- What is the state of trade in biocapacity – which countries have positive ecological trade balances, which negative?



The world map shows the countries discussed in the text from North and South America, Africa, Asia and Europe. They encompass an entire spectrum of ecosystems and reach across the entire economic spectrum.

- What roles do the average income and the rate of population growth ultimately play for the Footprint of the country, and how have development indicators changed over time?

We can also ask questions about the country's relationship to the world in terms of trade, economics and development:

- What does being an ecological creditor or a debtor mean for the stability of a country or its competitiveness? What are the advantages and disadvantages?
- To what extent do growing resource constraints influence development possibilities of a country, or the standard of living of its population? What advantages does a country have if it becomes more resource-efficient and protects its natural capital?

Some of these questions will be touched upon at the end of this chapter; others will emerge from country profiles and in continuing research.

For further background on these countries and themes, please refer to the data table on pages 118-119.

Each country profile also features graphics in the form of "feet", printed on the edge of each country profile. The graphics show the average Footprint of a country directly compared to the national biocapacity. To the left, the global biocapacity and the global Footprint are represented for purposes of comparison. All figures refer to the year 2005 and are per capita values.

It is important to keep in mind that global biocapacity does not include any land set aside for other species. If we want to assume that land is set aside, then the amount of biocapacity available per capita would be less.

These data tables and graphics support further comparisons, reflections and discussions about a world in which resources are becoming scarcer.

For a deeper discussion of the Footprint trends, there are additional questions and "food for thought" for all the countries presented here on pg. 115 ff..

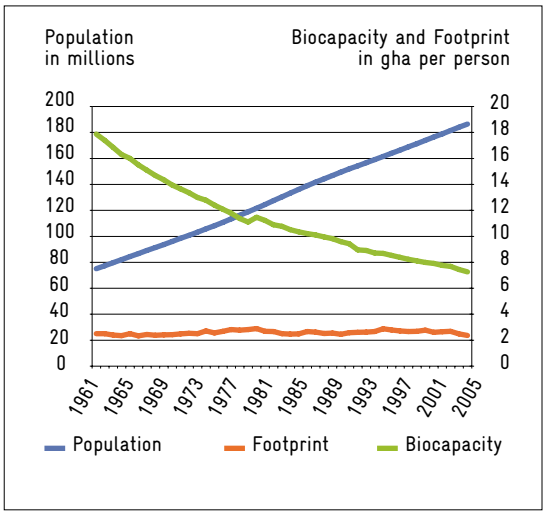
"Every country has its own history, every region can take a different path – there are so many ideas, plans, and also concrete projects which lead to sustainable development."

Elsa Leticia Esquer Ovalle from Mexico, student of natural resource management, and "Go 4 BioDiv" participant

Latin America

Brazil

Brazil, the country with the world's largest tropical rainforest, has enormous biological wealth at its disposal. It is regarded as a megadiverse country, or biodiversity hotspot. The population of this sparsely populated country more than doubled to 186.4 million inhabitants between 1961 and 2005. This emerging economy and partner of German development cooperation belongs to the group of countries with "high human development" according to the UNDP.
The average per capita Footprint of Brazil has scarcely changed since 1961 and stands at 2.4 gha (2005), just below the global average of 2.7gha. There are large differences in the per capita Ecological Footprint among the population. For example, many Brazilians in Rio de Janeiro or Sao Paolo have higher Footprints than the average USA citizen.
The total Brazilian Footprint has more than doubled since 1961. During this time, the country's total biocapacity has increased marginally due to more intensive agriculture. Because of population growth, however, the per capita supply was reduced by more than half (from almost 19 to 7.3 gha). Nonetheless, Brazil's biocapacity is still three times higher than Brazil's Footprint.
Along with Russia, Brazil is among the largest ecological creditor countries in the world. In 2005 Brazil's ecological surplus of 4.9 gha per person was twice as high as the Latin American average reserve (2.4 gha). In the same year, Brazil had a positive Footprint trade balance of one global hectare per person, i.e., the export of Ecological Footprint embodied in goods exceeded imports by that amount. This means that the Brazilian consumption Footprint was one global hectare per person smaller than its production Footprint.



gha/person	World	Brazil
Footprint	2.7	2.4
Biocapacity	2.1	7.3

Brazil (pictured: Rio de Janeiro with the Corcovado) counts as one of the world's largest ecological creditors with a total biocapacity reserve of 914.6 million gha.

Additional information about the Brazilian Amazon region can be found in Volume 7 (in German) of the series "Sustainability has Many Faces".

Chile

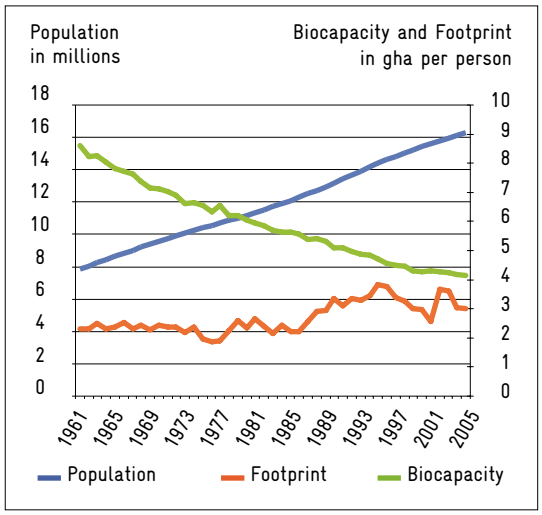
Chile has the highest HDI (0.87) of any Latin American country. It has experienced high levels of economic growth during the past 10 years, during which time its energy use also increased. In this regard, Chile is following a pattern that is common in many emerging economies.

Chile's per capita Ecological Footprint (3.0 gha per capita in 2005) is the third largest in Latin America; only those of Uruguay and Paraguay are higher. Since 1961, the Footprint of the average Chilean grew by only a third, but due to population growth, the total demand for biocapacity almost tripled.

In 2005, 16.3 million people lived in this country, more than twice as many as in 1961. The population is concentrated mainly in the country's central region. While the population densities (inhabitants per km²) of Brazil and Chile are equivalent, the biocapacity per person is far less in Chile, and so is their per capita Footprint.

"I believe without a doubt that the Footprint can be a good tool for managing renewable resources in any country, if local people understand it. The ecological damages which each country can do in different ways to the planet must be first understood and recognized before we can take action."

Ruth Carolina Caniullan Huaiquil from Chile, paramedic, nursing student and "Go 4 BioDiv" participant



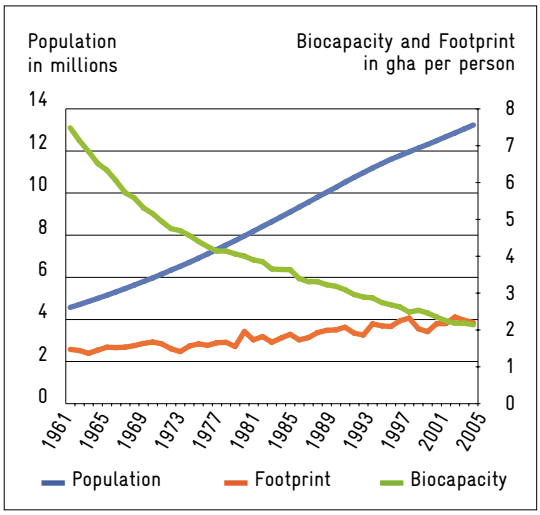
While it is true that the total supply of Chilean biocapacity has not changed since 1961, population growth reduced the supply per capita by more than half to 4.1 gha in 2005. Despite this decline, the narrow country, with its five different ecological zones and large species diversity, still has an ecological surplus of 1.1 gha per capita, and is thus considered an ecological creditor country. Its reserve fell below the Latin American average of 2.4 gha, however, and far below the ecological reserves of Brazil.

In 2005, Chile had a positive Ecological Footprint trade balance of 1.2 gha per person, i.e., the export of Ecological Footprint embodied in goods exceeded imports by that amount. This means that the Chilean consumption Footprint was 1.2 global hectare per person smaller than its production Footprint.

gha/person	World	Chile
Footprint	2.7	3.0
Biocapacity	2.1	4.1

Relatively sparsely settled Chile still has available ecological reserves.

Ecuador



Ecuador, one of GTZ's development cooperation partner, has an HDI of 0.81; thus, it ranks just behind Brazil on the UNDP Human Development Index (72nd out of 179 countries). With a gross national income of less than 2,910 annual USD per capita, it is placed in the lower segment of the group of "middle-income countries" according to the OECD – DAC listings.

The development trends of this biologically rich country are dramatic. Forty years ago, Ecuador had approximately five times more biocapacity per capita than its Footprint. Since then, powerful trends have pushed Ecuador toward ecological debtor status. The country's per capita biocapacity has declined largely due to the tripling of its population to 13.2 million people (2005); this has significantly contributed to its Footprint exceeding its biocapacity. The average Footprint of an Ecuadorian is 2.2 gha of resources, while only 2.1 gha of biocapacity per person is available domestically.

The drastic loss of per person biocapacity combined with a growing per person Footprint not only represents a real potential danger for the country's sustainable development, but has consequences for its biological diversity. Ecuador is a so-called "Megadiversity-Hotspot"; with its coastal mangrove swamps, the Galapagos Islands, the Andean highlands and the tropical rainforest of the Amazon region, it is one of the biologically most valuable regions on Earth.

Thus, Ecuador's political and economic decision-makers are confronted with questions of far reaching consequence: How can they build their future without depleting natural capital? Where will they obtain the resources needed for a growing population and for industrial development, given limited financial resources? The Ecuadorian Footprint trade is ecologically nearly balanced. In a world with overshoot, balancing the national ecological deficit with imports may become an ever more fragile option considering both the purchasing power of Ecuador compared to the world, and recognizing the increasing resource constraints under which all countries are operating. This risk could manifest in higher prices for net imports, disruption of supply chains, or violent conflicts over resources.

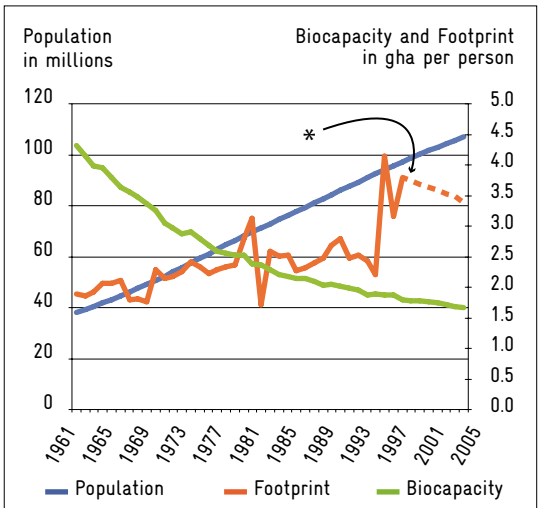
After being presented with the Footprint data, Ecuador's national government made a public commitment through their national development plan to reverse the trends by 2013 – the first nation in the world to set a national Footprint goal. This national development plan was launched on December 10, 2009.

gha/person	World	Ecuador
Footprint	2.7	2.2
Biocapacity	2.1	2.1

The biocapacity that is available to the average Ecuadorian has decreased since 1961 due to an increase in population of nearly 300 percent.

Mexico

With an HDI of 0.84, Mexico is placed ahead of Brazil in the human development rankings of Latin American countries. Like many states in this region, it belongs to the upper category of middle-income countries, according to the country listings of OECD – DAC. This emerging country is a partner country of German development cooperation. It has the second largest economy in Latin America, and is the 12th largest trading nation and fifth largest oil provider worldwide.
The population of this Central American state nearly tripled since 1961 and counted 107 million people in 2005. With 54 inhabitants per km², the country is not only the most densely populated of the Latin American countries presented here, compared to Brazil, Chile and Ecuador it also has the lowest per capita biocapacity (1.7 gha).
The total Mexican Footprint increased by a factor of five between 1961 and 2005 with the per capita Footprint growing in this period from 1.9 gha to 3.4 gha. The fluctuations of the Footprint shown in the graph might be driven more by unreliable data than real variations in consumption. The biocapacity supply on the whole increased due to changing agricultural practices. Yet it is only half as large as Mexico's Footprint, making Mexico the country with the largest ecological deficit in Latin America.
In 2005, Mexico had a negative trade balance of 1.2 gha per person, which signifies that the import of Ecological Footprint embodied in goods exceeded exports by that amount. Thus, the Mexican production Footprint was 1.2 global hectares per person smaller than its consumption Footprint.
If current population and Footprint trends in Mexico continue, the country will accrue an even greater ecological deficit – a trend that makes it increasingly vulnerable: on the one hand, through the scarcity of its own renewable resources, on the other, through the rise in the cost of necessary imports.



* Footprint data are based on United Nations statistics, as well as a number of other international datasets. Dotted lines indicate extrapolation for years with data inconsistencies. Starting in 1997, the national Ecological Footprint data have been consistently calculated and updated based on the most reliable global datasets available and an evolving calculation method.

gha/person	World	Mexico
Footprint	2.7	3.4
Biocapacity	2.1	1.7

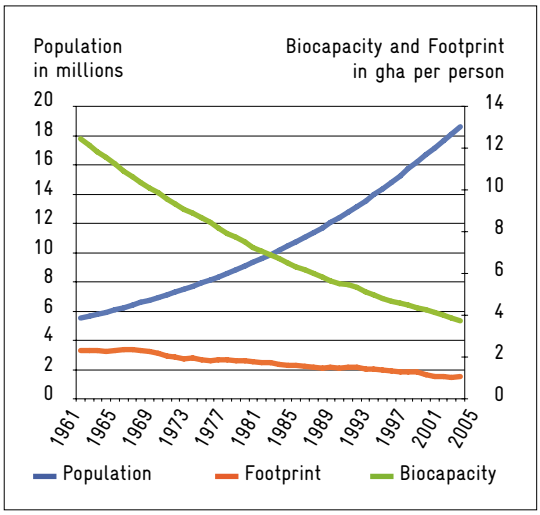
"In Mexico there are some campaigns to make the Footprint known among the public, in businesses, and in rural enterprises, etc. for example via the Ministry for the Environment and Natural Resources. But Mexico is as large as it is beautiful – and it is difficult to reach everyone."

Elsa Leticia Esquer Ovalle from Mexico, Student of Natural Resource Management and "Go 4 BioDiv" participant

Mexico's ecological deficit could further increase through growth of population and individual's Footprints, and through a decrease in biocapacity.

Africa

Madagascar



Although Madagascar is classified by UNDP as a country with "medium human development" with an HDI value of 0.53. OECD-DAC classifies it as a Least Developed Country (LDC). In addition, although the island nation is a partner country of German development cooperation, no financial commitments are currently being made at the government level, due to the political unrest that occurred in March 2009.

Madagascar's population grew by a factor of almost 3.5 between 1961 and 2005 and now counts 18.6 million. This population increase lies above the African average. The total Footprint of the island nation has also grown during this time; but on a per capita basis it fell by almost 0.5 to 1.1 gha, and is thus below the average of the African continent.

Although Madagascar's biocapacity has increased slightly since 1961, population growth led to an overall reduction of the per capita values; in 1961 the bioproductive area available per person was 12.5 gha. Since then it has shrunk by more than two thirds to 3.7 gha per person. Despite this, Madagascar's ecological reserve of 2.7 gha per person is far higher than the African average of 0.4 gha per person. Imports of this ecological creditor country were, however, smaller in 2005 than exports – the Footprint trade balance was -0.1 gha per person.

Madagascar is a tropical country with high rates of plant and animal endemism and rich forest ecosystems, which are of high value to the economy. However, because of a demand for cropland and firewood, the forest is rapidly being lost. Slash and burn agricultural practices, are also causing soil erosion and poor soil quality.

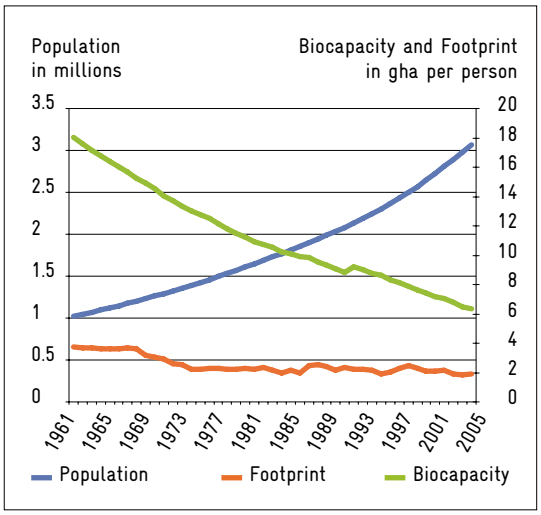
The trends relating to population growth and decreasing per capita biocapacity are similar to those in Namibia (discussed below). The country still has a positive ecological balance sheet, but to maintain this, it must reverse current trends.

gha/person	World	Madagascar
Footprint	2.7	1.1
Biocapacity	2.1	3.7

Madagascar's ecological wealth and its unique biological diversity are in danger through the loss of its primeval forests.

Mauritania

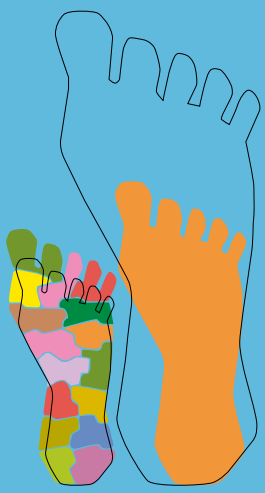
Like Madagascar, Mauritania with a HDI of 0.56, ranks among countries with "medium human development" according to the UNDP. Compared to 178 other countries, it falls in the lower third, but is ranked relatively high compared to its sub-Saharan neighbors. Following a military coup d'état in August 2008, German development cooperation restricted its development activities. The number of inhabitants in the sparsely populated, arid state (three inhabitants per km²) has tripled between 1961 and 2005. While the country's biocapacity has grown insignificantly, its available per capita value shrunk during this period from 18 gha to 6.4 gha due to population growth. The total Ecological Footprint has increased since 1961, but the per capita Footprint is now almost halved, from 3.7 gha to 1.9 gha in 2005.
Mauritania's ecological surplus of 4.5 gha per person (the sixth largest in Africa) is increasingly under pressure: overgrazing, deforestation, and soil erosion are exacerbated even more by population growth, periodic catastrophic droughts, limited water resources and climate change.



gha/person	World	Mauritania
Footprint	2.7	1.9
Biocapacity	2.1	6.4

Between 1961 and 2005 the biocapacity per person in Mauritania was reduced by two-thirds.

Additional information about Madagascar and Mauritania can be found in Volumes 5 and 6 in the Series "Sustainability has Many Faces".



gha/person	World	Namibia
Footprint	2.7	3.7
Biocapacity	2.1	9.0

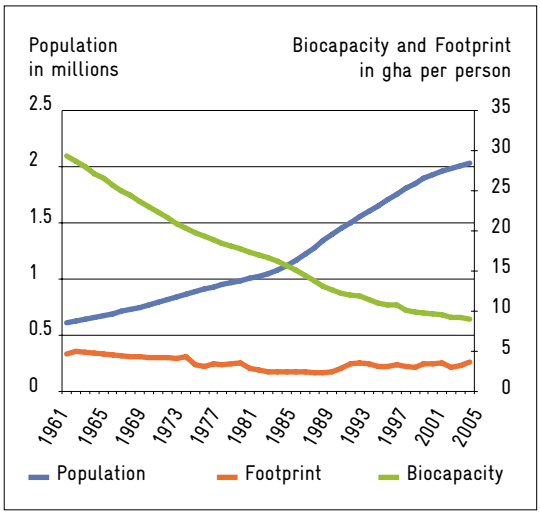
With its ecological surplus of 5.3 gha per person, Namibia has more biocapacity available domestically than its citizen's use.

Namibia

Namibia, with an HDI of 0.65, is considered a country with "medium human development" by the UNDP. The country lies in southwestern Africa and has a gross national income of 3,360 USD per capita (2007). The OECD – DAC country listings group it in the lower category of middle-income countries; it has been a partner country of German development cooperation since 1990.

The population of the sparsely populated country has more than tripled between 1961 and 2005. As a whole, the Namibian biocapacity has hardly changed since 1961. On a per capita basis, however, it has decreased by more than two thirds from 29.4 gha per person to 9 gha per person, due to population growth. The per capita Ecological Footprint is also in decline, amounting to 3.7 gha in 2005.

Namibia's ecological surplus of 5.3 gha per person is much higher than the African average of 0.4 gha per person. However, Namibia's ecological surplus is under threat; water in the most arid country south of the Sahara is markedly scarce and the soils are being degraded by erosion – both trends threaten Namibia's bioproductivity. Due to inappropriate farming practices and a growing population, less and less biocapacity is available to Namibians who are to a large extent directly dependent on renewable resources.

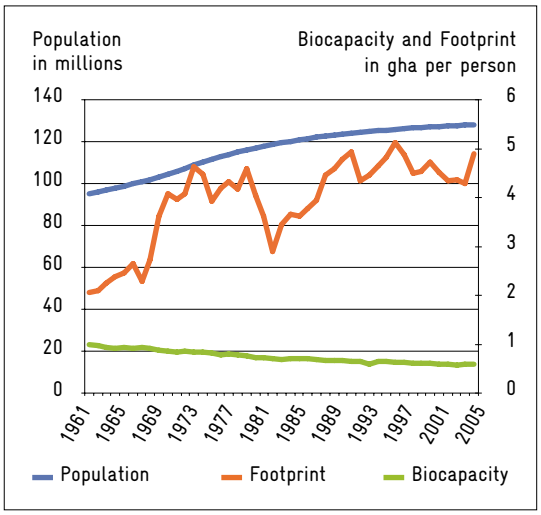


"The people in Namibia are dependent on renewable resources – these represent their livelihood."

Reagan Chunga from Namibia,
Junior Surveyor Land-Management
and "Go 4 BioDiv" participant

Asia

Japan



Japan is one of the industrialized nations with the highest human development according to the UNDP. With an HDI of 0.953, it ranks 8th among 179 countries – ahead of Germany and the United States. While the Japanese population has grown relatively slowly (by about one-third from 1961 to 2005), no other country presented in this brochure has a higher population density.
Japanese biocapacity has fallen both on a per capita basis and as a whole. In 2005, there was 0.6 gha of productive area per Japanese. The island chain comes in last in comparison to the countries presented in this brochure, in terms of biocapacity.
How did the Japanese demand for natural resources (their Footprint), change since 1961? Both the total and the per capita Footprint grew due to increasing personal consumption over this time period, by a factor of 3.2 and a factor of 2.3, respectively. The average Footprint of a Japanese resident amounts to 4.9 gha.
The country's demand for biocapacity exceeds its supply by more than eightfold. Japan has an ecological deficit of 4.3 gha per capita and is, in per capita terms, the largest ecological debtor in the East Asian Pacific region.
At the global level, Japan plays a large role in international trade. The country attempts to balance a portion of its ecological deficit through imports from other countries. The Japanese Footprint of imports is 2.8 gha per person, and their overall trade balance is negative – Japan imports more Ecological Footprint embodied in goods than it exports each year.
Japan's ecological deficit may present risks for the country since the cost of emitting carbon will likely become higher, and resources for import will be in greater demand. However, Japan's high population density may allow for more effective investment in low-carbon infrastructure and transportation systems in the future, which will help mitigate these risks.

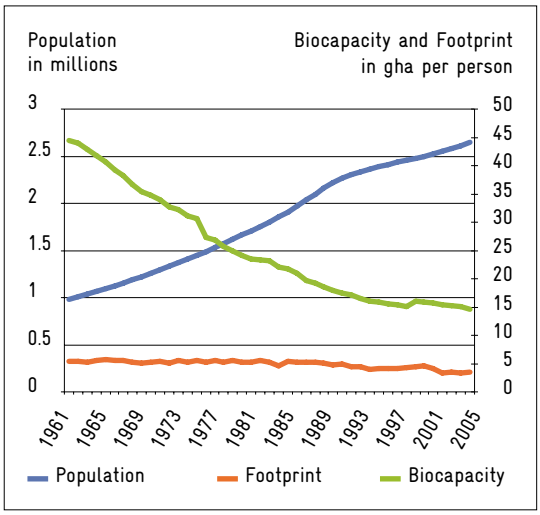
gha/person	World	Japan
Footprint	2.7	4.9
Biocapacity	2.1	0.6

Even though Japan's population increased slowly in the last four decades, total Ecological Footprint grew because of the energy and consumption- intensive lifestyle of its inhabitants.

gha/person	World	Mongolia
Footprint	2.7	3.5
Biocapacity	2.1	14.6

Mongolia

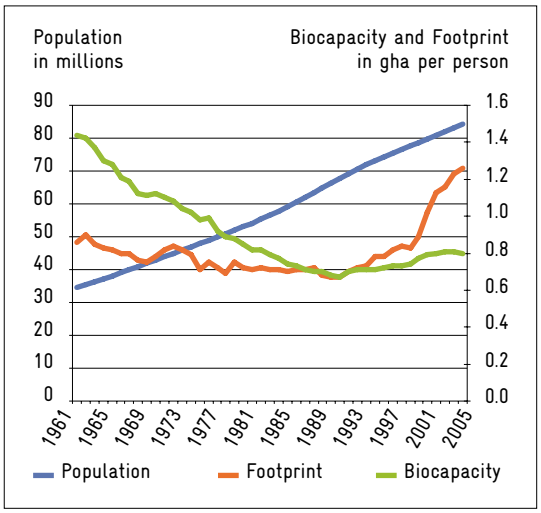
Mongolia, with an HDI of 0.72, is classified by the UN as a country with "medium human development." In the OECD – DAC country listing it is classified in the lower portion of the medium-income categories.
A partner country of German development cooperation, Mongolia is characterized by extreme climatic conditions and is, with two inhabitants per km², one of the most sparsely populated countries on Earth. In 2005, only 2.6 million people lived there, even though the population more than doubled between 1961 and 2005.
The ecological capital held by this central Asian country remains as immense as ever; despite the loss of 11 percent of its biocapacity since 1961. 14.6 gha per person is still available today.
Since the collapse of many industrial operations resulting from the withdrawal of the Soviet Union, both the total and per capita Footprints have declined. Most recently the demand on nature amounted to 3.5 gha per person.
The ecological surplus of Mongolia was 11.2 gha per person in 2005. Nonetheless, the trade balance in terms of Ecological Footprint was slightly negative in the same year with Mongolia reliant on imported biocapacity. The consumption Footprint of Mongolia exceeded the production Footprint by 0.2 gha.
Mongolia's ecological surplus is being jeopardized through overgrazing, soil erosion, deforestation, and population growth. Increasingly frequent heat waves and droughts may threaten the ability of the Mongolian people to provide for themselves through domestic biocapacity.



Mongolia is a country of broad steppes and cold winters. Due to its low population density, the Asian country currently still has an ecological surplus of 11.2 gha per person.

Vietnam

According to the UNDP, Vietnam is a "medium human development" country with an HDI score of 0.72. Vietnam has an annual gross national income of 390 USD per capita (year 2006) and belongs to the group of low-income nations. Vietnam has been a partner country of German development cooperation since 1990.
The population of the country grew almost 140 percent between 1961 and 2005 to 84.2 million inhabitants.
Since 1961, the total Footprint of this Southeast Asian country more than tripled; the per capita Footprint grew by 40 percent and amounted to 1.3 gha in 2005. Vietnam's per capita Ecological Footprint is well under the Asian average; among the countries presented here, only Madagascar's Footprint is smaller.
Although the Vietnamese supply of biocapacity has increased in the past decade through large-scale reforestation, intensive fertilizer use, and the changes in agricultural management systems (including the shift from state owned farms to privately owned farms), in comparison to 1961 the Vietnamese per capita biocapacity has declined from 1.4 to 0.8 gha, due to population growth. However, the achievements of the Vietnamese government in reversing this critical trend are remarkable: since 1990 biocapacity in Vietnam is not only increasing as a whole but on a per capita basis. Thus, despite its small per capita Footprint, the country is an ecological debtor and compensates its deficit partially through the import of ecological services. In 2005, Vietnam's Footprint trade balance was negative, meaning the nation imported more embodied Footprint than it exported.
Vietnam's purchasing power is weak, though rising very rapidly. The growing consciousness that there may be future bottlenecks in food supply prompted the government to adopt a strong program for self sufficiency in food for the growing population. It also reintroduced population policies. Ecologically unsuitable agricultural methods, especially on mountain slopes, diminish the mid- and long-term agricultural production performance through loss of soil quality. Erosion of the fertile topsoil will be further aggravated by climate change and the increase in extreme weather events, such as typhoons and periodically recurring drought. Food supply security is additionally threatened by the rising sea level and the infiltration of salt water into the "bread basket of the country", the great deltas of the Red River and the Mekong.
The GTZ and Global Footprint Network are now considering how the Footprint tool kit can be employed in Vietnam to support regulation processes and to design clear policy consulting at both local and national levels.



gha/person	World	Vietnam
Footprint	2.7	1.3
Biocapacity	2.1	0.8

The Vietnamese population is growing. While the generation of grandparents still lives very traditionally, the resource needs of their grandchildren are increasing.

Additional information can be found in the Footprint Factbook Vietnam 2009 from Global Footprint Network (available as a PDF file on the accompanying DVD).

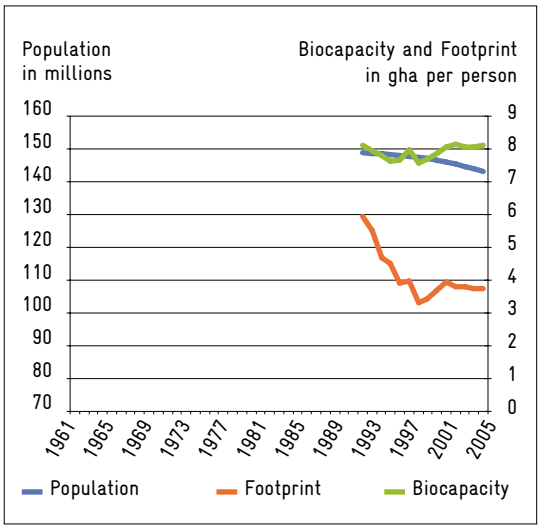
gha/person	World	Russia
Footprint	2.7	3.7
Biocapacity	2.1	8.1

Russia

Due to the collapse of the Soviet Union at the beginning of the 1990s and the subsequent creation of the Russian Federation of Independent States, consistent data series of population growth, Footprint, and biocapacity for today's Russia are only available starting in 1992.

With an HDI score of 0.81, Russia stands on the threshold for entering the "high human development" classification according to the United Nations Development Program. In 2005, the world's nation with the largest land mass had 143.2 million inhabitants. In 2005, the Footprint of an average Russian was, at 3.7 gha, similar to that of a Namibian or a Mongolian. However, the total Russian Ecological Footprint, 536.4 million gha, was substantially greater than the Namibian, Mongolian or even than the German total Footprint. The biocapacity supply of this sparsely populated state exceeds its Footprint by a factor of two.

With an ecological surplus in the amount of 4.4 gha per person, Russia is one of the largest ecological creditors in the world. The ecological potential of the country lies in its extensive forests: Almost 21 percent of the world's forest inventory and 70 percent of all coniferous forests are in Russia. Most recently the Russian Footprint trade balance was positive; the exports of embodied Ecological Footprint exceed imports by 1.1 gha per person.

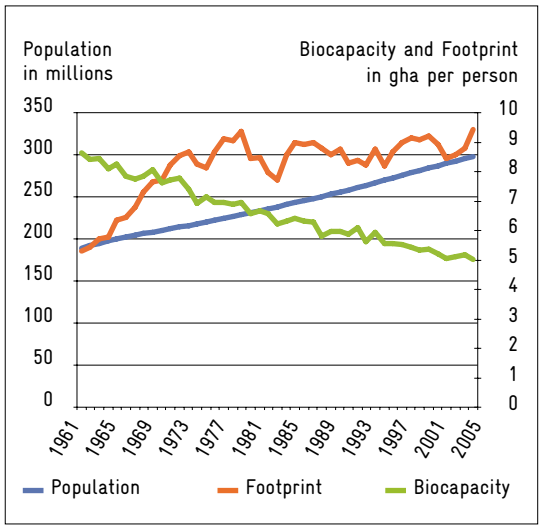


In sparsely populated Russia (here Siberia) there are 8.1 gha of biologically productive area for each of its 140 million inhabitants.

The United States of America

With an HDI score of 0.951, the United States ranks 15th among the 179 countries evaluated by the UNDP in terms of human development. Since 1961, the population of the USA grew by 60 percent; 298.2 million people lived there in 2005. This corresponds to a relatively high population growth rate for an industrialized country, mostly due to immigration policy and a relatively child-friendly environment in American society. Although it has the third largest land area after Russia and Canada and is endowed with great natural wealth, USA biological capacity has decreased since 1961 both in per capita terms and as a whole. In 2005 there was 5.0 gha of bioproductive area per American, down from 8.6 gha in 1961. The demand for renewable resources was already very high in 1961 – it grew enormously, however, leading up to 2005, both in per capita terms and as a whole. Today, the average US American lives on a Footprint of 9.4 gha due to high consumption and energy-intensive infrastructure. Only the United Arab Emirates has a larger per capita Footprint.

Despite a large supply of biocapacity, the USA has an ecological deficit of 4.4 gha per person. This high-income country balances a portion of its deficit through imports, with a Footprint trade balance of -0.8 per person. This means that in 2005, imports exceeded exports. In a worldwide comparison, the USA tops the lists both of biocapacity exporters and importers.



Sources for the country profiles:

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- UNDP: Human Development Report (2008 update).
- Ewing, B. et al. (2008): The Ecological Footprint Atlas.
- WWF/ZSL/GFN: Living Planet Report 2008.
- www.footprintnetwork.org/en/index.php/GFN/page/trends/
- www.gtz.de/en/weltweit/573.htm
- www.gtz.de/en/weltweit/571.htm
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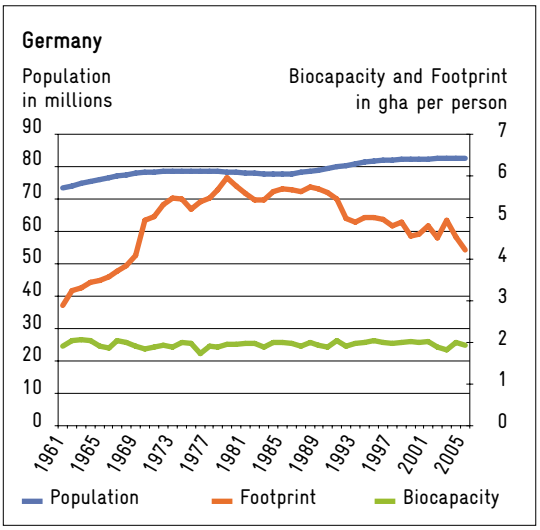
- WWF/GFN (2008): Africa. Ecological Footprint and human well-being.
- WWF/GFN (2005): Asia-Pacific 2005. The Ecological Footprint and Natural Wealth.
- www.unep.org/geo/geo4/media/fact_sheets/Fact_Sheet_12_North_America.pdf

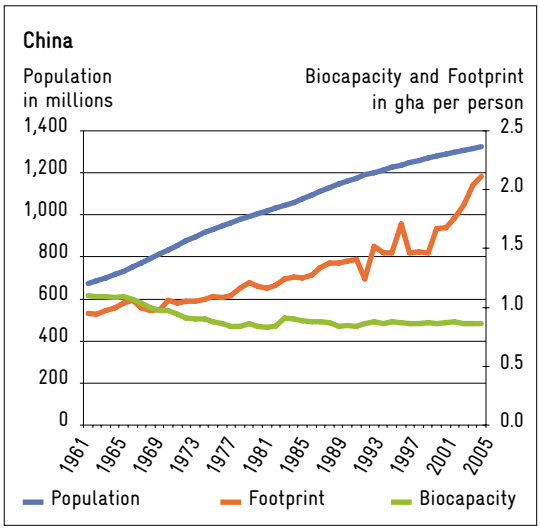
gha/person	World	USA
Footprint	2.7	9.4
Biocapacity	2.1	5.0

The United States of America (pictured is the Golden Gate Bridge in San Francisco) has the world's second largest per capita Ecological Footprint, at 9.4 gha.

Germany and China: A Footprint comparison

What does the situation look like for Germans? Germany is among the leading industrialized nations, with high per capita purchasing power. In the following section we take a more in-depth look at Germany's Footprint data and compare it to one of the world's most important emerging countries: China. The finite nature of our planet's resources and the urgency for action become especially clear through the comparisons we can draw when looking at Germany and China. The development trends of China, this large and extremely populous country, have a large influence on all of us. Chinese politicians and the world community have already recognized this – but can we use the time left to us to follow new paths of development?





gha/person	World	China	Germ.
Footprint	2.7	2.1	4.2
Biocapacity	2.1	0.9	1.9

Through rising standards of living and elevated energy demand (here Shanghai) ...

Development, population, Footprint

Germany, with an HDI score of 0.935, is a highly developed industrial country, according to the UNDP. China, in contrast, is deemed to be an advanced developing country with an HDI score of 0.78, just under the threshold of 0.8 for "high human development". While development is proceeding more slowly in rural areas, the standard of living for many Chinese, especially in the industrial south, is already at a high level. Between 1961 and 2005, the German population grew relatively slowly (by 13 percent). With 232 inhabitants per km², the country is densely settled. Still in per capita terms, Germany has about as much biocapacity as the world as a whole. The per capita Footprint in Germany was 4.2 gha in 2005, almost one-and-a-half times larger than in 1961.

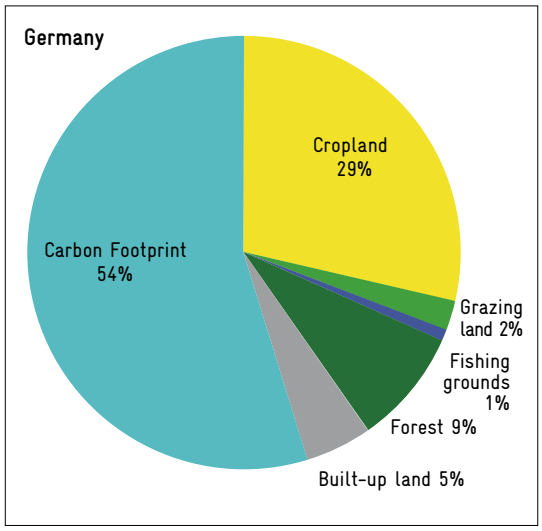
China accommodated more than 1.3 billion people in 2005, about 20 percent of the world population. The population density of the country amounts to 139 inhabitants per square kilometer, only about half that of Germany. It has one of the fastest growing populations in the East Asian – Pacific region, and despite its "one child" policy introduced in the 1970s, the number of inhabitants in China has almost doubled since 1961. The country's per capita Footprint doubled as well to 2.1 gha in 2005. This per capita Footprint is equivalent in size to the average globally available per capita biocapacity. In aggregate, however, the Chinese Footprint has quadrupled and is now larger than that of the European Union.

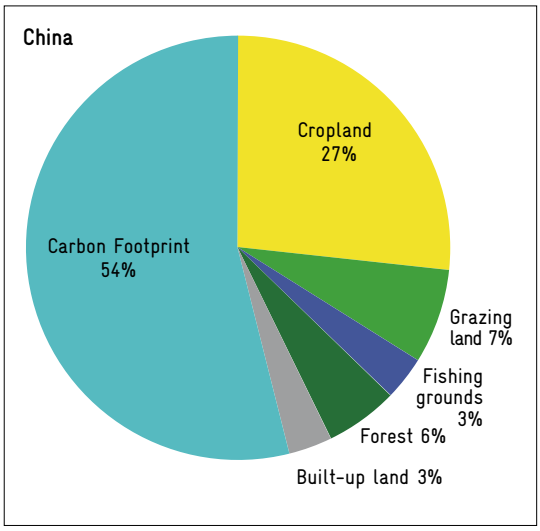
Biocapacity, land types, ecological deficits

After a surge in the total Footprint between 1961 and 1971 caused by carbon emissions (see left chart on pg. 110), Germany has managed to stabilize its Footprint through innovative energy policy and the reduction of coal consumption. Mainly due to improved agricultural methods and reforestation, available biocapacity has risen by 14 percent, now accounting for 1.9 gha per person in 2005. Germany's per capita Footprint is the third largest among the countries presented in this brochure, below the USA and Japan. If we compare it with other Western European EU member states however, the German Footprint

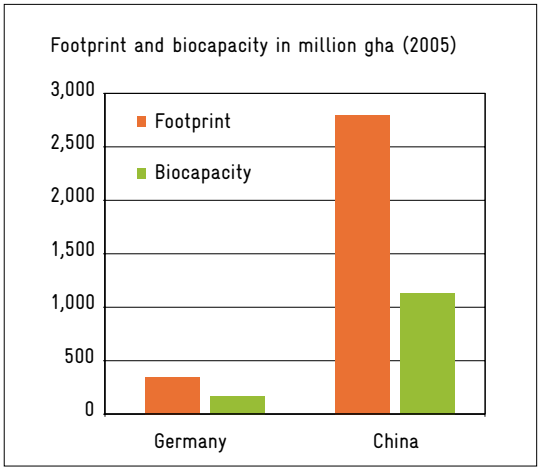
...the Carbon Footprint comprises the largest share of the Footprint both in Germany and China.

Composition of the German and Chinese Footprints in 2005





Although the biocapacity available to an average resident in China is only half of German per capita biocapacity, China's total biocapacity is significantly larger than Germany's.



is smaller than the European average. The per capita Carbon Footprint of 2.3 gha (54 percent of the total Footprint in 2005), a major driver of the increase in Footprint, reflects the mobility of German society, its enormous energy consumption, and its dependence on coal. Use of cropland accounts for 29 percent of the Footprint, forest products accountings for another 9 percent. Germany runs an ecological deficit; the difference between the Footprint (demand) and biocapacity (supply) was 2.3 gha per person in 2005. The average German citizen required more than two times as much biologically productive area than is available within Germany. If all people were to live as an average German does, we would need more than two planet Earths to provide for our resource consumption, not including what wild living plant and animal species require.

The composition of the Chinese Footprint is quite similar to that of Germany (see pie chart above). The country has been building the foundation for its industrialization during the past decade with high material and energy expenditures. A consequence of the rapid economic growth has been the tenfold rise in Chinese energy needs. China's Carbon Footprint, therefore, accounted for more than half (54 percent) of the Chinese demand for biocapacity. The use of cropland for the production of agricultural products had a 27 percent share of the total Footprint, forestry products six percent. Overall biocapacity has increased since 1961 primarily through the intensification of agriculture; China's biocapacity is significantly larger than Germany's (see chart above). However, per capita biocapacity in China decreased by a fifth and reached 0.9 gha per person in 2005, mainly due to strong population growth China needs more biocapacity than it can provide from its own surface area, despite its relatively low per capita Footprint. To date, it uses more than the area of "two Chinas", and registers, together with the USA, the largest demand for biocapacity worldwide (21 percent of global demand each). China has an ecological deficit that now stands at 1.2 gha per inhabitant. On a per capita level, this deficit is not very high. When one examines the total sum, however, the following becomes conspicuous: While total Chinese biocapacity did indeed grow by 54 percent since 1961, an enormous rise in demand for resources created an increase of more than 300 percent for the country's total Footprint.

With a growing ecological deficit, the most

populous country on Earth is risking further degradation of its ecosystems and, ultimately, the breakdown of ecosystem services that are of vital importance. Both in China and in Germany, a considerable reduction of carbon emissions could significantly reduce the ecological deficit. Due to the high degree of urbanization in both countries, infrastructure investments that lead to a reduction in resource consumption will be important.

Trade and the Ecological Footprint

Both China and Germany are reliant on net imports from other countries to balance their ecological deficits. China has developed into a global hub for product manufacturing. Its trade relations are characterized by raw material imports (e.g., metals and wood from Latin America, oil and cotton from Africa, or wool from Australia), of which only a quarter remain in the country. Changing Chinese consumption habits that have accompanied an improved standard of living (such as increasing meat and milk consumption) are demanding a growing number of imports, namely, agricultural and grazing land products.
Although a major portion of resources leave China again in the form of finished products (e.g., paper, furniture or textiles) for the USA, Japan, Australia, South Korea and the EU, overall imports exceeded exports in 2005; the trade balance in this year was negative.
Germany, on the other hand, had a positive trade balance and exported more than was imported in 2005; the German Footprint of consumption was 0.4 gha per capita smaller than the production Footprint. This may be caused in part by use of resources for the export of manufactured goods e.g., automobiles).

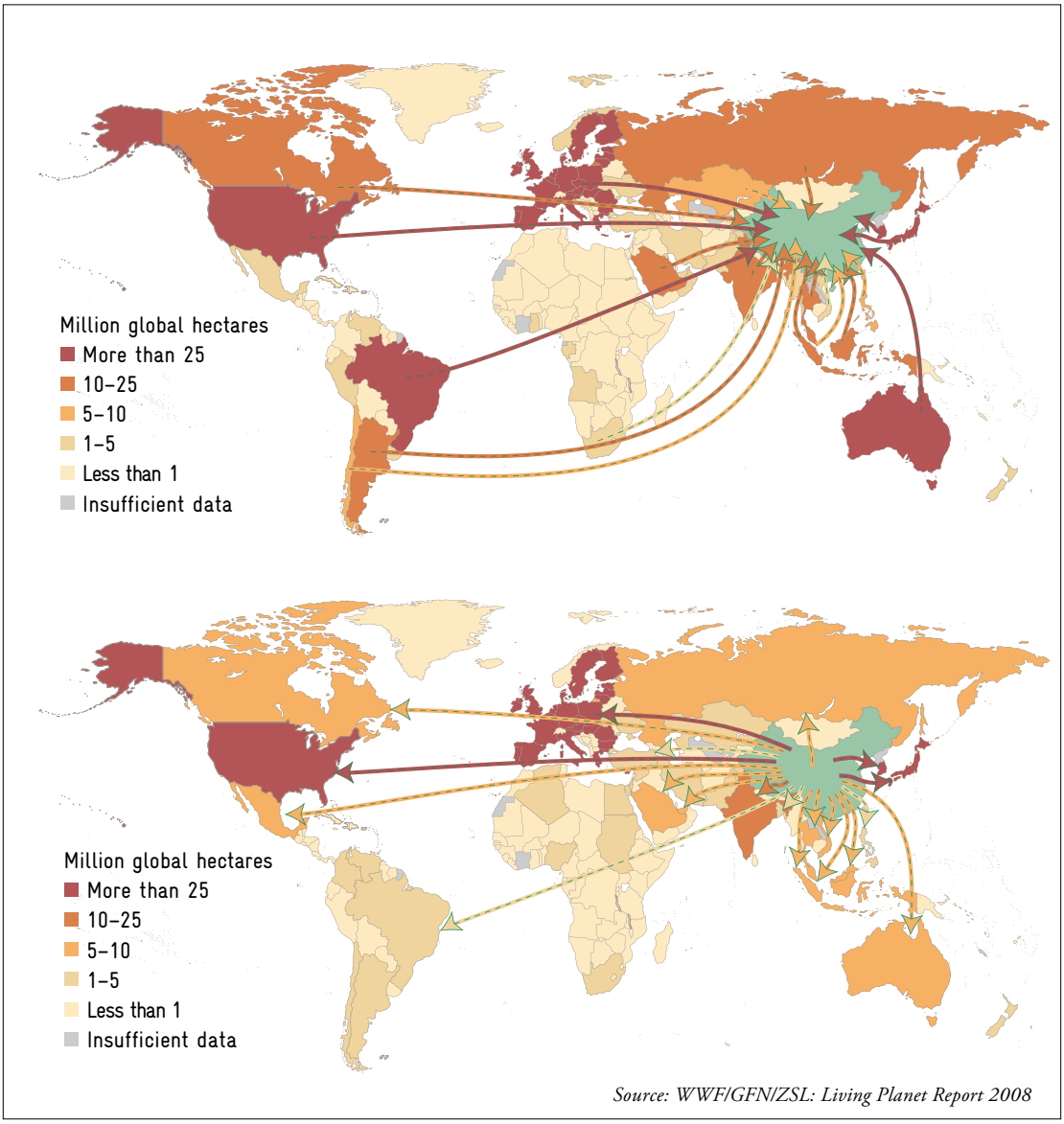
China imports raw materials such as metals, wood, oil and cotton.

A series of questions, suggestions and ideas for further research on the Footprint Data of Germany and China can also be found starting on page 115.

Sources and additional information:

- WWF, Global Footprint Network (2005): EUROPE 2005. The Ecological Footprint.
- WWF, Global Footprint Network (2005): Asia-Pacific 2005. The Ecological Footprint and Natural Wealth.
- CCICED, WWF-China, Global Footprint Network (2008): Report on Ecological Footprint in China.
- WWF/ZSL/GFN: Living Planet Report 2008.
- Ewing, B. et al. (2008): The Ecological Footprint Atlas.
- Umweltbundesamt (2007)
- Climate Change 2007
- Greenpeace (2008)

China's imports of embodied Footprint (above) exceed its exports (below). More than 90 percent of imports originate in 20 countries (2005 data).



Source: WWF/GFN/ZSL: Living Planet Report 2008

Future perspectives

Germany

Germany's development of environmentally friendly production processes, services and procedures makes the country one of the environmental trailblazers in the industrialized world.
The Ecological Footprint is increasingly gaining entrance into German and EU politics and is being employed in many places on a regional level, for example in Agenda 21 processes. Footprint studies have already been completed for cities such as Berlin and Munich since 2000 (see the case study on Berlin on pg. 42). In 2007, the Federal Environment Agency (Umweltbundesamt) sponsored a comprehensive analysis and evaluation regarding the possible use of the Ecological Footprint as an environmental indicator for Germany.

The Bavarian Footprint

Bavaria is the first German state to have its Ecological Footprint calculated. The study was done in the context of a doctoral thesis at the University of Augsburg using base data from the year 2000. The Footprint of the entire Bavarian population amounted to 51 million gha of biologically productive land, which is 4.2 gha net per capita. However, Bavaria's Ecological Footprint

In which direction will Bavaria go? A study revealed that in this federal state it is certainly possible to have a sustainable economy without compromising quality of life.

Sources und additional information:

- Bayerisches Landesamt für Umwelt (2007): Umweltbericht Bayern.
- Umweltbundesamt (2007)
- Klebel, Christoph (2004): Nachhaltigkeit und Umweltbewusstsein in Bayern (Summary available as a PDF file on the accompanying DVD).
- Treffny, Raphael (2003)

exceeds its biocapacity. The main cause for this is the Carbon Footprint, which has risen over the past decades through the consumption of fossil fuels. According to political leaders in Bavaria, in order to reduce the Bavarian Footprint, Bavaria would need to increase investment into renewable energy, change the transportation habits of the citizens, use more modern heating and insulation technology, and renovate older buildings. Reduction of meat consumption would likewise reduce Bavaria's Ecological Footprint. The study showed that in Bavaria it is possible, if the relevant technological, financial, infrastructure and political education efforts are made, to have a sustainable economy within Bavaria's biocapacity.

China

Since 1999, several dozen Footprint studies have been carried out in China at various levels, and many of the scientific results have made their way into governmental decisions. Chinese politicians and the public are aware that future decisions concerning resource consumption are tightly linked to their own competitiveness, as well as the fate of our planet.

Six environmental strategies should shape China's future development. They were brought together in a conceptual approach using the acronym CIRCLE:

1 C (compact) supports spatially compact urban development to limit urban sprawl. More green

spaces in urban centers should make better use of ecosystem services (fresh air, drinking water, etc.);

2 I (individual) means responsible consumption of each individual and reaches from improved energy efficiency to resource-saving nutrition habits;

3 R (reduce) focuses on the reduction of hidden waste flows, especially when fossil energy sources are used;

4 C (carbon) relates to strategies for CO_2 reduction;

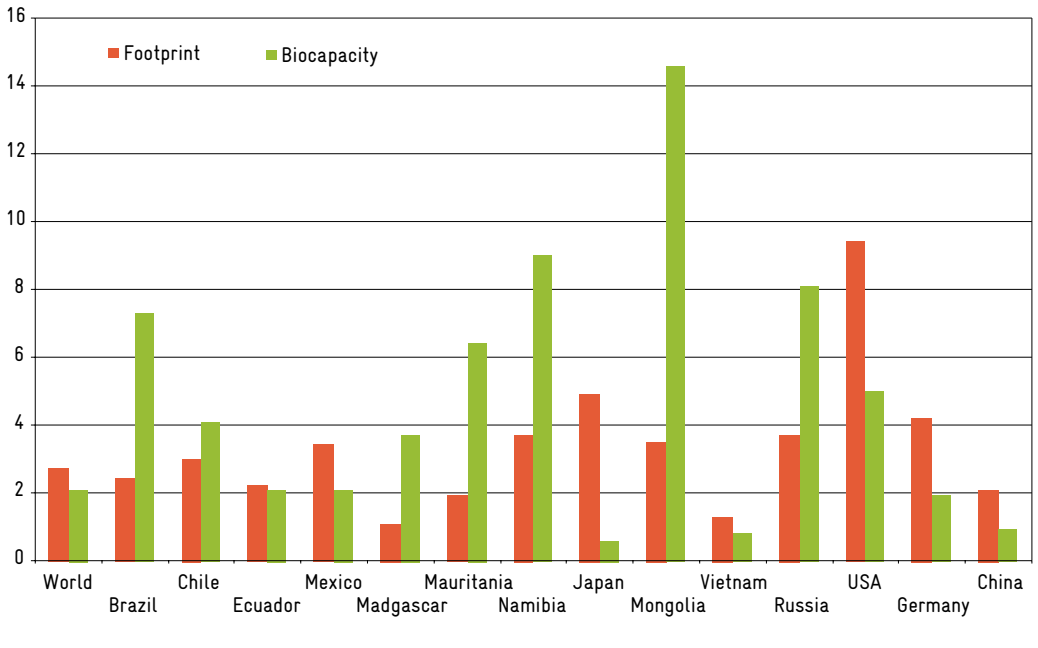
5 L (land) stands for targeted land management to retain the productivity of agricultural areas, and to maintain and improve yields and thereby raise China's biocapacity;

6 E (efficiency) strives for a cyclical economic model in which waste is recycled and used again.

"Yes, Chinese politicians place value on sustainable development and on the interaction between people and nature. Light is being cast on the problem of resource overexploitation and the Footprint concept supports its solution. [...] Although there are conflicts between development and environmental protection, the population of my home city Chengdu is trying to find a balance between these so-called extremes. Therefore I am as optimistic as ever in respect to the future"

ErShan Chen from China, student of forestry, resource preservation and tourism and "Go 4 BioDiv" participant

Footprint and biocapacity of all countries presented (in gha/person)



Decisions about resource consumption have direct effects on China's competitiveness.

Suggestions for further work:
National Footprints: Influencing factors and trends

With the aid of the table on pp. 118 and 119 let us consider:

Between 1961 and 2005 a great deal has changed in our 14 countries.

- In two countries the per capita Footprint has more than doubled. Which countries are they? What factors lead to this increase?
- In which countries did the per capita Footprint decrease? Are these countries, such as Mongolia, headed in the right direction? Is there something we can learn from them and replicate? Also take a look at these countries' HDIs. There are positive and negative events that can reduce the Footprint: Those which are planned for are generally good; dramatic or unplanned events, such as war, the collapse of economic systems or natural catastrophes are devastating.
- In **Germany** total biocapacity has slightly grown since 1961. How did this increase come about? Has it occurred to you that Germany's total biocapacity measured in global hectares (gha) (i.e., the area which can produce renewable resources) is five times larger than its territorial area? What does this mean?
- **Chile's** total Footprint hasn't changed at all since 1961. The per capita value, however, has reduced sharply. Why is this the case?
- In **Brazil**, total biocapacity has increased slightly, but biocapacity per inhabitant

has decreased. What are possible reasons for this? In the Amazon basin, 17 percent of the original rainforest cover has been destroyed and a large part of this area is now used for growing soya. Here we have an example of biological diversity loss on the one hand, and a simultaneous growth in biocapacity on the other. Can you explain why this is? If you would like to read more, the situation is described in more detail on page 33.

- In **Madagascar, Mauritania and Namibia** the population has increased by more than 200 percent. There are many opportunities to strengthened investments in women's education in these countries. How do you think education would affect the Footprint and biocapacity of these countries? Think about the fact that access to education, family planning and health care make it possible for women to have a job. Do research on this on the BMZ's Web site www.bmz.de (Enter "women's rights" on your search query).

Consider the role of lifestyle on the availability of biocapacity:

- Compare **Mongolia** with the **United States**. What differences strike you?
- What may be the factors contributing to the fact that the **USA** as a large, relatively sparsely populated, resource-rich country require twice the biocapacity as they have available? What might be the role of American consumer behavior? What might be the role of infrastructure? What role does the quality of housing stock play? How will this affect the competitiveness of the country if current trends continue? Do you think the USA will eventually reduce its Footprint? And if yes, for what reasons?
- In **Mongolia** per capita biocapacity is quite high. Why? Consider that the country has extensive steppes, but that they aren't very productive per hectare. Take a look at the population figures. What could be the reason that the country's total biocapacity is relatively small – so small that its biocapacity trade balance is already slipping into the negative zone?
- **Mauritania's** ecological reserve, as in many African countries, is threatened by drought and climate change. Additionally, the population is very poor. In which sectors could political strategies and development cooperation projects be launched in order to support the country? For more information, go to the GTZ Web site: www.gtz.de/de/weltweit/afrika/590.htm.
- **Mexico City** is one of the world's largest cities. Find out how many Mexicans live in cities. What share of the national Footprint do Mexico's urban centers have? What would be accomplished by having the Footprint of Mexican cities measured?
- What does it mean when an ecological debtor uses biocapacity in another country, be it by importing or unpaid use of ecological services? Does it develop at the expense of others?

Above all, with respect to their enormously growing populations, many countries with an ecological deficit, including **China**, want to raise their biocapacity through improved crop yields.

- How might a rise of biocapacity influence upon the following factors or be related to them: biodiversity, nature conservation, agricultural technologies, and monocultures?
- What challenges must be mastered with respect to socio-cultural factors, such as traditional knowledge about dealing with nature, or regarding sustainable resource management? What opportunities would an increase of biocapacity bring with it?

To be ecologically sustainable means to manage within the limits of the regenerative capacity of nature and to take the needs of other forms of life into account. If the Footprint (demand) is higher than the biocapacity (supply), either local resources are overexploited or imports from other countries are increased.

- Can one designate **Russia** as ecologically sustainable? The Russian consumes significantly more (an average Footprint of 3.7 gha) than the global average biocapacity available per capita (2.1 gha). Russia's biocapacity amounts to 8.0 gha per person, however. Thus the country is an ecological creditor. Would it be in Russia's self-interest to manage its Footprint anyway? Why?
- What does it mean that the amount of Ecological Footprint embodied in imported goods in countries such as the **United States, China, Japan** (and **Mexico!**) is very high, while, in contrast, other countries have a positive trade balance (exports > imports), and others are close to a balance between imports and exports? What do the respective countries have in common? Are the types of biocapacity available domestically the same in all three countries? Take a look also at the countries' HDIs and their gross domestic product.
- **Madagascar** may indeed have a respectable ecological reserve; however, its imports of embodied biocapacity are still higher than its exports. Can this be true? Why might Madagascar need to import a net amount of resources?
- **Japan** has very few resources available within its own territory. Does this pose a risk to its future economic competitiveness and development? How might Japan mitigate these risks?
- In **China**, the per capita Footprint is equal to the global average available per capita biocapacity. This Asian country nonetheless uses double the amount of Footprint as the amount of biocapacity within its borders. What happens if this economic activities continue to grow by five to six percent per year (as was the case in 2008) and Western development models are copied?

The development trends of individual countries could have consequences for all of us.

- For example, what significance does **Brazil's** status as one of the largest creditor nations have for the preservation of the rainforest ecosystem? What do the country's biocapacity exports consist of? To what extent could Brazil's position on the world scene change in the future?
- **Russia** has a large, and increasingly valuable, biocapacity reserve, primarily because forests are important as CO_2 sinks. Could this affect Russia's political position? Will Russia's strong position change when the Earth's warming thaws wide expanses of permafrost and tremendous amounts of greenhouse gases are released?
- **Ecuador's** per capita biocapacity is steadily falling. To satisfy its growing population's hunger for renewable resources, the country must also import biocapacity from other countries. How will it finance this in the future? A few years ago it was determined that large quantities of petroleum exist within the Ecuadorian National Park Yasuní. The government is now ready to share the responsibility for this biologically valuable rainforest area and home to indigenous peoples: It wishes to permanently forego income from oil production, if it receives financial compensation from the world community in the amount of $350 million annually over the course of 13 years. How could such a deal be configured? What other options does the Ecuadorian government have if it wants to turn around the biocapacity and/or Footprint trends?

		WORLD	Brazil	Chile	Ecuador	Mexico	Madagascar
Selected Country Data	Area in million hectares	51,007****	851.2	75.7	28.4	197.3	58.7
	Population in millions (1961)	3,092	74.9	7.8	4.6	38.1	5.5
	Population in millions (2005)	6,476	186.4	16.3	13.2	107.0	18.6
	Population density in inhabitants per km² (2005)	13	22	22	47	54	32
	Biocapacity-adjusted population density in inhabitants/global km² (2005)*	48	14	24	48	59	27
	HDI ranking X. of 179 countries (2006)	–	0.81 70.	0.87 40.	0.81 72.	0.84 51.	0.53 143.
	Happy Planet Index (HPI) ranking X. of 178 countries (2006)	–	48.6 63.	51.3 51.	49.3 58.	54.4 38.	46.0 71.
Overall Ecological Footprint and biocapacity 1961 (in million gha)	Consumption Footprint	6,974	186.5	18.1	6.7	71.9	12.6
	Biocapacity	13,011	1,339.1	67.4	34.2	164.1	68.6
	Ecological surplus (+) or deficit (-)	+6,037	+1,152.6	+49.3	+27.5	+92.2	+56.0
Overall Ecological Footprint and biocapacity 2005 (in million gha)	Consumption Footprint	17,443	439.2	49.0	29.1	361.9	20.1
	Biocapacity	13,361	1,353.8	67.4	28.3	178.4	69.7
	Biocapacity per area unit in gha/ha	0.26	1.59	0.89	1.00	0.90	1.19
	Ecological surplus (+) or deficit (-)	-4,082	+914.6	+18.4	-0.8	-183.5	+49.6
	Trade balance**	–	+180.3	+18.9	-0.5	-131.7	-1.3
Per capita Ecological Footprint and biocapacity 1961 (in gha per capita)	Consumption Footprint	2.3	2.5	2.3	1.5	1.9	2.3
	Biocapacity	4.2	17.9	8.6	7.5	4.3	12.5
	Ecological surplus (+) or deficit (-)	+1.9	+15.4	+6.3	+6.0	+2.4	+10.2
Per capita Ecological Footprint and biocapacity 2005 (in gha per capita)	Consumption Footprint	2.7	2.4	3.0	2.2	3.4	1.1
	Biocapacity	2.1	7.3	4.1	2.1	1.7	3.7
	Ecological surplus (+) or deficit (-)	-0.6	+4.9	+1.1	-0.1	-1.7	+2.6
	Trade balance**	–	+1.0	+1.2	-0.0	-1.2	-0.1
Percent change 1961 to 2005	Population	+109	+149	+108	+190	+181	+238
	Consumption Footprint***	+19	-5	+30	+49	+79	-53
	Biocapacity***	-51	-59	-52	-71	-61	-70

* This rounded value shows how many inhabitants share a km² biocapacity in absolute terms. For example, Brazil: biocapacity = 7.3 gha/inhabitants = 7.3/100 gkm² = 100/7.3 inhabitants = 13.7 inhabitants/gkm²

** Trade balance = allocation of a country's imports and exports of embodied biocapacity. For a positive value exports > imports (positive balance of trade); for a negative value imports > exports (negative balance of trade)

*** Increase or decrease are calculated with relation to per capita values

**** total surface of the Earth

Mauritania	Namibia	Japan	Mongolia	Vietnam	Russia	USA	Germany	China
103.1	82.5	37.8	156.4	33.0	1,707.5	982.7	35.7	959.7
1.0	0.6	95.0	1.0	34.5	–	189.1	73.4	672.8
3.0	2.0	128.1	2.6	84.2	143.2	298.2	82.7	1,323.3
3	2	339	2	255	8	30	232	138
16	11	167	7	125	12	20	53	111
0.56 140.	0.63 129.	0.953 8.	0.72 112.	0.72 114.	0.81 73.	0.951 15.	0.94 23.	0.76 94.
37.3 124.	38.4 118.	41.7 95.	49.6 56.	61.2 12.	22.8 172.	28.8 150.	43.8 81.	56.0 31.
3.8	2.9	195.8	5.4	29.8	–	1,001.0	211.2	639.4
18.5	18.0	94.7	43.7	49.7	–	1,633.6	140.4	737.7
+14.7	+15.1	-101.1	+38.3	+19.9	–	+632.6	-70.8	+98.3
5.8	7.5	626.6	9.2	106.2	536.4	2,809.7	349.5	2,786.8
19.6	18.2	77.2	38.8	67.7	1,161.9	1,496.4	160.5	1,132.7
0.19	0.22	2.04	0.25	2.05	0.68	1.52	4.50	1.18
+13.8	+10.7	-549.4	+29.6	-38.5	+625.5	-1,313.3	-189.0	-1,674.1
-0.4	+0.3	-204.8	-0.6	-14.1	+163.2	-236.7	+31.3	-165.5
3.7	4.7	2.1	5.4	0.9	–	5.3	2.9	1.0
18.0	29.4	1.0	44.5	1.4	–	8.6	1.9	1.1
+14.3	+24.7	-1.1	+39.1	+0.5	–	+3.3	-1.0	+0.1
1.9	3.7	4.9	3.5	1.3	3.7	9.4	4.2	2.1
6.4	9.0	0.6	14.6	0.8	8.1	5.0	1.9	0.9
+4.5	+5.3	-4.3	+11.1	-0.5	+4.4	-4.4	-2.3	-1.2
-0.1	+0.1	-1.6	-0.2	-0.2	+1.1	-0.8	+0.4	-0.1
+200	+231	+35	+169	+144	–	+58	+13	+97
-49	-21	+137	-36	+46	–	+78	+47	+122
-65	-69	-40	-67	-44	–	-42	+2	-22

Sources:
- CIA (2009) The World Factbook
- UNDP: Human Development Report, 2008 update
- Global Footprint Network
- new economics foundation: www.happyplanetindex.org

Part 7 Appendix
Specific Footprint terminology

Many terms specific to the ecological Footprint concept are covered based on the glossary of the Global Footprint Network: www.footprintnetwork.org/de/index.php/GFN/page/glossary

Biocapacity or biological capacity

The capacity of ecosystems to produce biological materials useful to humans and to absorb waste materials generated by humans, using current technological means. A material is biologically useful if it is used in economic processes which can change from year to year (e.g. use of corn (maize) stover for ethanol production would increase the biocapacity of maize cropland since, in addition to corn cobs, the stover would also become a useful material). 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**.

Biocapacity trade balance

is calculated by comparing a country's biocapacity imports and exports. The result is either negative (imports > exports with the national **consumption Footprint** being larger than the **production Footprint**) or positive (exports > imports with the national consumption Footprint being less than the production Footprint).

Biodiversity buffer

The amount of **biocapacity** containing various ecosystems and viable stocks of animal species, in nature reserves, for example. How much needs to be set aside depends on the desired outcome and the designated species diversity. The **Footprint** does not take this biocapacity into account. The *Global Footprint Network* suggests making 20 percent available for wild living animal and plant species. Leading scientists like the former Harvard Professor, E.O. Wilson call for 50 percent of global biocapacity to be set aside.

Biologically productive land and water

land and water areas are deemed biologically productive if they support significant photosynthetic activity and biomass is accumulated which is useable by humans. Non-productive areas as well as marginal areas with patchy vegetation are not included. Biomass that is not of use to humans is also not included. The total biologically productive area on land and water was approximately 13.4 billion hectares in 2005.

Carbon Footprint

the biologically productive land area which is required for the uptake of the carbon dioxide (which is not absorbed by the oceans). The supply of the corresponding biocapacity (**forest** set aside for carbon uptake) is, however, currently too small to absorb the entire quantity of CO_2 generated by humans. This results in increasing CO_2 concentrations in the atmosphere. The Carbon Footprint figures prominently in the debate over climate change. Not every calculation method for Carbon Footprints translates the tones of CO_2 into forest areas needed for taking up the CO_2 – some only document tons of CO_2 emissions or tons of CO_2 per Euro. The effects of CO_2 emissions on biologically productive areas lie outside the scope of the Footprint.

"Collective" Footprint

Biocapacity is used for the construction of public infrastructure which can be used by all inhabitants of a country (e.g., roads, rail tracks, hospitals, sewage systems, schools and power lines). The "collective" Footprint shows that, independent of individual lifestyle and nature consumption, the **Footprint** of a German or a US-American is clearly higher than that of a Vietnamese or a Beninese.

Consumption

Use of goods or of services. In regard to the **Ecological Footprint**, consumption refers to the use of goods or services. A consumed good or service contains all the raw materials and energy which were necessary to make it available to the consumer.

Consumption components

The total Footprint can be allocated to the following consumption components: food, shelter, mobility, goods, and services. To avoid double counting, all consumption goods are assigned to only one consumption category. For example, a refrigerator and be either allocated to the category "food" or the category "consumption of goods and services" but also to the category "dwelling".

Consumption Footprint

This is the most widely used form of **Ecological Footprint**. The consumption Footprint includes the area needed to produce the materials consumed and the area needed to absorb the waste. The consumption Footprint of a nation is calculated in the **National Footprint Accounts** as a nation's **production Footprint** minus the Footprint of exports and plus the Footprint of biocapacity imports. For example, if a country grows cotton for export, the natural **resources** needed for production will not be calculated as part of its consumption Footprint. Rather, they are added to the consumption Footprint of the country importing and consuming T-shirts produced from the cotton. The national average or per capita Footprint is equal to a country's Footprint divided by its population.

Consumption and land use matrix

The matrix (below) is populated with data from the **National Footprint Accounts**. In the process all six major Footprint **land types** (columns) and five **consumption areas** (rows) are recorded. Each consumption area can be disaggregated further to display more detailed information. The matrices are also used to carry out calculations on a regional or local level. In these cases, the national data is adjusted to the consumption pattern of a region or a city.

Double counting

The accounting method of the **Ecological Footprint** avoids any sort of double counting. For example, when adding the **Ecological Footprints** in a production chain (e.g., wheat farm, flour mill, and bakery), the study must count the cropland for growing wheat only once to avoid double counting. Similar, but smaller, errors can arise in analyzing a production chain because the end product is used in produce the raw materials used to make the end product (e.g. steel is used in trucks and earthmoving equipment used to mine the iron or that is made into the steel). A third source for error is when land serves multiple purposes (e.g. a farmer harvests a crop of winter wheat and then plants corn to harvest in the fall). Instead, the **yield factor** is adjusted to reflect the higher bioproductivity of the double-cropped land.

Earth Overshoot Day

see **Overshoot**

Ecological deficit / surplus

The difference between the **biological capacity** and **Ecological Footprint** of a region or country. An ecological deficit occurs when the Footprint of a population exceeds the **biologically productive area**. The term "deficit" originates in economics vocabulary and should convey a state of biocapacity shortage; it was coined by the Global Footprint Network. Conversely, an ecological reserve exists when the biologically productive area of a region is larger than its population's Footprint. States attempt to balance their deficit through the following mechanisms: by overuse of their own ecosystems (e.g., overgrazing); through the import of (unpaid) appropriation of other countries' ecological services (e.g., through CO_2 emissions which concentrate in the atmosphere).

Ecological Footprint

A measure of how much **biologically productive land and water** an individual, population or activity requires to produce all the **resources** it consumes and to absorb the waste it generates

Consumption and land use matrix

	Cropland	Grazing Land	Fishing Ground	Built-up Land	Forest	Carbon Footprint	**Total**
Food							
Shelter							
Mobility							
Goods							
Services							
Total							

using prevailing technology and resource management practices. The Ecological Footprint is usually measured in **global hectares**. Because trade is global, a country's Footprint can include land areas from different locations on the planet.

Ecological Footprint Standards

The standards contain the criteria, methodology, data sources and reporting which concern Footprint studies. They serve to produce transparent, reliable and mutually comparable results in studies done for Footprint studies and are established by the *Global Footprint Network Standards Committee* which is composed of scientists and practitioners from around the world.

Energy Footprint

The sum of all areas used to provide non-food and non-feed energy. It is the sum of the Carbon Footprint, hydropower land, forest for fuel wood, and crop land for fuel crops.

Equivalence factor

With the aid of this factor and the **yield factor**, specific land types (e.g., cropland or forest) can be converted into a universal unit of biologically productive area, a **global hectare**. For land types with productivity higher than the average productivity of all biologically productive land and water area on Earth, the equivalence factor is greater than 1. Thus, to convert an average hectare of cropland to global hectares, for example, it is multiplied by the cropland equivalence factor of 2.21. Pasture lands, which have lower productivity than cropland, have an equivalence factor of 0.48.

Footprint

see **Ecological Footprint**

Forest areas for carbon uptake

The available, biologically productive land area which is able to absorb through photosynthesis the carbon dioxide emitted by fossil fuel combustion (after subtracting the amount absorbed by the oceans).

Global hectare (gha)

A unit of measure denoting the yields of **biologically productive land and water** areas (the average productivity per hectare in one year). It quantifies the **biological capacity** of the planet as well as the demands on it by humans (i.e., the **Ecological Footprint**).

Land type

The Earth's approximately 13.4 billion hectares of **biologically productive land and water** are categorized into five types of surface area: cropland, grazing land, forest, fishing ground, and built-up land.

National Footprint Accounts

The *National Footprint Accounts* contain Footprint data of the world and of more than 150 countries from 1961 until today. More complete and globally coherent data is available at a national level than at city or household levels. Therefore the *National Footprint Accounts* are a core element of Footprint accounting. They are continually being developed and improved by the *Global Footprint Network* and more than 90 partners.

Neutral or negative Footprint

Human activities or services that result in no increase in the **Ecological Footprint** are designated neutral. If they result in a reduction of the ecological Footprint, one speaks of a negative Footprint. For example, if a house has been substantially remodeled, the renovation measures increase the Footprint of the property through the manufacture of the insulation and their installation. On the other hand, insulation reduces heating and cooling energy requirements.

Nuclear Footprint

Beginning with the 2008 edition of the **National Footprint Accounts**, nuclear energy was no longer included in Footprint calculations since expressing nuclear energy in terms of area is methodologically questionable. Nuclear energy implies other environmental risks not addressed by the Footprint such as military uses, operating risk, and the long life of radioactive waste. Before 2008 each kWh of electricity generated by nuclear power was calculated to be equivalent to a kWh of electricity generated by fossil fuels.

Overshoot

occurs when human demand for natural **resources** exceeds the actual assets. The regenerative abilities of the planet are overstrained since the global **ecological deficit** can not be balanced through trade. If the amount of **biological capacity** produced in one year is estimated, a symbolic date can be determined on which the renewable resources for the current year have already been used up. In 2010 this Earth Overshoot Day was set on August 21st: this means that from January 1st 2010 until this date humanity had already used as much biocapacity as the earth can provide for the entire year 2010. The formula for calculating *Earth Overshoot Day* is (biocapacity/ global **Footprint**) x 365. From a global perspective overshoot is thus identical to the world wide ecological deficit. A country, however, can have an ecological deficit without being in local overshoot. This happens when it net-imports resources while not overusing of its own ecological assets.

Planet Equivalent(s)

If all humans lived like an average European, we would need about 3 planets; with American consumption standards, 5. The planet equivalent is the ratio of the individual Footprint (average Footprint per inhabitant) to the available per capita biological capacity of the Earth (2.1 gha in 2005). In 2005, the world average Ecological Footprint of 2.7 gha per capita equals over 1.3 Planet Equivalents. For 2009, this ratio was over 1.4.

Production Footprint

The production Footprint includes all areas within a country which are needed for the production of primary products (cropland, pasture land, forestland and fishing grounds), a country's built-up land (roads, factories, cities), and the area required for the absorption of the country's CO_2 emissions resulting from fossil fuel combustion.

Productivity

The amount of biological material useful to humans that is generated in a given area. In agriculture, productivity is called **yield**.

Resources

An umbrella term for all resources which humans need for economic activity. One distinguishes between natural (biotic and abiotic factors) and manmade resources (infrastructure, buildings, machines, human knowledge). Natural resources are differentiated according to whether they are renewable (plants, animals, water in the context of its natural cycle) or nonrenewable (mineral deposits, coal, petroleum, even soil). In everyday language, natural resources are often taken to mean only those which are renewable. The nonrenewable resources are finite and depletable. In this brochure the concepts renewable natural resources/raw materials and regenerative resources/ raw materials are used synonymously.

Yield

The amount of primary product that a population is able to extract from a certain area of **biologically productive land or water** per year.

Yield factor

Each country and each year has specific yield factors for cropland, grazing land, forest, and fisheries since the productivity of these **land types** changes constantly. For example, in 2005, German cropland was 2.5 times more productive than world average cropland. The German cropland yield factor of 2.5, multiplied by the cropland **equivalence factor** of 2.2 converts German cropland hectares into **global hectares**: one hectare of German cropland was equal to 6.0 gha in 2005.

Glossary

Biodiversity

The term "biological diversity" encompasses the variety of life on earth, from the genetic diversity to the variety of species culminating in the variety of the ecosystems.
www.gtz.de/biodiversity

BMZ

The Federal Ministry for Economic Cooperation and Development (BMZ) is responsible for the planning and implementation of government development policies. It commissions different independent organizations to conduct concrete projects and programs for the German Development Cooperation, or enables their execution through financial contribution.
www.bmz.de/en

CO_2 emissions

Carbon dioxide is one of the most important greenhouse gases causing climate change. The output of CO_2 into the atmosphere where its greenhouse effects take effect is called emission. The concentration of CO_2 in the atmosphere has sharply risen during the past century, largely due to the combustion of fossil fuels such as petroleum or coal, but also due to the progressive continuation deforestation in every part of this earth.

Convention on Biological Diversity (CBD)

The convention was approved in 1992 in Rio de Janeiro links the protection of biological diversity to sustainable development and the just distribution of advantages arising from their use. In the meantime, 191 parties (190 Nations and the EU) have become parties to the convention. With its signature Germany committed not only to preserve **biodiversity** in its own country but to also support developing nations in taking the necessary steps for making it a reality.
www.cbd.int

Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)

is a private sector organization owned by the federal government. It primarily supports complex reforms and change processes in developing and transforming countries on behalf of the BMZ.
www.gtz.de/en

"Developing countries"

A uniform definition or a worldwide authoritative list of developing countries does not exist. In literature and in the media the term "developing nation" is used when, besides a low per capita income, inadequate food supply, poor health conditions across broad strata of the population, and deficient educational opportunities are present. Global Footprint Network believes that the term is outdated and counter productive, since it insinuates a uni-dimensional GDP-based development model. It is not even a physical option any longer that all countries consume at the rate of Europe, the United States, or Japan. With the current population level, this would require about 3 to 4 planets. In contrast, other development models encourage discovering how we could all live well within the ecological limits of the Earth. Few can do this; in this sense we are all in need of development. *Official Development Assistance (ODA)* is guided by the country listing of the DAC *(Development Assistance Committee)* and the Development committee of the **Organization for Economic Cooperation and Development** (OECD).

Ecosystem

According to 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."
www.cbd.int/convention/articles.shtml?a=cbd-02

Ecosystem services

are services generated by nature which humans can use. *The Millennium Ecosystem Assessment* differentiates four categories: (1) provisioning services (e.g., Food); (2) regulating services (e.g., regulating the climate); (3) cultural services (e.g., esthetic, educational, and spiritual aspects); and (4) supporting services (e.g., humus and soil building).

"Emerging Nations" (Countries with average income)

A uniform definition or a worldwide authoritative list of emerging nations does not exist. "Emerging nations" or "newly industrialized countries" (NIC) denote a group of mostly larger

economies which are rapidly industrializing such as Brazil or China. They are characterized by their relatively rapidly growing economic power and rising per capita incomes.

Human Development Index (HDI)

An indicator to compare the level of social development. Life expectancy, the rate of literacy and the actual spending capacity per person flow into the HDI. The HDI can lie between 1 at it highest and 0 at its lowest.

Least Developed Countries (LDC)

A committee of the *United Nations Economic and Social Council* (ECOSOC) lays down the criteria for classifying a country as LCD. The final decision is made by the General Assembly of the United Nations. The criteria for this classification are, among others, the gross dometic product (gnp); the *Human Assets Index* (HAI), which is primarily concerned with health and education idicators); the proportion of industrial production; a country's export orientation and its population. Least Developed Countries receive considerably more favorable conditions in cooperation with the United Nations than other **developing countries**.

Life cycle analysis (LCA)

A tool for quantitatively capturing and assessing a product's impact on the environment. In observing the entire life cycle of a product – also its use and disposal – LCA measures the quantities of energy, raw materials, and materials used for its production and distribution as well as the waste materials and emissions it creates in the air, ground, and water.

Organization for Economic Cooperation and Development (OECD)

30 industrialized countries are brought together in the OECD. According to Article I of its convention which was signed in Paris in 1960, it promotes policies designed to achieve optimal economic growth and employment and a rising standard of living for its member states and Through a sound economic expansion in the world economy contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.
www.oecd.org

Partner Country

Countries with with the German government directly cooperates within the framework of financial and technical development cooperation on the basis of governmental agreements.
www.bmz.de/en/countries

Sustainability

Sustainable development means meeting the needs of the present without restricting the opportunities of future generations (Brundtland, 1987). Sustainability should be the basis of all political decisions regarding the handling of natural, social and technical resources. Since the UN Earth Summit on the environment and development in Rio in 1992, Sustainable Development has been accepted as a global directive and shall be implemented through the Agenda 21 which was also approved in Rio.
www.gtz.de/en/top-themen/12347.htm
www.nachhaltigkeitsrat.de/en

World Bank

The World Bank is a special organization of the United Nations. It was founded at the monetary and financial conference of the founding members of the United nations in 1944 in Bretton Woods, USA at the same time as the International Monetary Fund (IMF). After the Second World War, its purpose was to promote reconstruction and, together with the IMF, create stabile currencies. Since the 1960's, Its major task is combating poverty in the world and improving living conditions in **developing countries**.
www.worldbank.org

Abbreviations

BMU	Bundesministerium 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)
CBD	Convention on Biological Diversity
CO_2	carbon dioxide
COP	Conference of the Parties
DAC	Development Assistance Committee (development committee of OECD)
DBU	Deutsche Bundesstiftung Umwelt(German Environmental Foundation)
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GFN	Global Footprint Network
gha	global hectare
gkm^2	global square kilometer
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH
ha	hectare
HDI	Human Development Index
HPI	Happy Planet Index
kWh	kilowatt hour
LCA	Life Cycle Assessment
LDC	Least Developed Countries
MIPS	Material Input per Unit of Service
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
TEEB	The Economics of Ecosystems and Biodiversity
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
USD	US Dollar ($)
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
WWF	World Wide Fund for Nature
ZSL	Zoological Society of London

Links & Literature

Ecological Footprint: Background materials

available as PDF file on the accompanying DVD in this brochure: "A Big Foot on a Small Planet?"

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Ecological Footprint case stories
www.footprintnetwork.org/en/index.php/GFN/page/case_stories/

- BedZED, Residence and Office Project
  www.zedfactory.com
- BioRegional
  www.bioregional.com
- GPT Group, Shopping Centers in Australia
  www.gpt.com.au
- Masdar City, CO_2-neutral city in the United Arab Emirates
  www.masdarcity.ae

Ecological Footprint Factbooks
www.footprintnetwork.org/en/index.php/GFN/page/publications

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Global Footprint Network
International think-tank where sustainability issues are illuminated with the aid of the Footprint.
www.footprintnetwork.org

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  www.footprintnetwork.org/gfn_sub.php?content=national_footprints
- Footprint Standards
  www.footprintstandards.org
- Glossary
  www.footprintnetwork.org/en/index.php/GFN/page/glossary
- Footprint calculation methodology
  www.footprintnetwork.org/en/index.php/GFN/page/methodology
- Ecological Creditors and Debtors
  www.footprintnetwork.org/en/index.php/GFN/page/ecological_debtors_and_creditors
- Country Trends
  www.footprintnetwork.org/en/index.php/GFN/page/trends/
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  www.footprintnetwork.org/en/index.php/GFN/page/case_stories/
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  www.footprintnetwork.org/images/uploads/Ecological_Wealth_of_Nations.pdf

Greenpeace
www.greenpeace.org

- (2008): Footprint. Der ökologische Fußabdruck Deutschlands. Hamburg.
  www.greenpeace.de/fileadmin/gpd/user_upload/themen/wirtschaft_und_umwelt/Footprint_Deutschland_2008.pdf
- Greenpeace CO_2 calculator
  www.greenpeace.klima-aktiv.com

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Nachhaltigkeit und Umweltbewusstsein in Bayern. Möglichkeiten und Grenzen einer Umsetzung von Umweltwissen in Umwelthandeln unter dem Aspekt einer Nachhaltigen Entwicklung in Bayern. Inaugural-Dissertation zur Erlangung des akademischen Grades eines Doktors der Naturwissenschaften an der Fakultät für Angewandte Informatik der Universität Augsburg.

- Contents
  www.umwelt-bayern.de/7_Inhaltsverzeichnis.pdf
- Summary
  www.umwelt-bayern.de/Zusammenfassung.pdf

Lexikon der Nachhaltigkeit
www.nachhaltigkeit.info

- Ecological Footprint
  www.nachhaltigkeit.info/artikel/kologischer_fussabdruck_733.htm

Lokale Agenda 21 Berlin
www.agenda21berlin.de/fussabdruck

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New Economics Foundation
British think and do tank whose members developed the Happy Planet Index, among other things.
www.neweconomics.org

- Happy Planet Index
  www.happyplanetindex.org
- Calculating one's own Happy Planet Index
  http://survey.happyplanetindex.org
- (2009): The (Un)Happy Planet Index 2.0
  http://www.happyplanetindex.org/public-data/files/happy-planet-index-2-0.pdf
- Map showing the overall scores of the Happy Planet Index
  http://www.happyplanetindex.org/explore/global/
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One Planet Living
A global initiative of BioRegional and WWF based on 10 principles of sustainability
www.oneplanetliving.org

Plattform Footprint
An alliance of environmental and development policy organizations which wishes to embed the Footprint as an integral measurement of the future-fitness of our society
www.footprint.at

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Redefining Progress
www.rprogress.org

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UNESCO-IHE
UNESCO Institute for Water Education
www.unesco-ihe.org

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Water Footprint Network
Dutch foundation and international Water Footprint network
www.waterfootprint.org

WWF
World Wide Fund for Nature
www.panda.org, www.wwf.de

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- for more information on the Footprint www.panda.org/index.cfm?uGlobalSearch=footprint

Ecological Footprint: Educational materials

Bavarian Environment Agency
www.lfu.bayern.de / www.lfu.bayern.de/doc/profil_englisch.pdf

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- (publ.) (2009): UmweltWissen – Didaktische Konzepte. Der Ökologische Fußabdruck im Unterricht an Schulen. www.lfu.bayern.de/umweltwissen/doc/uw_87_oekologischer_fussabruck_im_unterricht.pdf

Federation of German Consumer Organisations
www.vzbv.de/start/index.php?page=english

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Forum Umweltbildung Österreich
Austrian portal for environmental education an education for sustainable development
www.umweltbildung.at
www.umweltbildung.at/cgi-bin/cms/af.pl?ref=en

- Brochure: Ökologischer Fußabdruck in der Schule. Impulse, Szenarien und Übungen für die Sekundarstufe. www.umweltbildung.at/cms/download/1204.pdf
- Online questionnaire: Wie viel Umwelt brauchen Sie? www.umweltbildung.at/cgi-bin/cms/af.pl?navid=51

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Ecological Footprint Accounting: Building a Winning Hand (in German, English and French)
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Global Footprint Network; GTZ & The Bavarian Forest National Park (2009)
The Ecological Footprint. Living well within the means of nature. Flyer.
Ordering address: i-punkt@gtz.de

KATE e.V.
Contact point for environment and development – for policy and consulting organizations in social economy, churches and communities in Europe and Latin America
www.kate-berlin.de/about-us.html

- Campaign manual "sustainable consumption and development"

www.kate-berlin.de/aktions-cd.html
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www.krapp-gutknecht.de/Produkte/Methoden/Umwelt_und_Energie/Umwelt_und_Energie.htm

Sustainability Institute
Information about the strategy games "Fish banks" and "Strategem"
www.sustainer.org

University of Augsburg
Chair for the Didactics of Geography
www.geo.uni-augsburg.de/en/professorships/phygeo/

- Class material for teaching the ecological Footprint
  www.lfu.bayern.de/umweltwissen/doc/uw_bm_01_schuelerblaetter_oekologischer_fussabruck.zip

Vereinigung Deutscher Gewässerschutz e.V.
www.vdg-online.de
- Environmental training project „Virtuelles Wasser"
  www.virtuelles-wasser.de

WWF Switzerland
www.wwf.ch
- Face one planet
  http://oneplanetliving.wwf.ch

Footprint calculators

Bavarian Environmental Agency
www.lfu.klima-aktiv.de

BUNDjugend
www.latschlatsch.de/downloads/Printversion.pdf

City of Darmstadt
www.agenda21.darmstadt.de/index.php?view=article&catid=80%3Aaktionen-a-neue-projekte&id=515%3Aoekologischer-fussabdruck&Itemid=108&option=com_content

Earth Day Network
http://earthday.net/footprint2/flash.html

Federal Austrian Ministry of Agriculture, Forestry, Environment and Water Management
www.mein-fussabdruck.at, www.footprintrechner.at

Global Footprint Network
www.footprintcalculator.org

Greenpeace
http://greenpeace.klima-aktiv.com

Redefining Progress
www.myfootprint.org

WWF Switzerland
www.footprint.ch

Nature and resource consumption (tools, policy, miscellaneous)

Bavarian Environment Agency (2007)
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www.stmugv.bayern.de/umwelt/umweltbericht/index.htm

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Club of Rome
International association of prominent personalities from the fields of science, culture, industry, and politics which is committed to a livable and sustainable future for man
www.clubofrome.org
www.clubofrome.de

Factor 10 Institute
www.factor10-institute.org

FishBanks, Ltd.
A group role-playing simulation developed by

Dennis Meadows, Institute for Policy and Social Science Research
www.ed.gov/pubs/EPTW/eptw7/eptw7d.html
www.bpa.gov/Corporate/KR/ed/step/fishing_game/fishing.shtml

Heinrich Böll Stiftung
www.boell.de/service/home.html
- Toward a Transatlantic Green New Deal: Tackling the Climate and Economic Crisis.
  www.boell.de/ecology/economics/ecological-economics-7218.html

Intergovernmental Panel on Climate Change
www.ipcc.ch
- Climate Change 2007: Synthesis Report. Summery for Policymakers.
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Buying Farmland abroad – Outsourcing's third wave. May 21st 2009.
www.economist.com/world/international/displayStory.cfm?story_id=13692889

The Story of Stuff
Short film about the social and ecological consequences of our buying decisions
www.storyofstuff.com
- German version
  www.utopia.de/magazin/the-story-of-stuff
- original English version with subtitles
  www.storyofstuff.com/international

UNEP
United Nations Environment Program
www.unep.org
- Life Cycle & Resource Management
  www.unep.fr/scp/lifecycle

Vauban, City District in Freiburg
www.freiburg.de/servlet/PB/menu/1167123/index.html
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  www.wupperinst.org/en/projects/topics_online/mips/

ZEIT online: The New Green Deal
www.zeit.de/themen/wirtschaft/krise-als-chance/index

Biodiversity, sustainability, and development cooperation

Biodiversity in Good Company
Business and Biodiversity Initiative
www.business-and-biodiversity.de/en/homepage.html

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Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU)
German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
www.bmu.de/english
- General information about the COP 9 of the CBD
  www.bmu.de/un-naturschutzkonferenz2008
  www.bmu.de/un-conference2008
- Download of the reports on the TEEB study
  www.bmu.de/english/nature/convention_on_biological_diversity/doc/45525.php

Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ)
(Federal Ministry for Economic Cooperation and Development)
www.bmz.de/en/
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  www.bmz.de/en/countries/index.html

CIA – The World Factbook
www.cia.gov/library/publications/the-world-factbook

Commission on the Measurement of Economic Performance and Social Progress
- Report:
  www.stiglitz-sen-fitoussi.fr/en/index.htm

Conservation & Development
Publications, educational material and campaigns on the topic of "Nature Conservation and Development"
www.conservation-development.net/?L=2&ds=176
- Brochure series „Sustainability has Many Faces"
  www.conservation-development.net/?L=2&ds=247

Convention on Biological Diversity (CBD)
www.cbd.int

DBU
Deutsche Bundesstiftung Umwelt
A German foundation which supports projects in the areas of environmental technology, environmental research, and environmental communication
www.dbu.de/359.html

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Development Needs Diversity: People, natural resources and international cooperation – Contributions from the countries of the south. In: Sustainability has Many Faces, Nr. 1, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, Eschborn (in German, English, French and Spanish)
www.conservation-development.net/?L=2&ds=213

Falkenstein International Wilderness Camp
www.wildniscamp.de/flyer/english/

Fleischhauer, Andrea; Thora Amend & Stefanie Eißing (2008)
Zwischen Kochherden und Waldgeistern: Naturerhalt im Spannungsfeld von Energieeffizienz und alten Bräuchen – Anregungen aus Madagaskar. In: Nachhaltigkeit hat viele Gesichter, Nr. 5. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, Eschborn (in German and French).
www.conservation-development.net/?L=2&ds=217

German Council for Sustainable Development (RNE)
www.nachhaltigkeitsrat.de/en

GTZ
Deutsche Gesellschaft für Technische Zusammenarbeit GmbH
www.gtz.de/en
- General overview
  www.gtz.de/en/689.htm

- Program Implementing the Biodiversity Convention
  www.gtz.de/biodiversity
- Sustainable Development – GTZ's concept
  www.gtz.de/en/top-themen/12347.htm
- GTZ worldwide
  www.gtz.de/en/570.htm
- Latin America and Caribbean
  www.gtz.de/en/weltweit/573.htm
- Sub-Saharan Africa
  www.gtz.de/en/weltweit/571.htm
- Asia and Pacific
  www.gtz.de/en/weltweit/572.htm

Helmholtz Center for Environmental Research Leipzig
www.ufz.de/index.php?en=11382
- Information about TEEB
  www.ufz.de/index.php?en=16828

International Youth Summit „Go 4 BioDiv"
www.go4biodiv.org
- Declaration 2008
  www.go4biodiv.org/wp-content/uploads/file/Go4BioDiv_Declaration_eng.pdf
- Artistic contributions of the young summit participants – a selection
  www.go4biodiv.org/wp-content/uploads/file/Go4BioDiv_Kuenstlerische_Beitraege.pdf
- Photo brochure "Unity in Diversity"
  www.go4biodiv.org/wp-content/uploads/file/go4biodiv_unity_in_div_brosch_final_pdf.pdf

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User Rights for Pastoralists and Agreements based on traditional and modern law Contributions from Mauritania. In: "Sustainability has Many Faces, Nr. 6", Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, Eschborn (in German and English)
www.conservation-development.net/?L=2&ds=218

Kus, Barbara; Heine, Britta; Fleischhauer, Andrea & Judith Jabs (2010)
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. In: Sustainability has many faces, No. 8. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, Eschborn (in English and German).
www.conservation-development.net/?L=2&ds=220

OECD
Organization for Economic Cooperation and Development
www.oecd.org
- DAC List of Developing Countries
  www.oecd.org/dac/stats/daclist

respACT
(Austrian business council for sustainable development)
Business Platform for Corporate Social Responsibility (CSR) und Sustainable Development
www.respact.at/content/site/english/index.html?SWS=a9189de3f71ca83229a4ad4fd2dcb3c6

TEEB
The Economics of Ecosystems and Biodiversity
www.teebweb.org

Technische Universität München
Center of Life and Food Sciences Weihenstephan
www.wzw.tum.de/index.php?id=1&L=5

UNDP (2008)
Human Development Report.
www.hdr.undp.org/en/statistics

UNEP (2007)
Global Environment Outlook: environment for development (GEO4).
www.unep.org/geo/geo4/media
- GEO4 – Fact Sheets
  www.unep.org/geo/geo4/media/fact_sheets
- GEO4 – Fact Sheet North America
  www.unep.org/geo/geo4/media/fact_sheets/Fact_Sheet_12_North_America.pdf

World Bank
www.worldbank.org
- Country Classification
  http://data.worldbank.org/about/country-classifications

World Business Council on Sustainable Development
www.wbcsd.org

DVD contents
"A Big Foot on a Small Planet?"

"The Footprint – large demands on a small planet, 2007"
(German/17 min.)

A shortened version of a film about the Ecological Footprint, produced by Global Footprint Network in cooperation with Plattform Footprint; the full version of the film can be ordered at: http://shop.filmladen.at

The Story of Stuff, 2007
(English/20 min.)

A short film about the social and ecological consequences of our buying decisions. Created by Annie Leonard, supported by The Sustainability Funders and by the Tides Foundation, procuced by Free Range Studios.

International Youth Summit "Go 4 BioDiv": Dance theater
(English/3 min.)

Dance theater with participants of the International Youth Summit at the UN Conference of the Parties to the Convention on Biological Diversity in Bonn, produced by the Deutsche Bundestiftung Umwelt DBU.

Send Samauma's Call around the world, 2008
(Portuguese with English subtitles/8:16 min.)

Videoclip followed by short sequences from Brazil, Mexico, China, Namibia and Germany. Created by participants of the International Youth Summit "Go 4 BioDiv", produced by ARPA and irrlicht Film.

Interviews on the Ecological Footprint
(German)

Conducted by Bert Beyers on behalf of GTZ with:

Dr. Mathis Wackernagel

Co-creator of the Footprint Concept and president of the Global Footprint Network (28:53 min.)

Dr. Rolf-Peter Mack

Senior Planning Officer with GTZ (15:36 min.)

Susanne Willner

Staff member in the GTZ Planning Sector Rioplus (9:53 min.)

Tatjana Puschkarsky and Verena Treber

Participants in the International Youth Summit "Go 4 BioDiv" (14:58 min.)

Additional materials

The Brochure (PDF file, German/English)

Educational material on the Ecological Footprint

Global Footprint Network:

"Living Well Within the Means of Nature"
(wallet card, German/English)

"Driving Competitiveness in a new Global Economy"
(booklet, German/French/English)

Bavarian Environment Agency:

"Environment Knowledge. The ecological Footprint"
incl. educational material (German)

University of Augsburg:

Lesson materials for high school classes grades 7+ (German)

FORUM Umweltbildung in Austria:

"The Ecological Footprint in Schools – Ideas, Scenarios,
and Exercises for Secondary Education" (German)

PDF presentation for large format printing of the planet Earth, and for the following graphs (German and English)

"Ecological Footprint of Nations"

"Sustainable Development: Where are we today?"

"Living on Large Feet and on Small"

WWF Living Planet Report 2008 (German/English)

Additional information about the International Youth Summit "Go 4 BioDiv"

Photo gallery from the Youth Summit and educational use of the Footprint

Links, literature and selected PDF files on the subject

Additional material for all the brochures which appear in the series "Sustainability has Many Faces" are also available on the Internet: www.conservation-development.net/?L=2&ds=248

Where can I find the additional information?

All materials are stored on an off-line Web site on the accompanying DVD. To get there, just open the file "index.html" in the folder "Daten" on the DVD.

Exclusion of liability

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Development Needs Diversity
People, natural resources and international cooperation

Nature Conservation Is Fun
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Participation and governance for nature conservation and development

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

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Sustainable development and poverty alleviation need energy

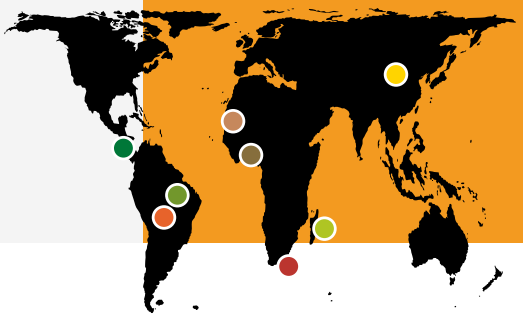
A Big Foot on a Small Planet?
Accounting with the Ecological Footprint

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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