World in Transition 2

German Advisory Council on Global Change (WBGU)

New Structures for Global Environmental Policy

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German Advisory Council
on Global Change

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Volume 2

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Acronyms and Abbreviations

AOSIS	Alliance of Small Island States
ARGE	Arbeitsgemeinschaft Neue Bundeslotterie für Umwelt und Entwicklung [Working Group for a Federal Lottery for the Environment and Development (Germany)]
ASEAN	Association of South East Asian Nations
ASSOD	Assessment of the Status of Human Induced Soil Degradation in South and Southeast Asia (FAO, ISRIC, UNEP)
BMU	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit [Federal Ministry for Environment, Nature Conservation and Reactor Safety (Germany)]
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung [Federal Ministry for Economic Cooperation and Development (Germany)]
CBD	Convention on Biological Diversity
CCOL	Co-ordinating Committee on the Ozone Layer (UNEP)
CDC	Centers for Disease Control and Prevention, USA
CDM	Clean Development Mechanism (UNFCCC)
CHM	Clearing House Mechanism
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora (UN)
COP	Conference of the Parties
CSD	Commission on Sustainable Development (UN)
CST	Comittee on Science and Technology (UNCCD)
DC	Development Cooperation
ECE	Economic Commission for Europe (UN)
ECOSOC	Economic and Social Council (UN)
EEAC	European Environmental Advisory Councils
EEZ	Exclusive Economic Zone
EPA	Environmental Protection Agency (USA)
ESSC	European Society for Soil Conservation
EU	European Union
FAO	Food and Agriculture Organization (UN)
FSC	Forest Stewardship Council
GATT	General Agreement on Tariffs and Trade
GEF	Global Environment Facility (UN)
GLASOD	Global Soil Degradation Database (FAO, UNESCO)
GTZ	Gesellschaft für Technische Zusammenarbeit [German Society on Development Cooperation]
IATA	International Air Transport Association
IBRD	International Bank for Reconstruction and Development (World Bank)
ICSID	International Centre for Settlement of Investment Disputes
ICSU	International Council of Scientific Unions
IDA	International Development Association (World Bank)
IFAD	International Fund for Agricultural Development (FAO)
IFC	International Finance Corporation (IBRD)

IFF	Intergovernmental Forum on Forests (UN)
IFIAC	International Financial Institution Advisory Commission/Meltzer Commission
IGO	Intergovernmental Organizations
IJC	International Joint Commission (USA and Canada)
ILO	International Labor Organization
IMF	International Monetary Fund
IMO	International Maritime Organization
IPBD	Intergovernmental Panel on Biological Diversity (recommended)
IPCC	Intergovernmental Panel on Climate Change (WMO, UNEP)
IPLS	Intergovernmental Panel on Land and Soils (recommended)
ISCO	International Soil Conservation Organization
ISDR	International Strategy for Disaster Reduction (UNESCO)
ISRIC	International Soil Science and Reference Centre (ICSU)
IUCN	The World Conservation Union
IUPGR	International Undertaking on Plant Genetic Resources (FAO)
IUSS	International Union on Soil Sciences
MAB	Man and the Biosphere Programme (UNESCO)
MARPOL	International Convention for the Prevention of Pollution from Ships
MIGA	Multilateral Investment Guarantee Agency (IBRD)
NAFTA	North American Free Trade Agreement
NASA	National Aeronautics and Space Administration (USA)
NGO	Non-Governmental Organization
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
OIOS	Office of Internal Oversight Services (UN)
OILPOL	International Convention for the Prevention of Pollution of the Sea by Oil
OPEC	Organization of Petroleum Exporting Countries
PCF	Prototype Carbon Fund (World Bank)
POP	Persistent Organic Pollutant
RAP	Risk Assessment Panel (recommended)
SBI	Subsidiary Body on Implementation (UNFCCC)
SBSTA	Subsidiary Body on Scientific and Technological Advice (UNFCCC)
SBSTTA	Subsidiary Body on Scientific Technical and Technological Advice (CBD)
SDR	Special Drawing Rights (IMF)
SOTER	Global and National Soil and Terrain Digital Database Program (FAO, ISRIC, UNEP)
SRU	Rat von Sachverständigen für Umweltfragen [Council of Environmental Experts (Germany)]
TC	Technical Cooperation
UBA	Umweltbundesamt [Federal Environment Agency (Germany)]
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
UNOPS	United Nations Office for Project Services
UNSO	United Nations Office to Combat Desertification and Drought (former United Nations Sahelian Office)
WBCSD	World Business Council for Sustainable Development

WBGU	Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen [German Advisory Council on Global Change]
WHO	World Health Organization (UN)
WMO	World Meteorological Organization (UN)
WSSD	World Summit on Sustainable Development, Johannesburg 2002
WTO	World Trade Organization (UN)
WWF	World Wide Fund for Nature

Summary for policymakers

Technical progress in the 20th century has revolutionised the transport of people, goods and information. Greater and greater speed and distances are being achieved at ever-lower cost per unit moved. Along with the transmission of energy and transportation of materials, the world's information highways are gaining in significance. The direct beneficiaries of these forms of transport – both real and virtual – are business and industry, which organise production, trade and investment today on a global scale. An indirect result of global transport, global business and global information is that the 'Western' life-style is leaping borders rapidly. Many traditional cultures are either being suppressed or are disappearing altogether. Religions, art, handicrafts and languages are particularly affected, but ultimately every variety of social norm and value is influenced.

The process of 'globalization' gives rise to undeniable economic and social opportunities; but it also puts three-fold pressure on the planet's environment: First, growth in production, services and consumption will imply a steady depletion of natural resources and sinks unless some 'green technological revolution' progresses to the point of making resource use and waste disposal considerably more efficient on a global scale than they now are. Second, environmentally polluting patterns of production and consumption are spreading across the planet, while sustainable patterns and practices are not. This divergence is leading in particular to site-inappropriate management of soils and fresh water resources. Third, the multiplicity of national legislative barriers and loopholes often present an opportunity for evasion of ecological standards – for example, for emissions and ambient pollution.

Can the institutions in place today within the United Nations system (Fig. 1a) cope with this great challenge? Their reputation is currently at an all-time low. Instead of strengthening them, there is talk of streamlining them, limiting their focus to core tasks or even disbanding them altogether. The incidents on the periphery of the ministerial conference of the World Trade Organization in 1999 in Seattle are the writing on the wall. This is a drastic state of affairs, indeed, because the condition of the Earth System calls for speedy, internationally concerted redress.

True, eight years after the Rio Summit, more than 900 bi- or multilateral environmental agreements are in force, but the most urgent environmental problems remain unsolved. The pressure of global environmental problems has even grown: greenhouse gases are being emitted with increasing rates; the thinning of the ozone layer above Arctic and Antarctic is spreading over ever-larger areas; more and more soil is being irreversibly degraded; 1200 million people have no certain access to clean drinking water; primary forests are being chopped down; and biological diversity faces irreversible losses.

The lack of coordination and collaboration among individual activities to preserve the natural basis for human life is painfully obvious. In an era of globalization – meaning also global accountability for the environment of the planet as a whole – humanity must unite in a common effort for the sustainable coevolution of nature and human society. Yet global environmental policy does not today enjoy a priority commensurate with the magnitude of the problems it addresses. This is why now, shortly before the World Summit on Sustainable Develepment (WSSD), the German Advisory Council on Global Change (WBGU) proposes a new *Earth Alliance* as a vision for the restructuring of international environmental institutions and organizations.

Restructuring the United Nations in the environmental sphere: creating an Earth Alliance

The Council's vision of an *Earth Alliance* to reform the framework of international environmental institutions and organizations builds on existing structures and develops them further as needed. The *Earth Alliance* (Fig. 1b) breaks down into three cross-cutting areas – *Earth Assessment*, *Earth Organization* and *Earth Funding* – to be linked to one another through mutual commitments for information and communication exchange, joint activities and common financing models.

The Advisory Council proposes the establishment of an independent entity to serve as a special authority for the evaluation of environmental problems. The duty of this authority would be to issue timely warnings of environmental risks. This authority, of deliberately limited size, would have certain rights of proposal vis-à-vis scientific panels – some of which are yet to be established – and would be entitled to address the public as needed (*Earth Assessment*).

Further, the Advisory Council recommends changes in the organizational hub of international environmental policy (*Earth Organization*). At the centre are institutional and organizational reforms in international environmental policy: these are already being discussed with an eye to the WSSD. Firstly, the Advisory Council urges improved cooperation among the various organizations and programmes: that is, closer linkage among the secretariats of the international environmental conventions and their scientific panels, which for the most part do not yet even exist. A second step would be to set up a coordinating umbrella organization with its own panels. The uniting of international environmental policy within

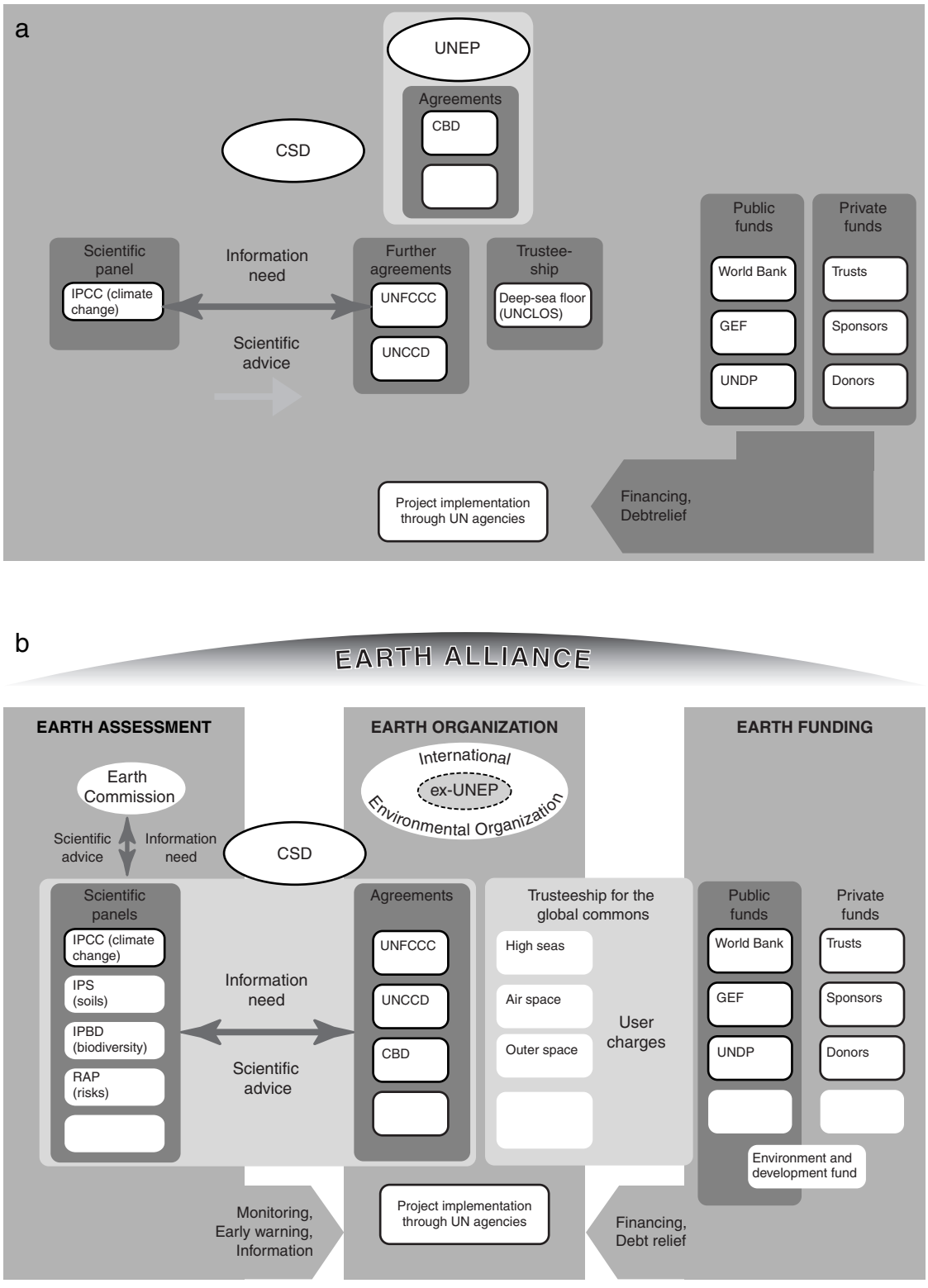

Figure 1
Reform of the United Nations in the field of environment: (a) today's status and (b) vision of a reform.
Source: WBGU

a single, central organization should be considered only if the desired improvements fail to come about.

In addition to legal certainty and good governance, sufficient financial resources are necessary to counter growing global challenges successfully. However, the reluctance of the industrialised countries to provide adequate funding – which has become increasingly entrenched over the years – poses an obstacle to the raising of sufficient funds to protect global environmental resources. In view of this fact, a final section includes recommendations for financing global environmental policy (*Earth Funding*).

The three pillars of the Earth Alliance

Earth assessment: setting up scientific panels and the Earth Commission

Knowledge and knowledge assessment are the keys to risk management. Following the example of the Intergovernmental Panel on Climate Change (IPCC), the Advisory Council recommends the establishment of comparable scientific bodies to advise and support, for example, international soil and biodiversity policy. Recognised scientists could meet together as an Intergovernmental Panel on Biological Diversity (IPBD) or an Intergovernmental Panel on Land and Soils (IPLS) and – working on an independent, on-going basis – could offer advice on scientific policy. In this system, the peer-review process of the IPCC should serve as a model, but not its relatively cumbersome structure. In addition to these sectoral advisory bodies, a Risk Assessment Panel (RAP) might then serve as a network cluster point where the various national surveys and reports on environmental threats can be systematically collected, and global risks identified.

As part of its vision for structural reconfiguration of global environmental and developmental policy, the Advisory Council sees the need for an independent entity with the ethical and intellectual authority to identify and evaluate the problems of global change. The Advisory Council recommends that the Federal Government of Germany reviews the idea of founding an Earth Commission and present corresponding proposals to the United Nations. The Earth Commission should provide the long-term thinking needed to protect the environment and the rights and interests of future generations and also give impulses for research and political action. The Earth Commission – appointed by the UN General Assembly and consisting of 10 to 15 members – should be composed of leading figures who can command the attention of a global audience, roughly as the Brandt or Brundtland Commissions have. The Earth Commission, with its scientific panels, should achieve four accomplishments in particular:

- *An overall perspective:* by employing existing monitoring systems optimally for an accurate assessment of the state of the Earth System.
- *Early warning:* based on current systems and further scientific data and findings, with timely notice to the world's people and particularly the United Nations of impending and potentially irreversible environmental damage.
- *Guard-rails:* guiding international environmental policy towards the prevention of irreparable environmental damage by delineating both transition areas falling within admissible parameters and circumstances that are inadmissible.
- *Reporting:* through an annual report to the General Secretary of the United Nations in which the most important environmental problems and developments are assessed according to the latest scientific information and standards.

In the Council's recommended structure for Earth Assessment, the Commission for Sustainable Development (CSD) would assume an important role in fostering linkage and dialogue among the various countries involved, the UN organizations, the Earth Commission, the scientific community and non-governmental organizations. The Earth Commission could also be accorded a right of proposal for debate within the CSD of topics that, from a scientific point of view, are particularly critical but which have not yet attracted the political attention they merit. The CSD, to whom the major NGOs can present their concerns and proposals for solutions, could also become the forum for discussion of Earth Commission reports, being, as it is in any case, the central forum for environment *and* development issues. This structure would to some degree amount to an international version of the German Council for Sustainable Development.

Earth Organization: upgrading UNEP

As a result of the frequently perceived lack of coordination and effectiveness of global environmental policy, the call for a comprehensive reconfiguration of international institutional and organizational structure has in recent years become audible. The UN Environment Programme (UNEP) has only 530 employees to carry out its global mandate, whereas the German Federal Environmental Agency (UBA), for example, has about 1,050 and the American Environmental Protection Agency (EPA) 18,000. This is why the Advisory Council has supported the founding of an international environmental organization in earl-

ier reports. Prominent European politicians have long lent their support to this idea as well. In view of the wide divergence among the various proposals, however, certain essentials for any restructuring of global environmental institutions must be defined first:

- All initiatives must be multilateral and launched jointly by industrialised and developing countries. The Advisory Council therefore expressly recommends forming coalitions with key developing countries in order to ensure acceptance of a political initiative right from the start.
- North and South should have equal rights in decision-making – the North-South decision-making parity of the Montreal Protocol, the Ozone Fund or the Global Environment Facility (GEF) could serve as a model.
- The reform should not lead to the establishment of an authority with a mandate to implement projects on its own. On-site projects should continue to be carried out by the UNDP, the World Bank, the FAO, UNIDO and similar players.
- The restructuring should not involve the creation of a financing organization in addition to the UNDP, the World Bank or the GEF.

The Advisory Council proposes the restructuring of the existing system in a series of steps. In the process, it is not to be assumed *a priori* that all of the steps be completed, so that in the end the third level is necessarily reached. Instead, in the beginning, only the first level is to be realised and its effectiveness tested: the next step is then to be weighed only if the previous one has not brought about the desired results.

Step 1: Improving cooperation

The first step involves improved cooperation among the various organizations and programmes: partners continue to work together on an equal basis. During this process, the several functions now exercised by the CSD, GEF, the various conferences of the parties, the convention secretariats, and the environmental divisions and programmes of the respective specialised agencies are not to be altered. Possibly UNEP could, even at this point, be assigned a different institutional structure within the UN system. This strengthening of UNEP could be modelled on the World Health Organization – that is, on a UN specialised agency with its own budget and membership – or on the UN Conference on Trade and Development (UNCTAD), as an internal UN entity.

Step 2: Setting up a coordinating umbrella organization with its own, independent panels

If improved cooperation among international organizations and programmes does not eliminate shortcomings within the system, coordination among the players involved should be improved in an effort to strengthen environmental protection. This would necessitate a certain amount of hierarchy within the organizational structure, for which the World Trade Organization (WTO) might serve as a model. Along similar lines, it might be advisable to integrate the various conferences of the parties to international environmental agreements within a framework agreement establishing an international environmental organization. They could then continue to exist as separate and largely independent committees to the ministers' conference, as in the case of the WTO. In all probability, however, the founding of such an umbrella organization will not be accepted by either developing or industrialised countries unless both sides are ensured a clear voice in that organization's further development. Appropriate here would be the application of decision-making procedures based on North-South parity analogous to those of the Montreal Protocol.

Step 3: Centralising and uniting within in a single organization?

The common goal of current proposals for a third step is to centralise and establish a hierarchical order for international environmental policy-making. Decision-making processes should be speeded up by moving beyond the consensus principle and/or by introducing smaller decision-making bodies – an 'environmental security council' for example. Minorities should lose their veto power. Such form of hierarchy, which strongly delimits sovereignty, will certainly encounter considerable resistance in both North and South.

Proposals for good regime design

But in addition to a cross-cutting reform of UN environmental bodies, the numerous sectoral regimes that already exist (e.g., on climate, biological diversity or combatting desertification) can also be optimised. The Advisory Council has evaluated experience from negotiating processes to this end, and has compiled proposals for good regime design.

Using protocols to advance the purposes of framework agreements

Today, the strategy that for the most part prevails is to draw up framework agreements only on broad goals and possible instruments and to leave the concrete terms to further rounds of negotiations, whose results then take the form of protocols that supplement the convention and make it more precise and more strict. The Advisory Council rates this approach as positive, because in this way it is possible to draw into the negotiation process even countries that tend to hold back. In view of the steady intensification of global environmental problems, however, it must be urgently pointed out that the period of time between entering into a convention and actually overcoming the problem on the local level is for the most part too long; this is why protocol negotiation, ratification and implementation must proceed with greater dispatch.

Making voting procedures more flexible

Voting procedures are a decisive factor in flexible regime evolution. The Advisory Council urges that an effort be made in the direction of softening the consensus principle in international negotiations, especially when an irreparable loss of environmental assets may otherwise result. The principle of 'tacit acceptance', especially, should be used more frequently. In modifying protocols or annexes, North-South parity decisions based on qualified majority votes should be promoted, since they are the most likely to gain consensus. Furthermore, in decisions that impact the human heritage as a whole, a modification of the formal principles 'one state, one vote' or in agreements about financial contributions the common practice of 'one dollar, one vote' should be reconsidered in favour of a 'one person, one vote' distribution.

Strengthening the right of access to environmental information and linking it to reporting procedures

In addition to the introduction of more flexible procedures, the way of international compliance control functions is a major criterion for a regime's success. Experience shows that the obligation of member states to report on the fulfilment of their commitments is an indispensible tool for monitoring international compliance. The Advisory Council recommends, however, that these reports be scientifically appraised to maximise their usefulness at the conferences of the parties. The recourse to internationally agreed indicators plays a vital role by increasing comparability and practical use of the reports. Farther ranging rights to access information should also be introduced as needed.

Possibilities of flexible reaction to complications encountered during implementation

Cooperative solutions are an increasingly common reaction to complications arising during implementation, since such solutions – achieved in a spirit of partnership – strengthen both international relationships and transparency for all. Guaranteed instruments to assist compliance that are not attached to any kind of conditions can, however, blunt the motivation to meet one's obligations on one's own hook. And in some instances strict sanctions have helped to eliminate implementation shortcomings. In view of this variance, the Advisory Council rejects any dogged adherence to either confrontational or non-confrontational policies. When complications arise during implementation, the Advisory Council recommends, instead, a flexible approach that is adapted to each individual instance. Existing regional/continental institutions (such as those of ASEAN or the EU) could also play a more active and extensive role in controlling and monitoring compliance with internationally agreed standards.

Integrating non-governmental organizations as partners in environmental protection

Non-governmental organizations (NGOs) provide valuable links on all levels – from local to international – and ensure that social factors are taken into consideration. The participation of environmental associations has proved particularly effective for gathering and distributing information on site and for local implementation of agreements. The Advisory Council therefore supports approaches that integrate NGOs into the implementation process on the basis of their consultative and participatory rights. Voting rights and autonomous decision-making power for NGOs are problematical, however, because of the difficulty of establishing standards for legitimacy in regard to them.

Ensuring that environmental certification systems are fair

World-wide product certification is another activity that is well suited to international non-governmental cooperation for environmental protection. Whether or not international cooperation among enterprises or certification initiatives can make a contribution to the long-term, sustainable use of global resources cannot be determined at present. However, the Advisory Council decidedly perceives in such certification an incentive system that – in addition to international governmental cooperation – must not be neglected. One possibility for managing environmental certification or labelling would be accreditation by

the Earth Commission, which could perhaps supply appropriate criteria.

Earth Funding: increasing efficiency and finding new methods

The Advisory Council recommends three measures for financing global environmental policy which – in addition to a desirable increase in available funds – would lead above all to a more efficient use of these funds: reorganising of both internal and external controlling structures in multilateral institutions, levying utilisation fees for resources belonging to the global community, and stepping up integration of both private and public financing mechanisms.

Making multilateral organizations more efficient

The Advisory Council assumes that in future, the primary instrument for global environment and development policy will continue to be financing of global tasks through appropriations from national budgets. This system offers, significantly, the advantages of direct and regular control by national democratic institutions and constant pressure on money-distributing bodies to demonstrate accountability vis-à-vis such institutions. Numerous international organizations have come under the scrutiny of the national parliaments of OECD countries for non-transparent or less than efficient handling of funds; willingness to provide financial support for UN organizations is waning. On the other hand, the UN organizations point to high acceptance in most developing countries as a result of positive experiences with UN capacity-building performance, in that projects are based on participatory procedures in which each country, whatever its economic strength, has a voice. Within existing multilateral organizations, it should be constantly reviewed to what extent

– the use of funds can be concentrated on a single, narrowly defined environmental problem or whether interplay with other environmental problems must be taken into account as well,
– auditing procedures within the organization are producing incentives for increased efficiency,
– external control might be improved by additional controlling bodies and different consultation procedures,
– lack of efficiency in recipient countries can be overcome by capacity-building measures that integrate local initiatives,
– the time, structural and spatial aspects of the process of adjustment needed to cope with global environmental problems are being taken into account,
– the organization of funds utilisation is geared to the type of environmental protection measures needed (from individual projects on up to comprehensive economic structural reforms).

Levying user charges for global commons

The linking of private market price mechanisms to the use of natural resources is in many instances the decisive factor in conscientious resource management. These mechanisms have their limits, however, due to the non-existence of property rights. Numerous natural assets – such as international air space, the high seas, or space – are 'open-access' resources and as such constitute resources belonging to the global community as a whole. Since it is impossible to put a price on such resources, only placing them within a common global trusteeship can prevent their overexploitation for exclusive use. In the *Earth Funding* system, the levying of user charges for the tapping of such global community resources provides an important alternative to appropriations from government budgets for financing global environment and development policy. The Advisory Council wishes to draw attention in this context to three aspects that are indispensable for the understanding of and terms governing such payments:

- The charges must serve a clear purpose which is directly linked to access to the global commons. A general environmental tax of some kind is not under discussion.
- The decision as to the type, amount and uses of utilisation fees is to be geared to the unique nature of each individual global community resource. In many cases, there can be recourse to existing multilateral or private organizations. It may prove impossible to derive additional revenue from some global resources; however, even in these cases incentives for greater efficiency can be produced through the granting of and trade in individual use rights or emission rights.
- The trusteeship is to be subjected to constant monitoring and approval by individual governments or their designated regulatory bodies.

Strengthening private financing instruments

The Advisory Council has already pointed out a number of times in previous reports the growing significance of the private sector and innovative financing instruments on local and national levels. This element is an important factor for

– taking advantage in individual cases of the familiarity of players with on-site conditions and the corresponding parameters for action,
– using a decentralised and intelligible structure for greater efficiency, which exerts greater competitive pressure in the private sector and among dif-

ferent localities, to the good of global environment and development policy,
– increasing basic motivation by means of more direct access to global environment and development projects.

'Global players' assume a growing role in the use of global resources and sinks. Multinational corporations frequently plan their activities in accord with their own environmental standards; many people in industrialised countries are active in environmental organizations and patronage; and many national and global NGOs are in a position to influence the behaviour of individuals, groups and organizations. It is at precisely the point where government standards do not apply effectively that private initiatives can take over. The Advisory Council recommends support for this process of private acceptance of responsibility – for example, through prizes and awards, centralised purchasing, and targeted awareness-raising.

The Advisory Council rearticulates its call for the creation of institutional framework conditions that can galvanise the private sector and strengthen national, non-commercial funds – e.g., in combination with a world-wide debt-relief initiative. The *Earth Funding* needs competition among a variety of individual, innovative financing schemes, whose respective efficiency will determine how widely they are taken up in other countries, sectors or problem areas. In the combination of the various financing instruments lies a distinct opportunity: the first successful steps toward reform could inspire an openness to financial agreements on specific global community resources – agreements that appear almost utopian today. At the same time, a firm focus must be steadfastly maintained not only on gaining revenue but on the efficient deployment of available financial resources.

Making the most of the World Summit on Sustainable Develepment

The vision of an *Earth Alliance* presented by the Advisory Council cannot be realised in the short run but should serve as a model for a long-term but imperative reform of global environmental policy. In particular, the follow-up conference to the 1992 Rio UN Conference on Environment and Development to take place in 2002 (WSSD) should serve as an opportunity to get some elements of this structural reform underway. As early as 1997, the Federal Republic of Germany spoke out for setting up an international environmental organization. In June 2000, French Prime Minister Lionel Jospin announced the intention to revive debate on an international environmental organization during France's presidency of the EU. The first international Environmental Ministers' Conference in Malmö also highlighted the need for organizational reform of global environmental policy. This auspicious political moment should, in the view of the Advisory Council, be seized, and an initiative launched – possibly by the EU – with Germany and France as forerunners.

Who is steering Spaceship Earth? A

Breathless and fragmented, the world lurches into the new millennium. A transformative process is at work which widens the gap between rich and poor, old and young, religion and science, urban and rural, nature and technology. The overall dynamic, however, is increasingly dominated by a new kind of contradiction, that between globalization and particularization of civil society which is radically transforming the traditional cosmos of economic, social and ecological rifts. This transformation can be categorized as the 'fifth step' in the evolving self-organization of life in the Earth System (Jolly, 1999). Ultimately it will determine our sustainability. The buzzword 'globalization' denotes a process that takes place on four causally linked levels of reality: technology, the economy, culture and the environment.

Technological progress in the 20th century has revolutionized the mobility of people, goods and information. As costs per unit moved fall, higher speeds and greater distances are achieved than ever. 'All is in flux' on this planet, and further acceleration is to come. One example is air transport, where global freight movements double every ten years, and in the year 1998 amounted to almost 100,000 million tonne-kilometres (UNDP, 1998). The number of passengers carried rises by 5–6% annually. According to estimates from the World Tourism Organization, by 2020 it will increase to around 1,600 million. The volume of the world merchant fleet also continues to swell. In 1998 it reached the record level of 531.9 million gross tons (85,828 vessels) compared to only 490.7 million gross tons back in 1995 (Lloyd's Register, 1999).

Beside the real flows of energy and materials, the world's information highways are also steadily gaining in importance. The Internet is one of the key technologies which diffused more swiftly than any other: It took no more than four years for the number of users to reach 50 million – it was 38 years before radio reached a similar audience. The number of servers on the Net has reached 43 million, supporting more than 300 million users (Nua, 2000), and between September 1999 and March 2000 alone these were joined by 100 million new users.

The direct beneficiaries of the real and virtual transport services are *business and industry*, which today organize production, trade and investment on a global scale. As a direct effect, the total value of all exports has almost tripled since 1985 to US$5.5 million million (Statistisches Bundesamt, 1998) which, among other things, means a noticeable increase in the share of exports in gross world product. Not insignificant contributions to these rates of growth came from the modern key sectors of data processing, telecommunications and biotechnology (Brown et al., 1999).

Although the economic significance of Internet-based 'e-commerce' is still comparatively small, virtual market processes are beginning to take the place of material ones. A globalized Internet economy is just around the corner, as the international capital market has demonstrated for some time: in 1993 direct cross-border investments rose by around 40% to US$313,000 million (UNCTAD, 1995), and again in 1998 by 19% to US$400,000 million. The daily global turnover in foreign exchange transactions is now around US$1.5 million million – meaning that volume has grown over the last 30 years by a factor of 83.

The greater part of this growth is due to some 39,000 multinational corporations with over 270,000 subsidiary and participation companies abroad. According to a recent study (Anderson and Cavanaugh, 1996) the turnover of the 200 largest corporations on Earth corresponds to 28.3% of gross world product and, at US$7.1 million million, is greater than the cumulative gross domestic product of all nations on Earth, minus only the nine strongest national economies.

The consequences of globalization

An indirect consequence of global transport, global business and global information is that the Western lifestyle is expanding across borders at lightning speed. The main catalyst for this is the electronic media, with entertainment programmes that have even succeeded in reaching the Stone-Age Dini tribe in Irian Jaya. The Internet, too, will lead to a massive shift in values in many regions. For example, in the Middle East more than 70% of all users are 21–35 years old (Zonis, 2000), an age at which new, previously unknown life expectations and value conceptions can rapidly gain in appeal. The impact of this is that established *cultures* are swamped or simply disintegrate. Worst affected are religions, art forms, handicraft styles and languages, and ultimately also social norms, attitudes and values of all kinds.

A few statistics may illustrate this general observation. Responsible in part for the global mingling of styles is the world trade in art objects and craft products which, according to UNESCO data, reached a volume of over US$200,000 million in 1991 and thus increased threefold in the period from 1980 to 1991. The 'linguistic imperialism' of English and of other national and regional languages favours cultural homogeneity (Beisheim et al., 1999). The German Press Agency not long ago put forward the scenario that in the next hundred years one-third of existing languages will be eliminated, in favour of the dominant national and regional languages. Out of approximately 15,000 languages that probably existed 10,000 years ago – at a time when the Earth's inhabi-

tants numbered around one million people – today around 6,000 remain.

All the globalization processes outlined contribute substantially to changes in the planet's *environment* – by helping to establish a worldwide pattern of civilization based on high consumption and short-term orientation, and by optimizing the cross-border commercial exploitation of the Earth's natural resources. Particular impulses for this expansion always arose when previously inaccessible regions of the world opened up, voluntarily or involuntarily: the end of the Second World War and, more recently, the fall of the Berlin Wall and the subsequent end of the Soviet Union mark such watersheds. The fall of the Iron Curtain gave a turbo-like boost to globalization (Jung, 1999a).

The environmental aspects of globalization which are central from the Council's point of view will receive more detailed attention later on. At this point a few quantitative facts will serve our purpose: despite all efficiency gains, the worldwide transportation of products and commodities is costing more and more energy – in absolute and relative terms. In 1980 transportation accounted for only 37.2% of global energy consumption, in 1996 this ratio was already 48.4% and for 2010 the forecast ratio is 53%. Apart from the high costs, this development causes a critical surge in carbon dioxide emissions and thus contributes to accelerating human-induced global warming. The global character of this is patently clear in that a locally emitted volume element of carbon dioxide spreads throughout the Earth's atmosphere within a week and remains there for up to 200 years.

Another problem of drastic and growing significance is the worldwide release of persistent organic pollutants. The scientific basis justifying acceptable intake criteria for these substances (chemical properties, distribution and decomposition) remains flimsy however: of around 100,000 chemicals on the market prior to 1981 when a more stringent registration regime was introduced in the European Union, 5,000 are produced in considerable quantities and emitted into the environment, but only 300 have so far been evaluated in terms of their environmental chemistry (BUA, 2000). For a range of chlorine compounds (the pesticides HCH, HCB, DDT and some PCBs) it has been shown that global distribution, particularly latitude variation, depends greatly upon physico-chemical properties (Calamari et al., 1991).

The opportunities of globalization

The globalization process was ultimately initiated by the technological impulses of the 19th and 20th centuries, and the ultra-technologies of the 21st century will accelerate it further. Few believe that this development can be restrained, let alone halted, but assessments diverge widely. Nevertheless even now, several direct advantages and disadvantages can be discerned for all those participating, voluntarily or involuntarily, in the round-the-Earth race.

Thus it is entirely undisputed that globalization makes a massive contribution to worldwide economic output. By overcoming physical, administrative and political barriers, there is a tendency to be increasingly able to exploit the comparative advantages of all economic actors and locations on Earth to the full. This means in particular tapping the planet's resources of energies, materials and capacities and hence unleashing all humanity's productive forces at the pace dictated by the 'invisible hand' of the world market. Gross world product has grown more than tenfold since 1970 to some US$29 million (World Bank, 2000b); in view of the future economic growth of 3% expected or hoped for in the industrialized nations, and 8–10% in the developing countries, hundredfold growth could be a reality in a matter of decades.

It is equally undisputed that, overall, this multilayered process considerably raises the fundamental *opportunities* of countless individuals to attain a reasonable quality of life. Security of the basic needs of food, clean water, shelter, clothing, health and mobility is not only achieved economically but also by a multiplicity of cross-border socio-political processes, ranging from routine technology transfer to international humanitarian missions (as recently seen in Mozambique and Ethiopia). An almost equivalent influence is exerted by the possibilities, in a diversely interconnected world, of fulfilling elementary human rights and having a stake in general educational and scientific progress.

Disparities of globalization

What remains disputed, however, is whether the majority of the world population is likely to enjoy the benefits of globalization in the near future, or whether this might even automatically give rise to the emergence of a planetary state of social justice. Even in the powerhouses of globalization, the tiger economies, despite rising profits, inequality seems not to be in decline. The question as to why globalization is linked to greater inequality, especially in developing countries, remains open, in the opinion of the American economist Paul Krugmann (Kaube and Schelkle, 2000). But even given identical starting conditions, the global competition between locations would probably soon lead to major individual and collective disparities in wealth. And there is little comparability among the participants in globalization: for example Silicon Valley in California and the Rift Valley in East Africa belong in two different universes, and not just geographically. It is difficult to

imagine that the first-mentioned location would be prepared to put its development on hold for several decades to let the second location catch up.

This is why we cannot expect that the unbridled search for investment, information and consumption opportunities will somehow automatically iron out the disparities that exist between regions, cultures and social classes (Zook, 2000). Instead this process will further reinforce a series of social gradients, even if the proposition by J. Mazur (Mazur, 2000) that globalization leaves behind dangerous instabilities and growing inequalities and has dramatically increased inequality between and within nations does seem exaggerated. The World Bank arrives at a more differentiated portrayal which includes undeniable blackspots (World Bank, 2000a).

A recent report from the consultancy firm A.T. Kearney reads along the same lines. After all, the disposable capital of the Earth's 200 richest citizens grew between 1994 and 1998 from US$440,000 million to US$1.042 million million; the latter figure corresponds to the current total income of the poorest 41% of the world's population! And 93% of all Internet connections are owned by the wealthiest one-fifth of humankind, whilst the one-fifth with no means has to make do with 0.2% (UNDP, 1998).

The principal reason for this development is the fact that the omnipotent powers of transnational competition to differentiate are not countered by balancing political forces of similar range and impact. To some extent the regime borders defined by today's nation states with their federal substructures form a semi-permeable membrane: almost completely penetrable for the opportunistic dynamism of highly mobile global players, but practically impenetrable for normative forces to protect the competitively weaker factions in regional societies or local populations.

Globalization of environmental crisis

This sceptical assessment applies in more acute form to the problem of nature and environmental protection (Schellnhuber and Pilardeaux, 1999). The historic battle over the conservation of the long-term resource base sustaining human life will largely be fought in the so-called developing countries, where political, technological and economic capacities are generally inadequate to cope with the global environmental crisis.

Over and above the North's moral obligation, the industrial nations cannot remain indifferent to these deficits since the geophysical, biochemical and civilisatory knock-on effects in the Earth System ensure rapid and intense export of the resulting damage. For example the large-scale conversion of particular ecosystems (for instance the tropical or boreal forests) does considerable harm to key stabilizing mechanisms of the biosphere.

Globalization – as already indicated – exercises threefold pressure on the planet's *environment*: firstly, growth in production, services and consumption without development will imply a steady depletion of natural resources and sinks unless a 'green technological revolution' immediately brings about far more efficient resource use and waste disposal on a global scale. Secondly, environmentally harmful patterns of production and consumption and lifestyles are spreading around the globe, while sustainable practices are not. A particular result of this is site-inappropriate management of soils (WBGU, 1995a) and freshwater resources (WBGU, 1998a). Thirdly the multiplicity of national legislative barriers and loopholes often present an opportunity to global players of any provenance to evade ecological standards, for example for emissions and ambient pollution.

This can only result in further deterioration of the already precarious state of the global environment. This at any rate is the prognosis of a comprehensive two-year study recently presented by 175 scientists, which was jointly commissioned by the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), the World Bank and the World Resources Institute (WRI, 2000). This points out that half of the original wetlands and forests on Earth have had to retreat in the 20th century in the face of 'civilization', and that the capacities of the multinational fishing fleets exceed the productivity of the oceans by 40%. But the drastic warning that the conservation of the planet's life-sustaining resources could represent the most difficult challenge ever faced in the history of humankind is unlikely to make much of an impact on the public at large. The current high priority placed on economic growth and increased employment is virtually blinkering us to the dynamic of the ecological crisis that is even now spiralling beyond controllable limits. It is symptomatic that there is only grudging recognition of the mounting evidence of the long-term human impact on the climate system, after many years in which the dispute over scientific proof was stirred up and instrumentalized as an ideological struggle by various interest groups.

In this report the Council will highlight the need for environmental policy action by giving a compact characterization of the six most pressing global problems (Chapter B). The picture presented in that chapter underscores that serious strategies for coping with the problems are difficult to envisage without effective and efficient international institutions. The world market, for example, considerably raises the earning potential of Indian software specialists, but

cannot prevent droughts which will increasingly descend on the subcontinent if global warming continues unabated. The disaster in spring 2000 with water shortages in large areas of western India gives merely a foretaste of what may face the 90% of the rural population in that region that is dependent on deep wells. To avoid or alleviate dramatic climatic consequences of this kind, a worldwide climate protection treaty is needed to set out, implement and enforce major reductions in greenhouse gas emissions, agreed by fast-track decision-making processes if need be.

On track towards 'green global governance'?

But how can powerful and sustainable environmental politics be made to work with the almost 200 sovereign nation states on Earth? This question exposes a fundamental dilemma: *We are setting out to overcome the challenges of the 21st century using structures which, at best, are borrowed from the 19th century* and in no way do justice to the virtual shrinking of the planet. Naturally this dilemma would be resolved by the creation, in parallel with technological-economic globalization, of a worldwide state with homogenous liberal-democratic institutions (somewhat after the model of the USA). However logical it may seem from an environmental perspective to move towards 'Earth Politics' (von Weizsäcker, 1997) with global constitutional and executive structures: it would be a rare politician or scientist today who believed that this vision could be realized in the foreseeable future. This assessment is borne out in the catchy but superficial slogan 'Global *governance* instead of global *government*!'.

In reality the worldwide trend towards political and social particularization, mentioned at the outset, is evident as an antithetical but concomitant trend of globalization: economically motivated attempts at deeper regional integration, for instance in the European Union, contrast with strong efforts for autonomy in many places on Earth, in the Balkans, East Africa or Southeast Asia for instance. This puts the nation state, a democratic derivative of European absolutism, under pressure from without and within, but in the absence of alternatives it grinds along unaltered as the political frame of reference.

The state's inner loss of significance in its current form is driven forward even more powerfully by the rapidly growing autonomy of the individual in an open and integrated world society. With the technological and cultural contraction of the Earth into a quasi-urban space (global village) the characteristics and paradoxes of the metropolis are reproduced on a planetary scale: anonymity induced by close proximity, loss of attachment induced by oversaturation of social valences, short-term orientation induced by overwhelming stimulation, self-organization in specialized ethnic, professional or hedonistic groups by means of hyper-communication. Thus the world citizen rises up as a particle of a superfluid mass with negligible cohesion. The flitting migration of so-called 'high potentials' on the world labour market is only one facet of a realistic vision of the future. Even today, Germany suffers an annual net loss of 20,000 specialist and management personnel in the occupational migration process.

So where are the counter-forces that could prevent the disintegration of the community of nations into globally displaceable social fragments and establish the basis for Earth Politics to define the essential concerns of humankind? The classic answer to this question might be found in the system of institutions and the institutional setting of the United Nations. These are typical products of the post-war period, when the gradual progress in the development of human organization from the League of Nations to the global state had not yet been discredited by the realities. While the process originally intended has almost come to a complete standstill, it has produced a mighty apparatus of bodies, authorities and projects forming a complex network of relationships with an array of more or less independent institutions (World Bank, International Monetary Fund, World Trade Organization, etc). Out of this network, since around 1960 a series of development policy initiatives with very concrete results (e.g. 'green revolution') and environmental policy initiatives (e.g. Agenda 21) have emerged.

On the whole, however, today the public standing of the existing global institutions is at an all-time low: instead of bolstering them up, the talk among many policy strategists is of slimming them down, breaking them up or even abolishing them. This attitude unites the most diverse camps in society, from the ultra-conservative to the deep-ecology fringe of the political spectrum. Accordingly the main criticisms form a vivid melange of sometimes contradictory views. Besides the traditional imputations of inefficiency and incompetence, these institutions are accused *at the same time* of strengthening (or weakening) international regimes, trading off the economy against the environment (or vice versa), intervening too heavy-handedly (or too timidly) in national sovereignty, fostering neo-liberal (or paleosocialist) tendencies, and so on.

The third summit of the World Trade Organization in Seattle at the end of November 1999 and the spring conference of the governors of the International Monetary Fund in Washington in mid-April 2000 acted as magnets for critics from all parties and regions. The mixture of justified concerns, unfounded

mistrust and sheer ignorance was unveiled in the parallel demonstrations, some of them scandalous. This did, however, expose the weaknesses of the structures concerned to the glare of publicity and initiated certain processes of critical reflection among the responsible politicians and administrators. The harsh insider's analysis delivered by the World Bank's former chief economist, Joseph Stiglitz (2000), may have contributed to this by directly or indirectly giving credence to common accusations against the IMF (arrogance, secrecy, lack of preparation and sound objectives for campaigns, neglect of social aspects and democratic checks and balances, etc). But the most that these events have achieved so far are vague proposals for improving the existing structures and processes. The global problems of the environment are barely mentioned in this context, let alone given consideration.

This is a dramatic finding, because the state of the Earth's ecosystem demands swift, concerted international remedies. There are two possible methods of providing institutional support for an appropriate action programme: either reforming the key international organizations and institutions specifically for the purpose, or else creating novel global policy institutions for sustainable decision-making and implementation processes.

Reforming the institutions of global environmental policy

In this report the Council will concentrate on the first approach, which allows palpable successes to be achieved within a reasonable timescale. To this end, the primary issue for investigation is how the existing institutions under the aegis of the United Nations can be used optimally, reinforced suitably and supplemented innovatively (Chapter C).

As part of this, particular attention must be turned to the instrument of the treaty under international law, an instrument that now exists in over 900 manifestations and is represented most significantly and visibly by the treaties on stratospheric ozone, climate, biodiversity and desertification. The associated conferences of the parties are often hampered by consensual decision-making mechanisms, which are not conducive to agreeing the painful but effective measures needed to deal with the core problems of global change. Also, reciprocal coordination of the separate environmental regimes is not taking place (WBGU, 1998a). Unfortunately there is an ever-present danger that, in the competing interests of opportunistic coalitions of nations, the various globally significant ecological assets will be traded off against one other.

The present report takes this as its starting point and, from the analysis of recent international environmental policy, develops ideas for improving the institutional foundation as it pertains to policy-making practice. In Chapter C the Council begins by devising concrete proposals for optimizing the institutions of global environmental policy, from their design through to final monitoring. Among other points the Council discusses,

- how institutions contribute to raising the status of environmental problems in politics *(agenda setting)* (Section C 2);
- how environmental policy negotiations can be improved and accelerated (Section C 3);
- how the implementation of agreements under international law can be guaranteed (Section C 4); and
- how global environmental policy can be advanced by institutional innovation on the national level (Section C 5).

These points are complemented in Section E 3 with ideas for raising and allocating the vital funds, and the Council does not shy away from putting forward innovative methods (such as charges on the use of the global commons).

After these structural proposals, which principally target the aspects of efficiency and budgeting, Chapter E addresses the crucial issue of effectiveness: How will environmental problems on a global scale, as depicted in Chapter B, in fact be solved? In response, the Council suggests a gradual reform of the relevant international network of institutions in its entirety, which in the long term should lead among other things to an 'International Environmental Organization' under the auspices of the UN.

These suggestions are pursued further in Chapter F and embedded within a political vision that takes account of the imperatives and subsidiary conditions of globalization. The concept under discussion here is an organizational structure for international environmental policy resting on three pillars of an *Earth Alliance*: The first pillar represents a coordinated and integrated system for continual analysis and evaluation of the global environment and development situation *(Earth Assessment)*. The second (and central) pillar concentrates and structures all relevant regimes and trusteeships, in particular the central environmental conventions *(Earth Organization)*. The third pillar unites the totality of all financial and other resources for effective Earth System management, in which payment for use of the global commons and precautionary adaptation and compensation funds play an essential role *(Earth Funding)*.

The Council is convinced that there is no sensible alternative to progressing in the multilateral political process towards this vision. However this only partially answers the original question as to who is steering Spaceship Earth (Schellnhuber, 1999). Perhaps in the long term, technological globalization will 'self-

organize' forces to oppose the atomization of civil society. The exponential growth in means of communication, for example, can favour the emergence of (at first) informal mechanisms of tele-democratic opinion forming and decision-making. And the Internet is only an initial quantum leap, heralding a series of qualitative innovations that humankind is about to bring forth. Viewed like this, the transition to the global environmental regime with appropriate international or even supra-national structures is probably just a question of time – and of *being in time*...

The situation: Global environmental trends

B

Syndromes of global change B 1

To an unprecedented degree, globalization is weaving ever tighter webs around the world. Falling frontiers, opening markets, rising mobility and worldwide communication through the Internet and mobile phones are bringing people and regions ever closer. Commodities, news and information from all around the world are accessible almost everywhere and intensify the impression of being part of a global civilization. Nonetheless, there is also a resurgence of national and regional interests, born above all of the unemployment problems prevailing in many countries. One consequence of this has been that, of late, the problems of global change and the messages of the 1992 Rio de Janeiro United Nations Conference on Environment and Development (UNCED) are no longer prominent in the minds of many players in society, politics and the media. However, globalization is intensifying the problems faced by human society and the natural environment, and is exporting them to other regions of the world. It is thus more urgent than ever to face the 'globalized' environmental problems.

To highlight the need to preserve the natural bases of human life and development and to underscore the urgency of the problems, the following Section B 2 initially sets out the six most pressing global environmental problems. The order of presentation implies no ranking, but progresses rather from global phenomena to those which, though more regional in their frame of reference, require globally coordinated countermeasures due to their worldwide ubiquity:

1. Climate change,
2. Global environmental effects of chemicals: Stratospheric ozone depletion and persistent organic pollutants,
3. Oceans at risk,
4. Biodiversity loss and deforestation,
5. Soil and land degradation,
6. Freshwater scarcity and pollution.

Each problem is first characterized briefly. Causes are analysed and the problem-specific need for action identified. This is followed by recommendations for institutional arrangements for prevention, adaptation and mitigation. Section B 2 concludes with a cross-cutting analysis, identifying the common characteristics of the six most pressing environmental problems that are critical to regime formation and institutional solutions.

The causal analysis of the global environmental problems builds mainly upon the syndrome methodology developed by the Council, which classifies prototypical worldwide manifestations of environmental damage and identifies causal patterns (WBGU, 1995a, 1998a, 2001; Table B 1-1).

Syndromes as functional patterns of global change

Regionalized analysis of global change illustrates that in many regions of the world human/environment interactions follow typical patterns. The Council terms these functional patterns of environment use and damage 'syndromes of global change'. They are undesired, characteristic, negative trajectories (or environmental degradation patterns) of natural and civilizational trends and their interplay, which can be identified in many regions of our world. They can be used to reduce the complex global environment and development problematique to a discrete number of syndromes.

The Council distinguishes between three groups of syndromes (Table B 1-1):

1. *'Utilization' syndromes:* Syndromes as a consequence of inappropriate utilization of natural resources as factors of production;
2. *'Development' syndromes:* Human/environment problems resulting from non-sustainable development processes;
3. *'Sink' syndromes:* Environmental degradation due to inappropriate disposal of the effluents of human society.

Each one of these 'clinical profiles of the Earth System' represents a discrete underlying pattern of human-induced environmental degradation. This means that each specific syndrome can – in principle – emerge and develop independently of the others. This is particularly the case where syndromes are characterized by self-reinforcing mechanisms, so-

Table B 1-1
The 16 syndromes of global change.
Source: WBGU

Syndromes	Sources
UTILIZATION SYNDROMES	
Sahel Syndrome: Overcultivation of marginal land.	WBGU, 1997; Petschel-Held et al., 1999; Lüdeke et al., 1999
Overexploitation Syndrome: Overexploitation of natural ecosystems.	WBGU, 2001; Cassel-Gintz and Petschel-Held, 2000
Rural Exodus Syndrome: Environmental degradation caused by abandonment of traditional forms of land use.	WBGU, 1997
Dust Bowl Syndrome: Non-sustainable industrial management of soil and water resources.	WBGU, 1997, 2000a
Katanga Syndrome: Environmental degradation caused by extraction of non-renewable resources.	WBGU, 1997
Mass Tourism Syndrome: Development of and damage to near-natural areas for recreational purposes.	WBGU, 1997
Scorched Earth Syndrome: Environmental degradation through military activities.	WBGU, 1997
DEVELOPMENT SYNDROMES	
Aral Sea Syndrome: Environmental damage caused by large-scale projects aimed at restructuring natural landscapes.	WBGU, 1998a
Green Revolution Syndrome: Environmental degradation caused by the introduction of site-inappropriate farming methods.	WBGU, 1998a; Pilardeaux, 2000b
Asian Tigers Syndrome: Neglect of environmental standards in the course of highly dynamic economic growth.	WBGU, 1997; Block et al., 1997
Favela Syndrome: Environmental degradation caused by uncontrolled urbanization.	WBGU, 1998a
Urban Sprawl Syndrome: Landscape degradation caused by planned urban and infrastructure expansion.	WBGU, 1997
Major Accident Syndrome: Singular anthropogenic environmental disasters with longer-term impacts.	WBGU, 1997
SINK SYNDROMES	
Smokestack Syndrome: Environmental degradation caused by long-range, diffuse dispersal of mostly persistent substances.	WBGU, 1997
Waste Dumping Syndrome: Appropriation of environmental space through the controlled and uncontrolled dumping of wastes.	WBGU, 1997
Contaminated Land Syndrome: Local contamination of environmental assets, mainly at industrial production sites.	WBGU, 1997

called 'loops' or 'vicious circles'. Mass tourism is prototypical: Its consequences make a region increasingly unattractive for tourists, so that they seek new regions or attractions and the typical pattern of the *Mass Tourism Syndrome* spreads further. Moreover, syndromes are often mutually reinforcing, such as the *Rural Exodus* and *Favela* syndromes. If, as in the first syndrome, rural infrastructure and living conditions of rural populations deteriorate due to rural exodus (*Rural Exodus Syndrome*), this at the same time generates further pressure towards migration to the cities (*Favela Syndrome*). The Council's 1996 annual report sets out the syndrome approach in detail (WBGU, 1997). Table B 1-1 lists references to each of the individual syndromes in past reports of the Council, and other sources in which the syndromes are discussed in fuller detail.

Interplay between the environmental problems

The interdisciplinary cross-cutting approach to the causes of global environmental problems using the syndrome-based analysis makes it possible to identify, in Section B 3.1, a number of key factors driving the dynamics of global change. Measures tailored specifically to individual environmental problems can thus be supplemented by approaches tackling the common causes of the problems.

Just as syndromes can reinforce each other, so there is also direct interplay between the global environmental problems. These – mostly reinforcing – interactions are generally given too little attention, because the usual sectoral approach to problems, with the resulting specialization of experts, provides little opportunity or incentive to consider side-effects in other fields. Only an interdisciplinary, integrative approach to the problems of global change will permit analysis of these systemic interactions, which can be highly significant. In Section B 3.2, the WBGU attempts to identify these interactions and to derive recommendations for institutional action for a number of examples. Section B 3.3 then summarizes the consequences of these cross-cutting analyses for the institutional design of global environmental policy.

B 2.1 Climate change

Humankind is in the process of altering the global climate (IPCC, 1996a; Grieser et al., 2000). Anthropogenic greenhouse gas emissions are causing global warming at a rate without precedent over the past 10,000 years (IPCC, 1996a, b). Since the onset of industrialization, atmospheric greenhouse gas concentrations have risen significantly: Carbon dioxide by 30 per cent, methane by 145 per cent and oxides of nitrogen by 15 per cent (IPCC, 1996a). Almost three-quarters of all anthropogenic emissions come from fossil fuel use (e.g. coal, mineral oil or natural gas) and about one-quarter from land-use change, notably as a consequence of the clearing of tropical forests (WBGU, 2000a). This has led since the late 19th century to a mean warming at the Earth's surface of 0.3–0.6°C (IPCC, 1996a), whereby 1998 registered as the warmest year since records began in 1854 (Jones et al., 1999). Clear indications of climatic warming are given by, for instance, the shrinkage of mean sea-ice thickness in the Arctic by approx. 2m within the past 28 years (Johannessen et al., 1999) or widespread coral reef bleaching (Hoegh-Guldberg, 1999).

Volcanic eruptions, which spew considerable amounts of dust and aerosols into the atmosphere, such as Pinatubo in 1991, cause short-term cooling, but this does not alter the longer-term warming trend (Roeckner et al., 1998). Climate models now leave scarcely any doubt that, as a consequence of the forecast doubling of CO_2 levels by 2100, the Earth will warm by a global average of 2°C (EU, 2000); in many regions, this value will probably even be exceeded (IPCC, 1996a). Climate change on this scale would be a severe global environmental problem, for wide-ranging impacts upon ecosystems, human health and economies are to be feared.

The predictive power of present climate models does not suffice to make reliable forecasts, notably of regional climatic changes or the occurrence of extreme events (Lozán et al., 1998). Nonetheless, general statements on the probable consequences of global climate change can be made.

The glaciers in the European Alps have already lost half of their mass, and their retreat will accelerate further (Lozán et al., 1998). As a consequence of the melting of mountain glaciers and the thermal expansion of the upper layers of the oceans, *sea levels* could rise by about 50 cm by the year 2100. This would have severe impacts upon low-lying coastal zones – particularly in developing countries. These zones are home to more than half the world's population, which would then be exposed increasingly to climate-induced environmental risks such as storms, flooding, coastal erosion and salination.

Agriculture is particularly sensitive to climatic changes. Climate change is expected to alter not only temperature distribution but also the distribution of precipitation. This will lead to shifting climatic and vegetation zones, with severe ecological consequences for marine and terrestrial ecosystems in coastal areas, for inappropriately managed agro-ecosystems and for forest ecosystems close to the tree line in high latitudes or in mountain regions (IPCC, 1996b, 1998; Section B 2.4).

Developing countries with arid regions must expect intensified *desertification.* This would affect about 1000 million inhabitants of arid or semi-arid areas. In these regions, economic capacities for adaptation by means of water-resources management or soil improvement are often small, so that many of these countries are already unable to cope with natural climate variability (IPCC, 1998). Due to its bio-geophysical and socio-economic situation, Africa is considered the continent most vulnerable to climatic changes (WBGU, 2001).

As a consequence of the *intensification of the global hydrological cycle*, disparities between arid and moist climatic regions could grow. Seasonal weather can also be expected to change: In Europe, for instance, increased precipitation in winter and more dry days in summer are expected, with a simultaneous increase in the frequency of extreme rainfall events. In general, the frequency of *extreme weather*

events may increase in step with global warming (IPCC, 1996a; WBGU, 2000a).

Due to the largely non-linear dynamics of the climate system, human-induced perturbation may lead not only to gradual changes but also to *sudden dramatic system swings*. These can be triggered by self-reinforcing feedback effects, such as sudden release of large quantities of greenhouse gases from permafrost soils, or by shifts in ocean currents that determine the climate of a region. In the event that greenhouse gas emissions continue to rise, an ocean current (North Atlantic Current) which branches out from the warm Gulf Stream could peter out, for instance, which would have fatal consequences for north-western Europe – the climate there would approach that of Siberia or Canada within a few decades (Rahmstorf, 2000). In its previous reports, the Advisory Council has highlighted the various climatic risks repeatedly and in detail (WBGU, 1996, 1998a, 2000a).

B 2.1.1 Causes

Fossil fuel consumption is continuing to rise and is the prime cause of human-induced climate change (accounting for about three-quarters of emissions, amounting to 6.3±0.6 gigatonnes C per year; IPCC, 2000). The growth rates are caused mainly by industrial structural change, urbanization and growing world trade flows (Table B 2.1-1). Globalization will ultimately intensify these developments, which are both cause and consequence of several syndromes of global change: The *Smokestack Syndrome* (unconsidered disposal of 'effluents' to the atmosphere) or the development syndromes such as the *Urban Sprawl Syndrome* and *Asian Tigers Syndrome* (WBGU, 1997; Table B 1-1). The populations of the burgeoning cities, in particular, are consuming growing amounts of energy and raw materials due to changing lifestyles and rising transport volumes (UNCHS, 1996).

Structural change in agriculture and forestry is a further main cause of climate change, accounting for about a fourth of emissions at approx. 1.6±0.8 gigatonnes C per year (IPCC, 2000; WBGU, 1998b, 2001; Section B 3). The broad-scale clearing of forests (*Overexploitation Syndrome*) and the reclamation of wetlands (followed in both cases by agricultural use; *Green Revolution Syndrome, Dust Bowl Syndrome*) lead, through the associated mineralization of large quantities of biomass (e.g. in fire clearing), to considerable greenhouse gas emissions and at the same time to a reduction of biospheric carbon sinks. The clearing of boreal forests, in particular, can contribute to abrupt and irreversible changes in the climate system, because the climatic conditions impose constraints upon regrowth of these forests, which contributed to stabilizing the climate after the last ice-age. It must be feared that the release of methane from the boreal soils will add to the growing concentrations of atmospheric greenhouse gases.

B 2.1.2 Need for action

The growing anthropogenic greenhouse gas emissions to the atmosphere must be stopped. Global climate policy thus has the challenging task of developing and implementing emissions reduction strategies and measures relating directly to the complex causes of global warming. This calls for international management. The need for environmental policy action appears all the greater when we consider that, despite the intentions declared, the conventions signed and the legislation amended, scarcely any real reductions in greenhouse gas emissions have yet been observed in industrialized countries. This is why a broad majority of climate scientists consider a future increase in the mean global temperature to be highly probable (Wallace, 1999; IPCC, 1996a). It is thus essential that institutional arrangements continue to step up preventive measures. Greater consideration will also need to be given to risk reduction strategies aimed at adaptation to the changes which may already be inevitable and, in particular, at preparedness for more frequent extreme weather events worldwide. This should not, however, be taken to mean that preventive measures should have lower priority.

B 2.1.3 Institutional arrangements

B 2.1.3.1 Prevention

LIMITING EMISSIONS FROM INDUSTRY, HUMAN SETTLEMENTS AND TRANSPORT

The Advisory Council welcomes the emissions limitation and reduction provisions agreed upon in the UN Framework Convention on Climate Change and in the Kyoto Protocol, although a need still remains to give specific shape to such aspects as compliance mechanisms (Section C 4.4.1). Globally agreed emissions quotas and mechanisms for ensuring their compliance would be easier to enforce if the parties to the

Table B 2.1-1
Climate change: Causes, need for action and necessary institutional arrangements.
Source: WBGU

Primary causes	Immediate triggers or effects	Prime need for action	Institutional arrangements
STRUCTURAL CHANGE IN INDUSTRY, URBANIZATION AND MOBILITY *(Smokestack, Urban Sprawl and Asian Tigers syndromes)* • Increasing consumption of fossil fuels • Industrialization • Growing transport volumes • Growing global trade flows • Spread of Western consumption patterns and lifestyles • Common access problem	• Increased concentrations of radiatively active trace gases and aerosols in the atmosphere • Intensified human-induced global warming	• Limit consumption of fossil fuels • Promote climate-friendly patterns of production and consumption • Enhance social acceptance of climate-friendly products, services and measures • Ensure effective emergency response • Secure funding for precautionary measures and measures designed to mitigate effects • Provide compensation for countries affected	• Ratify Kyoto Protocol • Define and implement emission rights trading schemes (with assigned amounts of emissions) • Introduce a qualified majority system for decision-making in the UN FCCC process • Promote internationally coordinated climate-friendly tax and financial policies, and best practices in climate protection • Accelerate technology and management transfer • Promote environmental education • Utilize the potential of insurance schemes for extreme events • Introduce catastrophe bonds • Promote compensatory insurance funds • Improve logistics and organizational structures in international emergency response and national emergency prevention, preparedness and response programmes • Promote technology and knowledge transfer relating to emergency response measures and techniques
LAND-USE INTENSIFICATION AND EXPANSION *(Overexploitation Syndrome, Green Revolution Syndrome)* • Increased food production • Converted natural ecosystems • Decline in traditional farming practices • Increasing consumption of fossil fuels	• Loss of biospheric carbon stocks (e.g. forests, wetlands) • Loss of biospheric carbon sinks • Release of bound methane	• Adapt agricultural and silvicultural practices in an ecologically and socially acceptable manner • Preserve or strengthen sink function (e.g. by stopping destructive exploitation of primary forests)	• Adopt a legally binding instrument on forests • Promote ecologically acceptable reforestation, reward voluntary cessation of use • Establish data bank on appropriate agricultural practices

convention were to establish a qualified majority voting system (Section C 3.6).

The Climate Convention currently embraces 165 parties, but only a few states have yet ratified the Kyoto Protocol. Germany should therefore support or enter into coalitions among parties that might adopt a pioneering role in international climate protection policy, in order to ensure that the overall objective of the convention is met. Inclusion of biological sinks in emissions reduction arrangements is problematic as long as the G-77 has not accepted any reduction commitments and as long as the danger persists of such inclusion creating counterproductive incentives to clear-cut primary forests (WBGU, 1998b).

The Kyoto Protocol's provisions on trading emission rights ('certificates') are promising, but need to be further developed, detailed and implemented. In the opinion of the Advisory Council, limited trade in certificates can be an effective and efficient instrument contributing to meeting emissions quotas because it can contribute to the market-appropriate introduction of measures in regions in which emissions reductions can be implemented cost-effectively. It remains to be examined whether the World Bank comes into question as the body issuing these certificates.

Adapting land use to climate strategies

Because of non-sustainable land-use practices (e.g. conversion of natural ecosystems; Section B 2.4), there is a risk of the biosphere losing its stabilizing, regulating function for the physical and chemical properties of the atmosphere and for the biogeochemical cycles of the Earth (Section B 2.1). The Advisory Council considers it crucial to act to maintain these functions, by stopping the destruction of primary forests and – where ecologically appropriate – pursuing reafforestation (also in its function as carbon sink). As a matter of urgency, negotiations should commence on a legally binding international forest conservation instrument (e.g. a forest protocol under the Biodiversity Convention; WBGU, 2001). The preconditions for offsetting sinks against emissions set out in detail in the Advisory Council's 1998 special report (WBGU, 1998b) need to be observed. For instance, it is essential to prevent the clear-cutting of primary forests with subsequent reafforestation from being credited as a climate protection measure creating new sinks (Section B 3.2.2.1).

B 2.1.3.2 Adaptation

Lack of economic incentives and political attractiveness

The further development of insurance services is an important measure for adaptation to the consequences of climate change. Such services are an effective form of making financial provision for the risks associated with the consequences of extreme climatic events, and can thus at least enhance economic resilience. Introducing mandatory insurance in particularly endangered regions can at the same time provide an economic incentive for risk-reducing construction methods and settlement structures. Under certain conditions, mandatory insurance (or possibly a fund scheme) is therefore recommendable.

To reduce the vulnerability of developing countries to environmental risks, the downward trend in public-sector development cooperation inputs needs to be reversed (Section E 3). In many countries, the necessary improvements in infrastructure and self-help capabilities can only be achieved with external support. Finally, it should be examined to what extent the issuance of catastrophe bonds might be an incentive instrument (Section E 3.2.5).

B 2.1.3.3 Mitigation of effects

Appropriate compensation for countries affected

To provide adequate compensation in the event of damage a compensatory insurance fund could be set up for countries affected directly by climate change, for instance small island states. Such international insurance schemes could function as follows: All countries would pay a premium based on their specific greenhouse gas emissions, from which a reserve could be established that is paid out to a core group of particularly endangered states when climate-related disaster damage occurs and the insured event arises. Premium rates could be designed flexibly in order to provide financial incentives both for measures to reduce potential damage in insured states and measures to reduce causal emissions in individual donor states.

Effective emergency response

The failure of international emergency aid after the flooding in Mozambique in March 2000 demonstrated once again the inadequacy of international emergency management logistics and instruments. No international aid was deployed at all to the eastern Indian region of Orissa, affected six months previously by a hurricane and floods, where 10,000 died. There is an urgent need for permanent rescue strike forces for relief missions; these should be established or expanded at all levels. The German national relief services (Technisches Hilfswerk) could provide a model. International emergency aid needs to be coordinated with the International Strategy for Disaster Reduction (ISDR). National emergency prevention, preparedness and response programmes in developing countries need to be further developed and promoted by strengthening human and institutional capacities (WBGU, 2000a). Furthermore, self-help capabilities should be improved by intensified transfer of technologies and knowledge relating to the emergency response measures and techniques tried and proven in many industrialized countries.

B 2.2 Global environmental effects of chemicals: Stratospheric ozone depletion and persistent organic pollutants

The reduction of stratospheric ozone concentrations counts among the most drastic changes in the atmosphere over the past decades (WBGU, 1994, 1995a). Although ozone (O_3) in the upper layers of the atmosphere has only a comparatively small concen-

tration (max. 10 ppm; Graedel and Crutzen, 1994), it performs a crucial radiation protection function for the biosphere. Ultraviolet (UV) light splits oxygen molecules (O_2) into oxygen atoms, which combine very rapidly with other oxygen molecules to form ozone. Irradiation with ultraviolet light causes the ozone to decompose again. Thus under normal environmental conditions there is a dynamic equilibrium in the stratosphere between ozone formation and depletion with the consequence that the energy-rich UV fractions of incident sunlight are absorbed (Graedel and Crutzen, 1994).

For a few decades now, this equilibrium is being disturbed by halogenated hydrocarbons which do not occur naturally (especially by chlorofluorocarbons, CFCs). One of the great advantages of CFCs in industrial use, namely their nonreactivity and thus nontoxicity in the troposphere, is thus reversed into a disadvantage: Due to their longevity, they rise up into the stratosphere within a few years. Here, at altitudes above 20–25km, solar irradiation is energy-rich enough to split the CFC molecules, releasing chlorine atoms and chlorine monoxide molecules. These are highly effective catalysts of ozone depletion, but are themselves decomposed only slowly. The present rate of chlorine input to the stratosphere is five times that of natural inflows, caused for instance by volcanic eruptions. This ultimately leads to a distinct reduction of the ozone concentration in the stratosphere and thus to intensified irradiation of harmful ultraviolet light (UV-B radiation) at the Earth's surface. This effect is most pronounced over the Antarctic at the end of the austral winter, where, at air temperatures below 193°K, polar stratospheric clouds (PSC) consisting of water ice and nitric acid form, on which, through heterogeneous catalysis, chlorine gas and other halogens are released. After the end of the polar night, photochemical reactions form halogen radicals, which cause ozone depletion.

The human-induced 'ozone hole' at the South Pole was one of the most surprising discoveries of the 1980s. Since then, a steady downward trend in atmospheric ozone levels has been observed, reaching a preliminary low in 1998: A thinning of continental scale formed over the Antarctic. The ozone hole remained stable for almost 100 days – longer than ever observed before. In September 1998, it covered an area of approx. 27.3 million km² (more than twice the area of Europe) and in November still measured a considerable 13 million km² (WMO et al., 1998). Evaluations of images gained by a NASA satellite showed that in 1999 the ozone hole was only slightly smaller than in 1998 (approx. 25 million km² in September 1999; NASA, 1999).

In the North Polar region, a noticeable depletion of the ozone layer was measured for the first time in the winter of 1992–1993, but one cannot speak of an 'ozone hole' comparable to that over the South Pole. However, in 1996–1997 new peak levels of ozone depletion emerged in the northern hemisphere: Ozone reduction reached up to 48 per cent of the average ozone concentration, the reduction even reaching 60 per cent at an altitude of 20km. Recent studies suggest that very warm air currents in the Arctic region are responsible for this (Hansen and Chipperfield, 1998; EC, 2000). Here, too, polar stratospheric clouds are the precondition to ozone depletion. In the winter of 1999–2000, particularly extensive clouds developed and remained over the Arctic for a longer period than in previous winters. Ozone reductions up to 60 per cent occurred again. Researchers of the NASA SOLVE project now presume an additional connection to human-induced global warming. The greenhouse gases emitted by human activities evidently promote increased formation of polar stratospheric clouds. Model computations suggest that tropospheric warming, such as caused by greenhouse gases, may be accompanied by a cooling of the stratosphere, which would further promote ozone depletion.

The reason for the different development of Arctic and Antarctic ozone reduction is the winter atmospheric circulation and extremely low stratospheric winter temperatures at the South Pole. During the austral winter, a vortex isolates the Antarctic stratosphere, preventing atmospheric exchange. As soon as this collapses in the Antarctic spring (November), ozone-bearing air can penetrate again and closes the ozone hole. However, this ozone export also means that the ozone layer over the middle latitudes is becoming increasingly thinner; model computations suggest that it will continue to decline substantially over the next 10–20 years. This trend is in principle reversible. However, due to the longevity of CFCs, despite emission control measures a further 100 years may pass until an ozone hole no longer forms over the Antarctic (Waibel et al., 1999).

The risks posed by mounting ozone loss are diverse and extend far beyond possible direct damage to human health. Scientific studies have examined rising melanoma frequency, impacts upon agricultural production or possible damage to infrastructure and building materials (Tevini, 1993). Scientific understanding of the effects of intensified UV-B radiation upon ecosystems is only rudimentary. Rising UV irradiation, as is to be expected as a consequence of stratospheric ozone depletion, can cause a 5–10 per cent reduction of primary production in Antarctic plankton algae (Smith et al., 1992); however, the intensity of this effect varies among the different algae species **(**Davidson et al., 1996). The

thereby reduced capacity to sequester CO_2 from the atmosphere could contribute to intensifying climate change (Section B 3). On the other hand, ozone depletion has caused a cooling of the lower stratosphere, which may have balanced the effect of other greenhouse gases by 30 per cent since the 1970s (WMO et al., 1998).

If the distinct reduction in ozone concentrations over the Arctic that has been recorded in recent years continues, large parts of Europe and North America could also be impacted. Due to the meteorological conditions, ozone depletion in the north is less marked, but could affect larger ecosystems. Moreover, in the northern hemisphere the amount of people and assets affected – and thus the potential damage – is considerably larger.

B 2.2.1
Causes and need for action

CFCs are non-toxic, non-flammable and simple to handle, which has led to their widespread use in industry and households. They have been and continue to be applied as foaming agents in plastics, as solvents and cleaning agents, propellants in spray cans, and refrigerants in refrigerators or air-conditioning units. Inadequate technology assessment and absent waste management legislation in conjunction with ever shorter life-cycles of products have all contributed to CFC emissions causing massive stratospheric ozone depletion.

The *Smokestack Syndrome* typifies the presumed harmless disposal of volatile effluents by dilution in environmental media (WBGU, 1997). The *Urban Sprawl Syndrome* characterizes similar developments (Table B 1-1). Here the spread of Western patterns of consumption and lifestyles and high levels of substance and energy consumption are important factors. The *Asian Tigers Syndrome* (Block et al., 1997) identifiable in many newly industrializing countries, with the dominant objective of rapid economic structural change in the industrial centres of production, while neglecting necessary environmental standards, is an important causal pattern (Table B 2.2-1).

Many individual states and the international community have already responded to the problem and have adopted national and international regulations designed to prevent the use of ozone-depleting CFCs (e.g. the Montreal Protocol, Sections C 2.2.1 and C 3.2, Box C 4.4-1). As a result, consumption of these substances has dropped from 1.1 million tonnes in 1986 to 160,000 tonnes in 1996, as the industrialized countries no longer produce, use or export these substances (UNEP, 2000). These measures have already impacted upon the total concentration of ozone-depleting substances in the atmosphere: Following the peak in 1994, levels have dropped steadily (WMO et al., 1998). However, the regulations in place do not suffice. For instance, developing countries will also need to stop the production and use of CFCs and other ozone-depleting substances.

B 2.2.2
Institutional arrangements

B 2.2.2.1
Prevention

Designing and implementing precautionary measures

The international ozone regime, whose development has been positive in the past (Sections C 2.2.1; C 3.2), could be jeopardized by the mounting demand for hazardous substances in the populous countries of the developing world. While up into the 1980s the industrialized countries were the main generators of the ozone problem, today it is above all China and India, but also Malaysia and Indonesia. Therefore the Montreal Protocol needs to be reviewed in terms of the permitted maximum quantities, particularly for these countries. Important steps in this direction have been taken by the Beijing Amendment to the Montreal Protocol: For phase-out of CFC production by 2010, China and India will receive financial support from the Multilateral Fund for the implementation of the Montreal Protocol amounting to US$150 million and, respectively, US$82 million. It merits consideration whether the German government should launch a new initiative for accelerated reduction.

To cope with the great amount of new chemical substances and their release, a convention on the management of persistent organic pollutants is to be adopted in 2001. However, at present this only covers the so-called 'dirty dozen' (Box B 2.2-1). In order to be able to identify potentially risky chemicals with regard to their potential environmental damage, the regional convention on air pollution control developed by the UN Economic Commission for Europe (UN/ECE) should be expanded to include new substance classes. International regulations should comprise monitoring and controlling functions in order to be able to monitor production cycles permanently and respond rapidly where necessary. The UN Risk Assessment Panel (WBGU, 2000a) proposed by the Advisory Council could undertake these tasks (Section E 1).

Table B 2.2-1
Global environmental effects of chemicals (stratospheric ozone depletion and persistent organic pollutants): Causes, need for action and necessary institutional arrangements.
Source: WBGU

Primary causes	Immediate triggers or effects	Prime need for action	Institutional arrangements
STRUCTURAL CHANGE IN INDUSTRY, URBANIZATION *(Smokestack, Urban Sprawl and Asian Tigers syndromes)* • Demand for new chemical production substances and their disposal • Industrialization • Growing global trade flows • Spread of Western consumption patterns and lifestyles • Common access problem	• Emissions of ozone-depleting substances • Toxicity through accumulation of POPs	• Substitute ozone-depleting substances and POPs • Close knowledge gaps • Carry out environmental risk assessments worldwide	• Further amend the Montreal Protocol, notably in developing countries • Adopt POPs convention • Establish UN Risk Assessment Panel • Standardize environmental impact assessments internationally • Expand scope of EIA convention to cover new substance classes • Introduce spatial and temporal containment strategies for new substances • Promote international monitoring and controlling of product cycles • Accelerate development of replacement substances • Provide investment incentives for basic and impact research
LAND-USE INTENSIFICATION AND EXPANSION *(Dust Bowl Syndrome, Green Revolution Syndrome)* • Demand for new plant protectants	• Application of persistent biocides	• Substitute persistent biocides	• Provide financial support for substitution processes • Introduce strict export conditions for nationally prohibited POPs • Intensify knowledge and technology transfer in the plant protection sphere • Integrate environmental standards in trade agreements • Promote precautionary measures internationally • Carry out long-term studies (human health, ecological impacts etc.)

SUBSTITUTING HARMFUL SUBSTANCE GROUPS

As persistent organic pollutants can, in the most unfavourable case, have a global extent of damage with irreversible consequences, it is essential to undertake research to develop replacement substances and processes (WBGU, 2000a). For this, the necessary basic research needs to be enhanced through appropriate investment incentives. However, substitutes also need to be assessed in terms of their impacts in other environmental spheres, e.g. global warming, and with regard to extreme environmental conditions.

B 2.2.2.2 Adaptation

IMPACT RESEARCH

In many areas of research on the impacts of stratospheric ozone depletion knowledge gaps still prevail. Concerning human health, for instance, this applies to impacts upon skin diseases and rising incidence of cataracts and skin tumours and the effectiveness of protective measures. Concerning ecosystems, there is insufficient knowledge on impacts upon agriculture and upon food chains in the biosphere, and particularly on the combination with parallel climatic changes. Further long-term studies are necessary in order to receive robust predictions of possible damage.

B 2.2.2.3 Mitigation of effects

Measures of this kind generally only serve damage limitation. However, in view of the high persistency and ubiquity of the problematic substances, it is essential to give preference to precautionary measures. The Advisory Council therefore urgently rec-

Box B 2.2-1

Persistent organic pollutants

The use of persistent organic pollutants (POPs) is associated with risks resulting in a phenomenon similar to the CFC problem (yet one with very different effects). Chemical industry is continually developing new substance classes whose environmental risks – sometimes global – are first recognized only after massive use has occurred (WBGU, 2000a; Table B 2.2-1).

Persistent organic pollutants are artificial organic substances. Due to their toxicity and environmental longevity, they can cause major damage. Of approximately 100,000 xenobiotics, of which 5,000 are produced in considerable amounts and enter the environment, only about 300 substances have been tested thus far in Germany in terms of their potential hazards to human health and the environment (BUA, 2000). The environmental impact of POPs is characterized by great uncertainty in terms of the probability of occurrence and consequences, ubiquitous distribution and a long delay effect (WBGU, 2000a).

Due to their global distribution and effects, 12 substances or substance groups are of particular impor-tance – the so-called 'dirty dozen' (WBGU, 2000a) – which include nine pesticides (aldrin, chlordane, DDT, dieldrin, endrin, hexachlorobenzene, heptachlor, mirex, and toxaphene), the polychlorinated biphenyls (PCBs) and the polychlorinated dibenzo-p-dioxins and polychlorinated dibenzo-p-furans (PCDDs and PCDFs). Altogether, the 'dirty dozen' comprise several hundred individual compounds. The production and use of many of these substances is prohibited in industrialized countries, while some are already banned worldwide.

POPs enter the environment through production or disposal leaks as well as through targeted use and application (e.g. of biocides). Not only are their effects acutely toxic in the environment, but they may also spread across vast distances according to their chemical properties. Even traces of these substances located far from their site of origin can have chronic, toxic effects. Some accumulate in considerable concentrations in the food chain.

Established ecotoxicological testing methods are inadequate, particularly in terms of possible combination effects on individual organisms, effects on the ecosystem as a whole, and coverage of complex environmental processes (Lammel and Pahl, 1998). A foresighted assessment of new substances must keep all relevant system levels in mind, ranging from the toxic effects on individual organisms to those on the global environmental system (WBGU, 2000a). Due to worldwide distribution of the products and their possible environmental consequences, international regulation is necessary. Negotiations on a POPs Convention are expected to conclude in 2001 (Section C 3.3.1).

ommends undertaking initiatives for worldwide education on specific changes in patterns of behaviour and use that can serve to contain hazards. Moreover, there is a need for emergency prevention, preparedness and response instruments for accident-related releases; these should increasingly be implemented in the form of mobile international emergency groups.

B 2.3 Oceans at risk

The threats posed to the oceans and their living resources have continued to mount in recent years. Rising amounts of inorganic and organic substances are discharged into coastal zones through rivers, diffuse coastal sources and atmospheric precipitation. Many of these substances are toxic, accumulate in organisms or impair growth and reproduction. Residues of these substances in the tissue of fish and shellfish pose threats to human health when they are consumed. High inputs of nutrient salts lead to eutrophication of coastal waters and can trigger shifts in the species composition of plankton algae. Rising inputs of suspended matter and sediment particles to coastal zones are jeopardizing coral reefs around the world. The sensitivity of these most species-rich marine habitats to elevated seawater temperatures as a consequence of climate change has already been discussed above (Section B 2.1). Overfishing natural fish stocks can have far-reaching consequences. For large parts of the coastal population, fish is one of the main sources of protein; destructive exploitation of this resource can jeopardize food security.

Land-based inputs, which account for some 80 per cent of total ocean pollution, impair mainly regions close to the coast and shallow water areas. In addition to pollution by residential and industrial wastewater from point and diffuse sources, overfertilized or pesticide-contaminated soils are washed out (GESAMP, 1990). Inputs from port areas can contain residues of antifouling paints, which have an endocrine-disrupting effect or contain high heavy metal concentrations (Goldberg, 1986; Greenpeace, 1999). Soil erosion in coastal zones leads to inputs of suspended matter that can also be severely contaminated (GESAMP, 1990). Despite prohibition of direct dumping of wastes at sea (König, 1997), large amounts of wastes enter the oceans annually through shipping operations, inappropriate landfills, tourism and offshore installations. Some 2.5 million tonnes of oil that enter the marine environment annually from illegal discharges or accidents cause severe damage (Tügel, 1999). To this day, 80 per cent of the world trade fleet still uses residue oils and inefficient motors (CONCAWE, 1997; Corbett et al., 1999), whose flue gases pollute the air. These various sources are joined by the dumping of radioactive waste, which is still per-

missible for military purposes (Tügel, 1999), and legal discharges of irradiated wastewater.

Moreover, shallow water areas are frequently the sites of hydrocarbon deposits (mineral oil and natural gas). These are increasingly being developed in order to extract energy. The resultant environmental problems range from construction interventions in sensitive habitats (drilling platforms) over contamination during extraction operations through to the consequences of accidents (oil spills, fires, destruction of platforms by extreme weather events). Deep sea mining currently plays no major role due to its poor profitability, but could gain importance in the future (Section C 3.3). Estimates suggest that the deep ocean floor holds methane hydrates containing twice as much energy as all other fossil fuel stocks taken together (Hydrates, 2000). The potential hazards posed by the anticipated extraction of these stocks are considerable, as a roughly 160-fold volume of gaseous methane could be released explosively from the frozen gas hydrates (Pietschmann, 1999).

In immediate coastal areas, valuable ecosystems are being destroyed by construction measures or other uses (conversion). This is particularly affecting coastal zones in the tropics, which harbour species-rich and biologically productive biotic communities (coral reefs, mangroves). About 58 per cent of the world's coral reefs are at risk, overexploitation (36 per cent of all reefs) being the main threat (Bryant et al., 1998; WBGU, 2001). This is destroying habitats whose biological diversity is indeed comparable to that of the tropical rainforests (Section B 2.4). Mangroves are also being cleared all around the world, often to make way for aquaculture with high pesticide inputs. It is estimated that more than 50 per cent of all mangroves have already been destroyed today (Spalding et al., 1997).

Particular importance attaches to the overfishing of the oceans: 35 per cent of all fish stocks are overexploited, 25 per cent are fished to full capacity, only 40 per cent of stocks still offer prospects for increased yields (FAO, 1997; WBGU, 2001). In some regions, populations of certain fish species can collapse completely. Moreover, certain fishing methods (e.g. beam trawling, gill netting) decimate the fauna of the sea-floor, and marine mammals and seabirds (WBGU, 2001). In the developing world, the livelihoods of 300–500 million people depend directly or indirectly upon fishing. High population densities in coastal areas lead to a marked intensification of artisanal fisheries and contribute to degradation of coastal and shallow sea areas (BMZ, 1998). Coral reefs are used for fisheries and exploited for jewellery production (corals, sponges). In contrast to the fish species of the high seas, coral fish species are frequently under threat of extinction (BfA, 1999; WBGU, 2001). Overfishing and ecosystem conversion in coastal areas also jeopardize stocks of high-sea fishes whose juvenile development phases take place in coastal biotopes. The discharge of ballast water taken up by ships – together with its flora and fauna – in other regions of the world can lead to the invasion of alien species in coastal areas, which frequently impacts negatively upon local biological diversity (WBGU, 2001).

B 2.3.1 Causes

Several syndromes of global change contribute as prime causal complexes to the degradation of the oceans (Table B 2.3-1). Food production plays a central role. In coastal areas, in particular, food production from the seas has intensified greatly. With a high level of energy consumption and using high-performance technologies, fish stocks are undergoing destructive exploitation in many marine areas. Modern tracking systems, high-technology fishing gear, high engine performances and large on-board refrigeration capacities of fishing vessels leave the fish no chance. These vessels are often referred to as the 'vacuum-cleaners of the seas' (*Overexploitation Syndrome*).

Marine aquaculture generally involves high pesticide and antibiotic inputs. It causes problems stemming from coastal ecosystem conversion, the introduction of alien species and emissions of nutrients and contaminants (*Dust Bowl Syndrome*). As the species reared are predominantly predatory fish, fed with, among other sources, the by-catch of ocean fisheries, by-catch must be included in fisheries balances and allowable catches.

Structural change in agriculture, which plays a crucial role in both the *Dust Bowl Syndrome* and the *Green Revolution Syndrome*, causes considerable marine pollution through inputs of particulates and dissolved substances. Nutrients and biocides, in particular, impair water quality. Intensive agriculture pollutes not only groundwater and river water – the release of gaseous nitrogen compounds as a consequence of overfertilization can also intensify nitrogen loading of the oceans through atmospheric precipitation.

Urbanization and industrialization contribute substantially to air pollution, to localized impairment of the water quality of the oceans and to the conversion of coastal ecosystems. These complexes are characterized by the *Waste Dumping, Asian Tigers, Favela, Urban Sprawl and Smokestack syndromes*. Specifically they involve direct discharges, the dumping of wastes at sea and the anticipated extraction of nat-

Table B 2.3-1
Oceans at risk: Causes, need for action and necessary institutional arrangements.
Source: WBGU

Primary causes	Immediate triggers or effects	Prime need for action	Institutional arrangements
OVEREXPLOITATION OF MARINE FISH STOCKS *(Overexploitation Syndrome)* • Industrialization • Burgeoning megacities • Population growth • Spread of Western consumption patterns and lifestyles	• Overuse of marine ecosystems • Damage to ecosystem structure and function	• Safeguard conservation of marine ecosystems • Design arrangements for sustainable use of the stocks of marine organisms	• Enter into international agreements for allowable catches, fishing techniques, protected zones, moratoriums, monitoring and bans, and introduce sanctions for non-compliance • Establish reliable data on sustainable yields, set up expert panels at the FAO to set allowable annual catches and to designate protected areas • Reduce fleet capacities by winding down subsidies • Partly substitute fisheries operations by environmentally sound aquaculture operations • Designate protected zones for endangered habitats and species
INTENSIFICATION OF THE USE OF COASTAL AREAS (AQUACULTURE) (*Dust Bowl Syndrome, Green Revolution Syndrome)* • Spread of Western consumption patterns and lifestyles • Advances in biotechnology and genetic engineering	• Conversion of natural coastal ecosystems • Water pollution by emissions from intensive aquaculture • Risks posed by release of genetically modified marine organisms	• Design aquaculture in a sustainable fashion	• Develop and implement standards for sustainable aquaculture • Technology and knowledge transfer for sustainable aquaculture
STRUCTURAL CHANGE IN INDUSTRY, URBANIZATION *(Urban Sprawl, Favela, Smokestack, Major Accident, Waste Dumping and Asian Tigers syndromes)* • Industrialization • Burgeoning megacities • Population growth • Spread of Western consumption patterns and lifestyles	• Direct discharges (waste management, dumping, accidents) • Pollutant inputs through atmospheric precipitation and indirect land-based discharges • Damage to ecosystem structure and function	• Reduce pollutant inputs to marine ecosystems • Safeguard watercourse and air quality	• Enforce international agreements for minimum air and water quality standards • Establish, through reporting procedures, a formal record of infringements • Create preconditions for monitoring compliance (e.g. by surveying, evaluating and networking water quality data) • Implement, financially support and promote the transfer of pollution control measures • Provide international support for the cleanup of polluted coastal areas • Designate protected zones for coastal areas, shelf seas and the deep ocean
INTENSIFICATION AND EXPANSION OF AGRICULTURE (*Dust Bowl and Green Revolution syndromes)* • Soil erosion (increase of sediment loading of rivers) • Conversion of natural ecosystems	• Land-based sediment, nutrient and biocide inputs (diffuse sources)	• Reduce pollutant inputs to marine ecosystems • Promote sustainable forms of land use	• Establish regulations for the reduced application or prohibition of chemical fertilizers and pesticides • Promote organic farming systems • Promote adoption of the POPs Convention and link it to the UN FCCC

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Table B 2.3-1 (continued)
Oceans at risk: Causes, need for action and necessary institutional arrangements.
Source: WBGU

Primary causes	Immediate triggers or effects	Prime need for action	Institutional arrangements
GROWTH OF WORLD TRADE FLOWS (*Waste Dumping, Smokestack and Major Accident syndromes*) • Growing volumes of ocean-going shipping • Industrialization	• Human-induced alien species invasions • Pollutant inputs (accidents, illegal and legal discharges)	• Prevent ship-generated pollutant inputs (e.g. dumping, tank flushing) • Improve environmental standards for ships • Reduce accident risks (e.g. tankers)	• Enforce minimum international technical standards for ships (e.g. double hulls for tankers) • Provide better training for ship crews • Link standards to harbour fees and implement strict controls • Only give docking permission if technical standards are complied with • Establish international rapid emergency response groups for accidents

ural resources from the deep ocean. In addition, growing world trade flows and the globalization of markets (structural change in industry) have led to ocean-going shipping gaining prominence, with tonnages mounting from year to year. This gives rise to the danger of marine pollution through waste and oil residue discharges or as a consequence of collisions and accidents (*Major Accident Syndrome*). It also increases the risk of alien species invasions through their transport in ship ballast water.

B 2.3.2 Need for action

Because the greater part of the oceans is a common asset that can be used by all (common access problem), international agreements are indispensable to provide effective protection for the oceans by abating pollution and destructive exploitation (Section C 3.3.2). A further aspect is that pollutants are transported far across national boundaries by the air and ocean currents, so that generators and affected parties are far removed from each other. Here numerous international agreements have already been adopted (e.g. UNCLOS, MARPOL; Section C 3.3), but a need for action remains to further develop these regimes and, in particular, to enforce them. The UNEP regional seas programmes provide promising international approaches, under which institutional environmental policy arrangements are agreed among the coastal states of specific regional seas. However, implementational problems, such as inadequate funding, have meant that enforcement capabilities are still lacking (Section C 3.3).

Above all, fish catches must be controlled strictly, because the setting of and compliance with total allowable catches is an essential precondition to sustainable management of fish stocks. Improving the environmental performance of management practices and technologies in all sectors concerned (industry, shipping, agriculture, fisheries, aquaculture) abates pollutant inputs and can thus considerably reduce the damage to ecosystem function and structure.

B 2.3.3 Institutional arrangements

B 2.3.3.1 Prevention

SETTING AND COMPLYING WITH ALLOWABLE CATCHES AND ESTABLISHING PROTECTED AREAS

Although an array of international agreements and commissions for the conservation of worldwide fish stocks are in place, the overfishing of numerous fishing grounds has not been prevented (Peterson, 1993). Therefore internationally valid rules need to be agreed for the determination of allowable catches and techniques, and for the designation of protected zones, including coastal areas and the deep ocean. Overcapacities of fishing fleets have now been recognized as a principal cause of overfishing; consequently, subsidies for fishing vessels, e.g. within the EU, need to be reduced.

In addition to FAO's monitoring of fish stocks, fishing fleets at sea also need to be monitored. An expert body should be set up at the FAO with the task of setting annual allowable catches and protected areas on the basis of the most important fishing grounds as defined by the FAO and the determination of their degree of overexploitation (fully fished, overfished, depleted, recovering; Beisheim et

al., 1999). Allowable catches should be lower than the maximum yield that would result from the natural annual regeneration of each species, in order to reduce the risk of jeopardizing stocks in the event of unpredictable losses.

Allowable catches do not as yet include by-catch, which can be up to 50 per cent of the total catch and is frequently used for feeding in aquaculture. This by-catch not only reduces fish stocks, it also affects CITES species (e.g. dolphins or turtles) and food availability for commercially utilized fish species. As the by-catch can be used commercially, there is no incentive to reduce it at present.

Ensuring minimum quality of inflowing waters and pollutant concentrations in the air

Intensified efforts need to be made to set and implement minimum air and water quality standards by international agreements in order to safeguard water quality, particularly in near-coast marine areas. Such efforts could be modelled on the acid rain regime, which was designed to abate transboundary air pollution and is generally considered to be successful and effective (Zürn, 1997; WBGU, 2001). In order to provide weaker countries 'help towards self-help', the Advisory Council recommends knowledge and technology transfer of technological and organizational options for reducing emissions and wastewater discharges.

Reducing ship-generated pollution and accident probabilities

The training of ship crews in environment and health protection in on-board operations needs to be intensified. Evidence of such training could be made a precondition for the use of certain near-coast shipping routes and for docking permits, if such a system could be set up internationally in a binding form. In order to reduce the probability and magnitude of damage of ship accidents, there is a need for minimum standards applicable worldwide, particularly for oil tankers (Box B 2.3-1).

B 2.3.3.2 Adaptation

Aquaculture has been introduced increasingly in both sea- and freshwater in order to reduce dependence upon naturally regenerating fish stocks and to mitigate their overfishing. However, the production of 'luxury foods' such as shrimps and salmon, which account for the bulk of marine aquaculture today, cannot solve the food problem of developing countries and is currently associated in most cases with high inputs of fish meal and fish oil, pesticides, the introduction of alien species, destruction of coastal ecosystems and nutrient and pollutant emissions. The Advisory Council notes that it is essential to comply with the rules of environmentally sound manage-

Box B 2.3-1

Double-hulled ships as a precaution against oil pollution

The International Convention for the Prevention of Pollution from Ships (MARPOL) regulates, among other things, requirements upon ships to reduce oil pollution arising from e.g. tanker spills. An important impetus for the Annex I supplement was the Exxon Valdez tanker spill (1989).

Double hull plating for ships, especially for oil tankers, is regarded as a measure that in the future will avoid or greatly reduce oil pollution caused by spills. Alternative designs are possible, but they must be at least equivalent to the double-hull design in terms of their oil outflow potential.

If oil tankers of a specific size are not double-hulled, they may no longer enter harbours in the United States of America after a transition period (USA Oil Pollution Act, 1990). After the Erika oil spill off the coast of Brittany, France demanded stricter international regulations.

According to Germanischer Lloyd, the international classification society headquartered in Hamburg, Germany, a double-hulled tanker design can indeed greatly reduce the risk of oil pollution caused by spills, but in some cases such a design can also contribute to an increase in the risk of a spill:

- Since the steel weight of double-hulled ships should not be greater than that of single-hulled ships, both of the individual hull walls are thinner, i.e. they are, in principle, less resistant to wear.
- The bending strength of the ship's hull is not necessarily increased in a double-hulled ship; the risk of the ship's hull breaking apart is thus not necessarily reduced through double-hulled design (the Erika accident, for example, would not have been prevented).
- Leakage in the oil tank can result in volatile gases seeping into the air space between the hulls if the ship's inner hulls are leaky, which can lead to the risk of explosion there. However, such a risk could be reduced if the air space were filled with an inert gas.
- Corrosion may occur in areas of the double hull that are hidden from sight or that are inaccessible. Such areas are either not discovered or cannot be remedied because of their inaccessibility.

The use of double-hulled ships represents an effective and viable precautionary measure against oil pollution caused by tanker spills. However, through further supplements to MARPOL regulations, it is necessary that structural improvements to double-hulled ship design continue, as well as that the introduction of equivalent or better alternative designs is not prevented.

Source: Payer (personal communication)

ment if the rapidly growing aquaculture industry is to make its contribution to feeding the world (Naylor et al., 2000; WBGU, 2001). Care further needs to be taken that neither by-catch nor commercial fish taken in excess of set allowable catches are processed to feedstuffs for marine aquaculture, as is current practice (Naylor et al., 2000). This practice undermines rules and incentives to minimize by-catch and comply with allowable fish catches. A possible solution to this problem would be to introduce mandatory proof of origin of feedstuffs or corresponding certification (labelling) of the products of aquaculture.

B 2.3.3.3 Mitigation of effects

The possibility of imposing moratoriums or bans should be taken into consideration in cases of non-compliance with prescribed allowable catches or techniques in designated protected areas. Because sanctions and court rulings are hard to enforce in international law, at least formal declarations of infringement should be made through reporting procedures; such reports could be prepared by the FAO (WBGU, 2001).

Polluted coastal areas that cannot be restored by financially weak states themselves should be cleaned up with international support because in such cases a global asset is at risk (this is similar to the freshwater situation, Section B 2.6).

Furthermore, an international emergency group should be established (WBGU, 2000a) that can respond to accidents, notably tanker spills. It needs to be considered whether rather national or transnational groups should be established for the 200-mile zone, and international emergency groups for international waters.

B 2.4 Biodiversity loss and deforestation

The loss of biological diversity in terrestrial and aquatic ecosystems is a global environmental problem. This concerns not only the extinction of species, but also the genetic impoverishment of populations and the restructuring of the biosphere that is taking place through conversion of natural ecosystems into cultural landscapes (these issues are set out in detail in WBGU, 2001). A process of particular relevance in this context is the rapid clearing of primary forests – from tropical rainforests to boreal coniferous forests.

The cause of this problem is the restructuring of the biosphere by humankind. Present species extinction rates are 1,000 to 10,000 times higher than the natural background rate (Barbault and Sastrapradja, 1995; May and Tregonning, 1998). These, however, are only rough estimates, as there are still major gaps in knowledge on biological diversity and the extent of its threats. Thus, for instance, the total number of species on Earth is estimated with the substantial range of 4 to >100 million species (Heywood, 1997). According to – as yet still rough – estimates, there is a risk that about 10–50 per cent of all species are lost worldwide within the next 50 years (WBGU, 1996). This human-induced wave of extinction is so dramatic, even compared to the disasters in geological history, that it has been described quite rightly as 'the sixth extinction' (WBGU, 2001). Among traditional crop varieties, too, there is rapid loss and genetic impoverishment. This is narrowing the genetic base for further development of crop species and is generating wide-ranging risks to food security (FAO, 1996; WBGU, 2001).

As a large part of biological diversity is harboured by tropical forests, the development of deforestation rates is an important indicator of the threat posed to terrestrial biological diversity. In Europe, North America and Northeast Asia, the greater part of deforestation already took place before 1700 – whereby, however, most European tree species escaped extinction. In Southeast Asia and South America, large-scale clearing of primary forests and expansion of agriculturally utilized areas only took place from 1950 onwards. In the period from 1960 to 1990 alone, 15-30 per cent of the tropical forests were destroyed, with high attendant species losses (Bryant et al., 1997). Protected areas, which cover about 5 per cent of the land surface worldwide, are unable to provide adequate protection for biological diversity, as they are mostly too small, are inadequately connected and are insufficiently protected against disturbances (WBGU, 2001). The rising incidence of large-scale forest fires (e.g. in Indonesia and the Amazon region) is posing a growing threat to the remaining forest areas.

Species extinction not only presents fundamental ethical questions. It also jeopardizes the many values that emerge from the use of biological diversity (WBGU, 2001). This concerns not only the material utilization of natural resources such as timber, but also the human experience of nature, and the 'green gold': Genetic resources that are essential to develop, for instance, new medicines or resistant crop species. Moreover, it is still largely unclear which consequences the loss of biological diversity has for ecosystem functions, as these are based on complex and frequently non-linear mechanisms. Over the short term, a part of the immediate ecosystem functions can also be provided with a relatively small number of species

and functional groups (e.g. N_2-fixing organisms). Long-term functionality, however, always remains dependent upon a large species assemblage. What is beyond doubt is that when a species dies out this is an irreversible process. Restoration of species diversity after an extinction event takes many millions of years (Kirchner and Weil, 2000). The clearing of primary forests is also an irreversible process on a human time scale, for regeneration can take thousands of years.

B 2.4.1 Causes

The direct and indirect utilization of natural resources by humankind and the associated land-use changes are the main causes of biodiversity loss and forest destruction (Sala et al., 2000). Structural change in land use plays a pivotal role (*Dust Bowl, Sahel and Green Revolution syndromes*; WBGU, 1997, 1998a). This involves both the intensification of land use and the expansion of agriculture. Natural ecosystems are either converted directly into agricultural lands or their structure and function is impaired by chemical inputs (pesticides, nutrients) or soil degradation. The use of genetically modified organisms in agriculture can generate new risks to biological diversity (WBGU, 2000a). Moreover, the decline of traditional farming practices is leading to dangerous losses of the genetic diversity of crop plants and domesticated animal breeds.

An equally important cause is the destructive exploitation of natural ecosystems, notably forests and marine and coastal ecosystems (*Overexploitation Syndrome*; WBGU, 2001). Failure to take a long-term perspective, uncontrolled access to natural ecosystems (common access problem), inadequate valuation of ecosystem services and, finally, subsidies, policy failure, lobbyism and corruption are leading to the short-term overuse, conversion and fragmentation of natural ecosystems. In the developing world, indebtedness can further drive the substitution of natural ecosystems by cash crops.

The increasing levels of energy and raw material consumption generated by industrial structural change (industrialization, globalization of markets, large-scale engineering projects) further heightens the pressure upon natural resources (*Smokestack and Aral Sea syndromes*). The growth of global trade flows is accelerating the rate of anthropogenic introductions of alien species, which is a further important cause of biodiversity loss (Sandlund et al., 1996; Bright, 1998). Persistent pollutants from industry and agrochemicals also place serious pressures upon natural ecosystems (Section B 2.2). Pressure upon natural resources will continue to rise in future, above all due to population growth, rising aspirations and the spread of Western consumption patterns and lifestyles. In industrialized and developing countries alike, urbanization is an important cause of the loss of ecologically valuable areas to new settlement, commercial and transport uses (*Urban Sprawl, Favela and Mass Tourism syndromes*).

Over the medium and long term, human-induced climatic changes will also have a severe impact upon the biosphere. Mass coral bleaching is already considered to be a consequence of climate change (Section B 2.1). Other animal and plant species, too, will not be able to adapt or migrate quickly enough when climatic zones shift. This is an aspect that needs particular consideration in the future design of the global protected area system.

A basic problem associated with the loss of biological diversity is that many ecosystem services – such as carbon sequestration or flood protection – are not included in economic valuations because they are difficult to express in monetary values. However, according to estimates made by Costanza et al. (1997) these values are substantial. He estimates the value of global ecosystem services and products at US$33 million million per year – almost twice as much as the gross world product.

B 2.4.2 Need for action

To conserve and sustainably use the biosphere (Table B 2.4-1), the integrity of bioregions must be preserved, the long-term regulative functions of the biosphere (e.g. for the climate) must be maintained and the global natural heritage must be conserved (WBGU, 2001).

The system of international institutional arrangements, comprising the Biodiversity Convention and an array of further specific organizations and institutions (WBGU, 2001), does not suffice as a whole to redirect wrong turns in development into sustainable channels. The loss of biological diversity is not only unabated, it is even accelerating. The institutional system therefore needs improvement; proposals for this are set out in the following (Section B 2.4.3; Table B 2.4-1). Each institutional solution needs to do justice to the complexity of the biosphere problem. Complementary, regionally viable approaches need to be integrated that permit use of the diverse biospheric services without jeopardizing them irreversibly.

Decisions on how to manage biological diversity are generally taken on site from the economic perspectives of users, often under conditions of acute

Table B 2.4-1
Biodiversity loss and deforestation: Causes, need for action and necessary institutional arrangements.
Source: WBGU

Primary causes	Immediate triggers or effects	Prime need for action	Institutional arrangements
INTENSIFICATION AND EXPANSION OF AGRICULTURE (*Green Revolution and Sahel syndromes)* • Population growth • Decline of traditional farming practices • Globalization of markets • Rising aspirations, lifestyles • Advances in biotechnology and genetic engineering	• Conversion and fragmentation of natural ecosystems (e.g. tropical forests) • Biogeochemical overload of ecosystems (e.g. POPs, nutrients) • Overexploitation of biological resources • Loss of traditional varieties and breeds • Risks posed by release of genetically modified organisms	• Create protected area networks • Pursue sustainable, multifunctional land use • Integrate nature conservation in land-use concepts • Develop indicators • Stop genetic erosion • Improve consumer information • Create economic alternatives for rural populations in developing countries	• Give shape to CBD provisions (such as Articles 6, 8, 10), e.g. through guidelines or protocols, and implement these nationally • Apply the concept of differentiated land use • Implement bioregional management • Strengthen the MAB programme • Reduce and restructure agricultural subsidies by rewarding ecological services • Safeguard and expand gene banks • Draw up Red List of endangered varieties and breeds • Harmonize the IUPGR with the CBD • Establish IPBD, strengthen biosphere research • Ratify and implement biosafety protocol • Develop and support labelling for sustainable agricultural products
OVEREXPLOITATION OF NATURAL ECOSYSTEMS (*Overexploitation Syndrome)* • Neglect of long-term perspective • Common access problem • Inadequate valuation of ecosystem services • Policy and market failure • International indebtedness • Globalization of markets	• Broad-scale degradation and fragmentation of natural ecosystems (e.g. tropical forests, coastal ecosystems) • Loss of natural substances and active agents	• Preserve or restore the global natural heritage • Conserve the regulative functions and biopotential of the biosphere • Create incentives to conserve natural ecosystems • Strengthen science and education	• Adopt legally binding instrument on forests • Give protected status to 10-20% of the land surface (incl. hotspots), organize and finance global, representative protected area system • Implement CBD provisions – here: financing incremental costs • Modify the law governing foundations • Develop private-sector 'nature sponsorships' • Support labelling systems (e.g. Forest Stewardship Council and Marine Stewardship Council)
STRUCTURAL CHANGE IN INDUSTRY (*Smokestack, Urban Sprawl and Asian Tigers syndromes)* • Industrialization • Globalization of markets • Growth of worldwide trade flows • Implementation of large-scale engineering projects (Aral Sea Syndrome) • Rising aspirations, lifestyles	• Biogeochemical overload of ecosystems (e.g. POPs, nutrients) • Introduction of alien species • Unfair access to genetic resources • Trade in endangered species • Growth of tourism • Low environmental standards as competitive advantage	• Provide safeguards against alien species introductions • Prevent trade in endangered species • Establish fair access to genetic resources • Develop decentralized alternatives to large-scale projects • Ensure market access for companies with high environmental standards	• Amend trade and transport regime – apply guidelines for alien species • Improve CITES monitoring system • Specify CBD's access provisions and transpose into national law • Utilize bioprospecting opportunities • Amend credit award guidelines of World Bank and IMF and for German government-backed Hermes export credit guaranties

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Table B 2.4-1 (continued)
Biodiversity loss and deforestation: Causes, need for action and necessary institutional arrangements.
Source: WBGU

Primary causes	Immediate triggers or effects	Prime need for action	Institutional arrangements
URBANIZATION AND MOBILITY (*Urban Sprawl, Favela and Mass Tourism syndromes)* • Unsustainable settlement forms • Urban sprawl • Rising mobility • Rising aspirations, lifestyles	• Loss of ecologically valuable areas through settlements and transport infrastructure	• Promote sustainable tourism • Harmonize demands upon and conservation of resources • Enforce sustainable land-use planning	• Develop guidelines for sustainable tourism • Apply or develop regulations for sustainable spatial planning and sustainable land use
CLIMATIC CHANGES (*Smokestack Syndrome)* • Rising aspirations, lifestyles • Mobility	• Exacerbation of negative consequences of land use • Overstepping of adaptive capability of natural ecosystems (e.g. coral bleaching)	• Reduce emissions • Preserve natural carbon stocks and sinks • Plan protected area systems in a forward-looking manner	• Implement UNFCCC • Design Kyoto Protocol provisions in a manner promoting biodiversity

market or policy failure. Conservation of biological diversity entails concrete costs, but the benefits of conservation are hard to monetarize, are thus difficult to argue for and frequently only become evident to later generations, whereas the conversion of natural ecosystems promises quick profits. To tackle this problem, institutional solutions need to be found and applied.

B 2.4.3 Institutional arrangements

B 2.4.3.1 Prevention

PROMOTING SUSTAINABLE LAND USE

Sustainable patterns of land use are crucial to solving this global environmental problem. At the local and regional levels, the Advisory Council recommends differentiated, multifunctional land-use concepts (WBGU, 2001) such as bioregional management, permitting on-site integration of conservation and sustainable use. Above all, it is crucial to involve as many of the relevant actors as possible, to elaborate regional indicators and monitoring systems and to create appropriate economic incentive systems (e.g. by reducing and partly diverting agricultural subsidies in a direction that rewards ecological services; WBGU, 2001). Certification schemes involving the labelling of sustainable agricultural products and efforts to integrate environmental education measures can build useful bridges to consumers. The biosphere reserves designated under the MAB programme are promising pilot projects for improved integration of different demands upon the natural environment; greater use should be made of the understandings derived from this programme. Ultimately, all regions, with their various species complements, need to be included in the analysis, for no one can say today which species or which ecosystem function is important for future human use and where it occurs.

SAFEGUARDING BIOLOGICAL RESOURCES, STOPPING GENETIC EROSION

Conserving the diversity of genetic resources for food and agriculture is extremely important for global food security. This is a further reason why it is essential to promote forms of agricultural production that are multifunctional and as diverse as possible (WBGU, 2001). There is a need for an international inventorization and early warning systems for threatened crop varieties and animal breeds, as many traditional varieties and breeds are at risk of being lost irrevocably. Many of the ex-situ collections of rare plant species (gene banks) are themselves at risk. These need to be secured, supplemented and networked globally.

The unresolved legal issues surrounding ex-situ collections and Farmers' Rights need to be clarified and harmonized with the requirements of the Biodiversity Convention. This necessitates a legally binding revision of the International Undertaking on Plant Genetic Resources for Food and Agriculture (IUPGR), possibly as a protocol to the Biodiversity Convention.

Efforts to develop international standards on the use of traditional knowledge and on *access to genetic resources*, their sustainable use and benefit-sharing within the scope of the Biodiversity Convention process should press ahead swiftly; support needs to be given to their national implementation. This offers opportunities not only for the conservation of biological diversity, but also for the natural substances industry.

Enforcing nature conservation worldwide and preventing destructive exploitation

As a 'guard rail' for the biosphere, the Advisory Council has recommended a worldwide representative system of protected areas extending over 10–20 per cent of the world's land surface (WBGU, 2001). This system should both include the 'hotspots' holding a great number of wild species in a small area (Myers et al., 2000), and should represent the diversity of ecosystem types. Furthermore, for global food security it is important to include the 'Vavilov centres of genetic diversity' that hold a large genetic diversity of crop species or their wild relatives (Vavilov, 1926; Hammer, 1998).

Some areas of the biosphere have particular importance because of the functional importance of their ecosystems to the global environment (these include the Atlantic coastal area of Amazonia, the eastern Sahel zone, southern China and Indochina; WBGU, 2001).

New protected areas need to be designated according to ecological criteria, existing areas placed in connection to each other and further developed towards a robust, integrated protected area system that can also follow the anticipated shifts in vegetation zones caused by climate change. Closing the prevailing financing gaps for such a protected area system should not be an impossible task. The corresponding funds could be redirected by reducing and restructuring subsidies, for instance those for agriculture. Biological diversity occurs mainly in developing countries which, in contrast to industrialized countries, do not command over the necessary funds for conservation. This presents the need for compensatory payments for lost use. The Biodiversity Convention already provides for the financial compensation of the agreed full incremental costs, but the funds made available for this are far from sufficient. Conversely, care needs to be taken that development, infrastructure and structural adjustment measures, such as those financed by the IMF or the World Bank, do not countermand efforts to conserve natural ecosystems. Above and beyond governmental or international measures, the commitment of private-sector actors will also be necessary and needs to be promoted, for instance by creating appropriate framework conditions (Section C 3.5). Consequently, current efforts to create a privately operated and tax-exempted biosphere fund should be given political support.

Because forests hold a large proportion of overall biological diversity, a legally binding international forest conservation instrument (e.g. a forest protocol to the Biodiversity Convention; WBGU, 1996, 2001) would be an important milestone for the conservation of biological diversity and would at the same time provide a valuable tool to combat soil degradation and climate change. A further important element of efforts to prevent destructive exploitation is *certification* of the products of sustainable forest management (Section C 3.4).

Making industry, trade and tourism biodiversity-friendly

Within the scope of the Biodiversity Convention, the possibility to establish common standards for the *management of alien species* should be promoted (e.g. a commitment to replace ballast water at sea). As a matter of principle, the parties responsible should be made liable even for the unintended introduction of alien species. The necessary uniform definition of concepts needs to be agreed internationally and harmonized with those applying to the introduction of genetically modified species, as the issues are similar. Under the Washington Convention on *International Trade in Endangered Species* (CITES), the monitoring system needs to be improved through certification and identification methods, and a benefit-sharing mechanism introduced.

In the opinion of the Advisory Council, elaborating *tourism guidelines* within the Biodiversity Convention process would be a step in the right direction. Such guidelines could form an important element of a future overarching international instrument on sustainable tourism.

Closing knowledge gaps

The glaring lack of knowledge is perhaps the most important aspect in the biosphere debate. Not even the order of magnitude of the overall number of species worldwide is known. The available data on the current state of the biosphere and its broad-scale ecosystems (biomes) is inadequate. These knowledge gaps currently impede measures both to conserve and sustainably use biological diversity. Closing them is, among other aspects, a precondition to developing indicators; consequently, corresponding projects deserve support (e.g. the Millennium Ecosystem Assessment; Ayensu et al., 1999). There is further a need for improved organization and clear priorities in international biosphere research. The Advisory Council has previously already called for improve-

ment of scientific policy advice in this sector and has recommended establishing an Intergovernmental Panel on Biological Diversity (IPBD) modelled on the IPCC (WBGU, 2001; Section E 1.3.2).

Improving implementation and international compliance

In recent years, many countries have made considerable progress in elaborating their legislation on the management of biological resources, and have joined international agreements such as CITES, the Biodiversity Convention or the Ramsar Convention. Nonetheless, implementational deficits abound at the local and national levels: Protected areas only exist on paper, programmes of action are non-binding and are not implemented, national reports are not written at all. This indicates a need for more effective international mechanisms by which to ensure compliance (Section C 4). To monitor implementation, it is essential to develop cross-national indicators. Important approaches to improving implementation include promoting the exchange of information (e.g. through the Clearing-house Mechanism), capacity building and environmental education. A further helpful step would be to remove the veto right of individual states in the above-mentioned international convention processes.

B 2.4.3.2
Adaptation and mitigation of effects

In this field, adaptation to and mitigation of effects are not discussed explicitly, because many of the measures set out above promote prevention, adaptation and mitigation at the same time. Moreover, the loss of biological diversity is irreversible: An extinct species or a lost ecosystem type cannot be restored by mitigative measures. Ecosystem restoration only has a basis if sufficient populations of the species or areas of the ecosystem still occur; this aside, for the restoration of broad-scale and complex ecosystems in particular, the knowledge base will presumably be lacking for a long time to come. Specific preconditions to restoration measures include, for instance, the strict conservation of remaining fragments of natural ecosystems, the preservation of indigenous knowledge on nature and the environment and, finally, the establishment of ex-situ collections.

B 2.5
Soil and land degradation

As the Council stated in detail in its 1994 annual report, soil and land degradation is a global problem (WBGU, 1995a). Some 15 per cent of ice-free land areas worldwide show signs of degradation, 15 per cent of which is classified as severe, i.e. soils which are no longer fit for cultivation and only remediable at very great financial expense. 1 per cent of soils have already been irredeemably lost. The majority of soil degradation is classified as slight (38 per cent) or moderate (46 per cent) meaning that either partial agricultural use of such soils is possible, or that such use is severely curtailed. Where soils are moderately degraded, major efforts are necessary to return the affected land to a state in which it can be used to the full. In slightly degraded soils, full productivity can be regained by adopting different soil management. Land showing signs of slight degradation merits special attention because this is where there is scope for reversing the symptoms of degradation. Soil and land degradation affects the developing countries most of all but also ranks among Europe's more serious environmental problems (European Environmental Agency, 1999). In Asia alone, 39 per cent of soils are degraded, followed by Africa (25 per cent), South America (12 per cent), Europe (11 per cent), North America (8 per cent), and the Southwest Pacific (5 per cent). Soil and land degradation is concentrated in the Earth's arid regions and in this context it is also known as 'desertification'. Around 40 per cent of the Earth's land surface is in arid zones, and 70 per cent of these are affected by soil and land degradation (BMZ, 1997). Around 1,200 million people are threatened by desertification and drought, i.e. every sixth human inhabitant of Earth. This direct risk in arid zones was the motivation for ratifying the Convention to Combat Desertification (Sections C 2.4 and C 4.3).

A new study in Asia made it clear that substantially more land area is affected by degradation than the initial collection of data indicated (van Lynden and Oldeman, 1997). The greatest increments in areas affected have been registered in the categories of slight soil degradation (288 per cent) and severe to extreme soil degradation (146 per cent). This augmentation in degraded areas cannot be attributed solely to a rising trend towards degradation, but also reflects the availability of better and more accurate data.

The main types of soil degradation are water and wind erosion, physical degradation through compaction (e.g. mechanization of soil cultivation) and sealing (e.g. road building) as well as degradation though loss of nutrients (e.g. through overexploitation), salination (e.g. defective irrigation), contamination (e.g. overapplication of fertilizer) and acidification. These types lead to longstanding, perhaps permanent disruption to soil functions, or even their complete loss. The use function of soils is their most

important globally relevant function, since soils are a fundamental resource for agricultural production.

In addition, soils also perform significant regulating functions in global biogeochemical cycles. Soils are crucial to the water cycle on the continents, and to the energy balance of the atmosphere; they are sources and sinks for greenhouse gases, stores and transformers of nutrients, and buffers, filters, transformers and stores of pollutants. Soils also have a habitat function because they harbour a high biodiversity of plants, fungi, animals and microorganisms which provide essential support for regulative and production functions in the form of microbial conversion (WBGU, 1995a). Finally soils, as the foundation supporting all other conditions in a given region, also possess a cultural function.

Any impairment of these functions can have serious impacts on humankind's natural resource base. The first of these is the risk to global food security from soil and land degradation. This affects the developing countries in particular, since the vast majority of their inhabitants live directly from agriculture and the loss of this source of income will, in most instances, immediately jeopardize livelihoods. Here, soil and land degradation overlaps with the problem of absolute poverty. Given the current progress of soil and land degradation, in combination with dynamic population growth in the developing countries, food security is liable to worsen due to stagnating or declining production in the foreseeable future (especially in Africa). Soil loss also reduces the soils' sink function for greenhouse gases, thus accelerating climate change. Soil and land degradation alters water cycles because the soils' water storage capacity is greatly reduced. The extent to which the soils' regulating function in global biogeochemical cycles is impaired by degradation remains largely unknown. Finally, soil destruction always means a further loss of biodiversity.

B 2.5.1 Causes

The main causes of global soil and land degradation are overexploitation for agriculture and forestry (deforestation, overgrazing), together with diffuse contamination from fertilizer application and a progressive sealing of soils, especially in industrialized countries (WBGU, 1995a). The main causes of soil and land degradation bear a strong similarity to those of biodiversity loss. The foremost problem is structural change in land use (*Dust Bowl Syndrome, Sahel Syndrome, Green Revolution Syndrome*), especially the intensification of agriculture, rising food production and expansion of the area used for agriculture. Soil degradation is largely the result of inappropriate production techniques, such as poverty-induced over-use (e.g. loss of vegetation cover) or industrial farming (e.g. loss of fertility, salination, contamination).

Industrial agriculture, which is normally highly subsidized, has especially serious consequences: Prime locations are used for monoculture farming, using high inputs of capital, energy and technology to maximize yields (*Dust Bowl Syndrome*). Yet this form of agricultural use is not restricted to industrialized countries; in fact it is also applied in the production of cash crops in developing countries (on the connection between globalization and food security: BMZ, 2000). The *Sahel Syndrome* has quite different underlying causes: Here the foremost problem is the overexploitation of natural resources to safeguard human survival. The degradation of natural ecosystems, particularly worldwide deforestation, also makes soils prone to devastation (*Overexploitation Syndrome*). Likewise, large-scale engineering projects can bring about soil degradation, as demonstrated by the widespread soil salination beside the Aral Sea following the expansion of farming with irrigation (*Aral Sea Syndrome*). Here, increased demand for food but also the necessity for intensive cash-crop production to generate foreign currency earnings are key issues.

Global food security was also the background to the spread of the 'Green Revolution' which was particularly successful in Asia but failed in Africa. Because the Green Revolution demands precise, carefully timed and site-appropriate use of agricultural inputs, in many cases it turned out to be an inappropriate technology with corresponding negative impacts on soils (e.g. salination, contamination, compaction, erosion; WBGU, 1998a). Being a large-scale planned strategy to modernize agriculture with imported agrarian technology on a standard model, it was almost incapable of taking special regional features into account (*Green Revolution Syndrome*).

Land-intensive urbanization is another development contributing, by surface sealing, to the loss of usable agricultural land and the 'disappearance' of soils (*Urban Sprawl Syndrome*). The effects that climate change will have on soils cannot yet be predicted. It is largely unknown how quickly they will adapt to new climatic conditions and what the accompanying socio-economic consequences will be. In the case of progressive global warming, a large-scale thawing of the Siberian permafrost soils is expected. The sudden availability of new agricultural land would be counterbalanced by likely losses of land in the Sahel and an abrupt massive release of the greenhouse gas, methane (Section B 2.1). What is certain is that soil and land degradation will have

Table B 2.5-1
Soil and land degradation: Causes, need for action and necessary institutional arrangements.
Source: WBGU

Primary causes	Immediate triggers or effects	Prime need for action	Institutional arrangements
LAND USE EXPANSION (*Sahel Syndrome, Overexploitation Syndrome)* • Absolute poverty • Threat to food security • Population growth • Common access problem	• Overcultivation of land in marginal locations • Conversion of natural ecosystems	• Improve the knowledge base • Apply multifunctional, location-appropriate land use strategies • Internalize soil protection into prices • Establish security of the law	• Introduce a global soil convention • Establish an Intergovernmental Panel on Land and Soil (IPLS) • Support more balanced distribution of land ownership • Reinforce development cooperation
INTENSIFICATION OF AGRICULTURAL USE (*Dust Bowl-Syndrom, Grüne-Revolution-Syndrom, Aralsee-Syndrom*) • Threat to food security • Increased food production • Globalization of markets	• Non-location-appropriate use • Biogeochemical overloading of ecosystems • Market and policy failure (subsidizing overproduction)	• Promote multifunctional, location-appropriate land use • Encourage market conditions for agricultural production which reflect environmental concerns	• Introduce a global soil convention • Establish an Intergovernmental Panel on Land and Soils (IPLS) • Dismantle agricultural subsidies and allocate released funds to reward ecological services • Support more balanced distribution of land ownership • Apply integrated systems of fertilizer use, irrigation and drainage, mixed cropping and crop rotation, and give incentives for organic farming • Develop location-appropriate crop varieties • Strengthen technology and knowledge transfer for integrated systems
URBANIZATION (*Urban Sprawl, Contaminated Land and Waste Dumping syndromes)* • Mobility • Migration • Lifestyles	• Urban Sprawl • Land sealing, land appropriation • Contamination	• Promote sustainable urban development • Promote awareness of soil	• Reduce land appropriation • Promote 'unsealing' of urban areas • Clean up contaminated sites
CLIMATIC CHANGES (*Smokestack Syndrome)* • Lifestyles • Mobility	• Thawing of permafrost soils and availability of new soils • Increase in soil and land degradation through changes in water cycles	• Improve adaptability of agricultural systems to predictable climatic changes	• Give integrated consideration to climate and soil protection: improve interplay between the conventions • Breed adaptable crop varieties

impacts and repercussions on the climate system, e.g. through a global change in surface albedo or altered evapotranspiration activity.

B 2.5.2 Need for action

The conservation and sustainable use of soils requires a whole package of measures that unite conservation and use interests in the spirit of sustainable development (Table B 2.5-1). Being an insidious process, however, soil and land degradation must be categorized as particularly risk-laden since we can never know the point at which it may lead or contribute to irreversible and critical changes in natural environmental systems. Another especially serious problem is that people fail to perceive soil and land degradation as a risk.

With regard to existing international agreements, which have hitherto related to conservation of soils in arid zones (Section C 4.3), the Council has repeatedly recommended the development of an internationally cross-cutting regime for conservation and

sustainable use of soils (WBGU, 1995a, 2000a, 2001). Development cooperation is needed as much as ever, because environmental and developmental problems are concentrated in the developing countries. But action is also needed in the industrialized countries. In particular, this applies to the need for reform of agricultural subsidies, e.g. in the European Union (WBGU, 2001).

B 2.5.3 Institutional arrangements

B 2.5.3.1 Prevention

Improving the knowledge base

A major problem of international soil policy is the current deficit of knowledge. Admittedly the Global Soil Degradation Database (GLASOD) has been in existence since 1990, when the first scientific global inventorization was carried out, but this work has not been continuously advanced and refined. Also the GLASOD data are mainly qualitative assessments based on expert opinions (Oldeman, 1999). A better mapping of the Asian region has since been completed by the Assessment of the Status of Human-Induced Soil Degradation (ASSOD) project. Thanks to the availability of better and more accurate data it became clear that substantially more land was affected by soil degradation than had been noticed previously (van Lynden and Oldeman, 1997). To gain detailed insight into soil degradation worldwide, the advancement of the Global and National Soil and Terrain Digital Database Program (SOTER) should be supported. The development of SOTER is a cooperative effort of the International Soil Reference and Information Centre (ISRIC), the FAO and UNEP. Over the next 10–15 years, SOTER is expected to result in a global database on soils, soil use and soil degradation (Oldeman, 1999).

In the long term, however, a structure is needed which monitors changing soils as a follow-up to SOTER. There is also an urgent need for advice on the role of biological sinks in the implementation of international environmental regimes, on setting global 'guard rails' for soil and land degradation ('tolerable windows'), and on developing a basic set of global indicators. Hence the Advisory Council recommends the establishment of an Intergovernmental Panel on Land and Soil (IPLS) (Section E 1.3.2). The measures to improve the knowledge base apply particularly to the regime to combat soil and land degradation in arid regions (United Nations Convention to Combat Desertification, UNCCD), where the development of a core set of global indicators and guard rails for soil and land degradation is still outstanding (Section C 4.3).

Forging a global agreement binding under international law

Developments in the follow-up processes since Rio together with new scientific insights have reinforced the Council's belief that it is right to renew its call to create a much-needed global soil convention (WBGU, 1995a, 2001). A series of other institutions have since backed this recommendation (TISC, 1998; SRU, 2000). This aim seems most likely to be attained by extending the Convention to Combat Desertification, for instance by adding new regional annexes (WBGU, 2000a, 2001). However this proposal will only be practicable as and when the interests of the developing countries are adequately taken into account (Pilardeaux, 1999). Such a global soil convention should be built on the cornerstones of technological and scientific advice, compliance control and secure financing (Chapter C).

Implementing national action programmes

Among the central instruments for implementing the aims of the Convention to Combat Desertification are the national action programmes which have been conceived in almost all the affected countries since 1999. It is crucial that the practical implementation of these measures receives financial and technical support from the industrialized nations.

B 2.5.3.2 Adaptation and mitigation of effects

Local adaptation and diversification of national agricultural development policies

In advancing the development of land-use systems the defining principle is never to repeat the mistakes of the past, especially those of the Green Revolution (WBGU, 1998a). Regional adaptation of systems is crucial, in which account should be taken of indigenous knowledge, and mixed cropping systems should be given preference over monocultures. By using an integrated system of fertilizer application, irrigation and drainage with multiple and rotational cropping systems, lasting improvements can be made to soil quality and food security can be enhanced. To address overexploitation due to poverty, the best recipe for improving the situation remains a combination of creating alternative income-generating possibilities and introducing measures for land restoration, together with a package of socio-political measures. Certainly the principle of diversity of use is

not only more resilient against crisis but also less detrimental to soils.

Ensuring the place of climate change in agricultural research

To make agricultural systems more adaptable to the expected climatic changes, the development of suitably adaptable crop varieties by the international agricultural research community is recommended. Bearing in mind that, although the latest modelled predictions anticipate higher global rainfall overall as a result of global warming, lower rainfall is to be expected in arid and semi-arid regions (WBGU, 1998a), further research on the development of drought- and salt-resistant crops is urgently required.

Little prospect of remediation and mitigation of effects

Completely degraded soil is irreplaceable. Moderately and severely degraded soils can only be remediated with great financial and technological commitment. Already about 16 per cent of soils worldwide must be viewed as more or less beyond redemption. All that mitigation measures can achieve is to cushion the socio-economic impacts for those directly affected and to staunch overspill of the problem into neighbouring regions. This is why the emphasis should be placed primarily on preventive and adaptive measures.

B 2.6 Freshwater scarcity and pollution

The freshwater crisis has become more acute in recent years and regional disparities in freshwater supply have become greater (WBGU, 1998a; Gleick, 1998). Today around 1,200 million people live without access to clean drinking water, especially in developing countries (Cosgrove and Rijsberman, 2000). Fifty countries on Earth are already dominated by major water *scarcity* and this might be an aggravating factor in future conflicts over water.

Aside from scarcity, the second central feature of the water crisis is *pollution.* Nutritive salts and contaminants from agriculture and industry impair the utility of inland water bodies and groundwater. Worldwide only around 5 per cent of discharged wastewater undergoes any kind of treatment, and even in the OECD nations one-third of wastewater is not treated (WBGU, 1998a). The vast majority of the burgeoning megacities in developing countries have no wastewater treatment facilities, a fact which also represents a rising burden on the world's oceans (Section B 2.3). To date, where efforts to restore inland water bodies have succeeded, this has happened almost exclusively in industrialized countries.

Freshwater is the most important limiting factor on food production, with *agriculture* already accounting for 70 per cent of global water consumption. To safeguard or increase water yield, over 40,000 dams are operated worldwide. Nevertheless, in many regions on Earth crop failures are already occurring due to inadequate irrigation facilities or wrongly constructed irrigation (WBGU, 1998a; Cosgrove and Rijsberman, 2000).

Risks to health are also on the increase: Some 3,300 million people lack a clean water supply for sanitation. Over 50 per cent of the world population, particularly in emerging economies and developing countries, are affected by water-borne diseases. Every year 3.4 million people die as a result of impurities and germs in their drinking water (WHO, 1999).

The spread and intensification of agriculture is linked to the *destruction of aquatic ecosystems* (wetlands, lakes, watercourses) which frequently harbour a particularly high degree of biological diversity. In Great Britain and The Netherlands 60 per cent of wetland areas have already been lost, and the figure in California is as high as 90 per cent (Finlyason and Moser, 1991; Dahl, 1990). Water pollution and groundwater contamination are of special ecological concern because of major delay effects, and because of their persistency. Many pollutants can accumulate over long periods in aquatic systems before revealing their effects, sometimes only when they combine with other substances. Altogether, the extent and significance of the present freshwater problem may have sown the seed of a global social and economic crisis (WBGU, 1998a).

B 2.6.1 Causes

A key reason for the freshwater crisis in numerous regions is the extremely unequal distribution of freshwater on Earth due to climatic and biogeophysical factors. Water yield is very sensitive to the influence of *climatic changes*, particularly in marginal climatic locations (e.g. in the Sahel zone) so that the freshwater crisis has every potential to become more acute (Section B 2.1).

Freshwater plays such a central role in society that close to every syndrome of global change contributes causally to the water crisis (Table B 2.6-1). With regard to land use, the *Dust Bowl*, *Green Revolution* and *Aral Sea syndromes* are the most significant. But the *Favela* and *Urban Sprawl syndromes* centring on cities, and their interplay with the *Waste Dumping*

and *Contaminated Land syndromes,* play an equally critical role in the complex web of causality of the freshwater crisis (WBGU, 1998a).

Structural change in agriculture is a substantial driving force of water scarcity. The rise in farming with irrigation – growing produce for export to earn foreign currencies (cash crops) or basic foodstuffs in response to population growth – accounts for a considerable proportion of the worldwide rise in water consumption. The farming of location-inappropriate crops can result in an arid country 'exporting' its scarce water in the agricultural produce, thus undermining local water supply (e.g. citrus fruit production in Israel; Falkenmark and Wildstrand, 1992). Increased meat consumption is responsible for a further rise in the water requirements for food production. In comparison to purely vegetable-based foods, a diet which contains only 20 per cent meat leads to a doubling of agricultural water requirements (Klohn and Appelgren, 1998). Large-scale engineering projects (e.g. dams; *Aral Sea Syndrome*) are intended to help to cover the increased demand for water, but are frequently associated with social rifts (e.g. through resettlement programmes) and create other ecological problems (McCully, 1996; WCD, 1999). The intensification of farming leads to nitrogen loading of groundwater and surface water, reducing its suitability as drinking water due to excessive nitrate concentrations. Added to this are the biocides which may or may not accumulate in the food chain.

At the same time, lifestyle shifts in the wake of urbanization and industrialization are leading to increased consumption and pollution of freshwater. As a consequence of urbanization, yields of usable water are falling due to surface sealing. Rising aspirations and the spread of Western consumption patterns and lifestyles are driving forward structural transformation in industry and the higher consumption of energy and raw materials also gives rise to a greater demand for water (e.g. *Asian Tigers Syndrome*). Nutrient and pollutant inputs from insufficiently purified domestic and industrial effluents lead to rapid eutrophication and pollutant accumulation in the aquatic environment (especially as a result of the *Favela Syndrome*). The subsidization or even free provision of freshwater can contribute to careless and wasteful water management, yet at the same time it is indispensable to ensure the basic supply needed by the lowest-income groups. Poor efficiency of the water supply system and of water use restricts the availability of the scarce resource of freshwater. In many cities, leaking pipes and illegal tapping of water supplies cause losses of 20–50 per cent (Zehnder et al., 1997).

B 2.6.2 Need for action

When only the freshwater problems in Central and Western Europe and North America are considered, the situation is far from constituting a global environmental problem. Yet in many other regions on Earth there is a considerable need for action in response to water scarcity and pollution. Overall the analysis shows that the freshwater crisis that is mounting worldwide will become more acute in future. Therefore an immediate political response is needed, to lower the risks and achieve a reversal of the trend.

The guiding vision for freshwater management developed by the Council in its 1997 annual report points the way: *Maximizing efficiency while taking into consideration the imperatives of equity and sustainability*. Based on this vision the Council has developed approaches for solving the water crisis in specific policy areas (WBGU, 1998a).

Implementing the guiding vision and the guardrail approach necessitates a *global strategy*, the essential elements of which are outlined here. Each particular cause and associated trend is listed in Table B 2.6-1 along with detailed proposals for the institutional action required. Priority should be given to prevention.

B 2.6.3 Institutional arrangements

B 2.6.3.1 Prevention

THE RIGHT TO WATER

The German federal government should take an active role in the worldwide enforcement of a right to water. In this process, the primary concern is to ensure that the technical preconditions are met for free access to water supplies in all countries – in compliance with the minimum standards for water quality set out by the World Health Organization (WHO). A (regionally determined) minimum per capita supply of water must be guaranteed across the board for the lowest-income social groups in every country. This should take place by providing 'water assistance' payments (analogous to housing assistance in Germany) or using an appropriate tariff structure, i.e. charging the quantity of water established as the minimum individual consumption at low-cost tariffs.

Table B 2.6-1
Freshwater scarcity and pollution: Causes, need for action and necessary institutional arrangements.
Source: WBGU

Primary causes	Immediate triggers or effects	Prime need for action	Institutional arrangements
LAND-USE INTENSIFICATION AND EXPANSION (*Green Revolution, Dust Bowl, Sahel and Aral Sea syndromes)* • Increased food production • Production of cash crops • Exploitation of marginal land • Market and policy failure (subsidization) • International debt	• Increased water consumption and change in local water balance • Expansion of irrigation, large-scale engineering projects • Pollution of groundwater and surface water with nutrients and biocides	• Promote sustainable, location-appropriate forms of land use • Only carry out large-scale projects which remain within environmental and social guard rails • Improve the efficiency of irrigation technology • Transfer water-intensive production to countries with an adequate water availability	• Promote organic agriculture and labelling systems • Take greater account of water-related standards in development projects (e.g. World Bank) • Promote breeding of salt- and drought-resistant crop varieties, and deploy new technologies for water-saving land use • Promote technology and knowledge transfer relating to effective and efficient (including traditional) irrigation systems • Enforce regulations to reduce or ban utilization of agrochemicals
STRUCTURAL CHANGE IN INDUSTRY (*Green Revolution, Katanga, Waste Dumping and Asian Tigers syndromes)* • Rising aspirations, lifestyles • Industrialization • Market and policy failure • Globalization of markets	• Failure of water prices to reflect scarcity of water resources • Contamination of water resources	• Improve efficiency of use • Ensure minimum water quality • Organize water management on transparent and participatory principles • Avoid interventions which distort the market	• Institutionalize water markets • Develop, apply and transfer appropriate water supply technologies • Promote and implement pollution control technology for residential and industrial wastewater • Agree minimum international standards for freshwater quality (e.g. drinking water, irrigation) • Dismantle subsidies for water supply and wastewater management • Strengthen environmental education on the water problematique • Extend research and development projects on seawater desalination
URBANIZATION AND MOBILITY (*Favela, Urban Sprawl and Mass Tourism syndromes)* • Rising aspirations, lifestyles • Population growth • Growth in socio-economic disparities, poverty • Unsustainable forms of settlement • Sprawl • Increase in tourism • Increase in mobility	• Lowering of the groundwater table • Contamination of surface waters and groundwater with nutrients and pollutants	• Secure basic supply of drinking water • Introduce transparent and participatory water management in River Basin Districts	• Guarantee the 'human right to water' • Introduce World Water Charter and World Water Fund • Support poor groups in society financially to safeguard their drinking water supply • Establish early warning of epidemics (e.g. networking of health authorities) • Apply River Basin Management • For cross-border waters, deploy transnational commissions and dispute settlement mechanisms • Improve global monitoring of freshwater resources and ecosystems • Promote clean-up of polluted surface waters and groundwater

World Water Charter and Global Action Programme

In its 1997 annual report, the Council recommended the initiation of a 'World Water Charter' which all governments, municipalities, international organizations and non-governmental organizations would have the option of signing (WBGU, 1998a). The nature of this agreement is a global code of conduct, politically committing all the players to overcoming the freshwater crisis. Building on this, a 'Global Plan of Action' should be developed to flesh out and implement the agreed principles. The recommendations of the 2nd World Water Forum are along the same lines.

Global Water Fund

All opportunities for reducing the debt-servicing burden on developing countries threatened by water crisis should be exploited, not neglecting to examine possibilities for links with water policy programmes. The establishment of a Global Water Fund replenished via robust international financing mechanisms (e.g. by levying a World Water Penny) should also be explored.

Basic needs and water markets

Reliable and efficiently operated systems of water supply and disposal must be established; on the one hand, these systems should set water prices which reflect the scarcity of water resources while, on the other hand, safeguarding the right to sufficient water to meet basic needs and fulfilling minimum environmental standards. The best approach is the introduction of water markets based on competition, and of property rights to water supply and treatment systems (WBGU, 1998a). Decentralized supply structures and arrangements should be given preference since they are generally more efficient, easier for those concerned to comprehend and better adapted to particular regional characteristics than rigid central solutions. However, governmental competence for putting the framework conditions in place and overseeing progress must be assured. The coordination of water resources should be organized to coincide with the relevant catchment areas or river basins. The concept of integrated river basin management forms a suitable framework for this process.

Development cooperation

Governments affected or threatened by water crisis must receive better support. Specific needs centre on the modernization of existing irrigation systems in agriculture, the rehabilitation and extension of water supply networks and the establishment or continued development of drinking water supply, wastewater disposal and recycling systems. It is important to transfer technology and expertise to guarantee socio-cultural and ecological water standards, especially for regions affected by water crisis and for the protection of world natural heritage; methods should place special emphasis on water conservation, environmentally and culturally sound practices, and appropriateness to the particular location.

Monitoring and early warning

There is a lack of monitoring capacity for controlling water quality in freshwater ecosystems. Existing monitoring systems should be examined for suitability and applicability in developing countries and emerging economies, and their installation should be promoted with organizational support and capacity building. Furthermore a European and global network is required which integrates national health authorities and international forums such as the Centers for Disease Control and Prevention (CDC) and the WHO, in order to build up an international early warning system for epidemic risks and for better management of epidemics.

Use and protection of cross-border waters

In the case of cross-border bodies of water, transnational agreements can be useful with permanent commissions responsible for the management of freshwater issues throughout the catchment area. The International Joint Commission in the border waters regime between the USA and Canada may serve as one example (Section C 4.2).

Avoiding conflict

Many international conflicts are rooted in unequal use of water resources by upstream and downstream riparians of rivers. Pilot projects on balanced use of cross-border rivers should be promoted, international mediators should be provided for settling such conflicts, and compliance with equity principles should be included as a criteria for development cooperation.

Education measures

The participation of all actors in water management decisions should be accompanied by education and training measures. These education measures should communicate the connections between water, health and the environment. Traditions, ways of life, the role expectations of the people concerned and, most importantly, their potential for self-help must be integrated into programmes tackling local water problems.

B 2.6.3.2 Adaptation

Water conservation

An effective reduction of water consumption can only be attained by exploiting all potential savings to the full (irrigation technology, wastewater and rainwater use, farming of location-appropriate crops, water recycling, public education). Techniques and procedures for recycling residential or industrial wastewater and for multiple use of non-potable water and rainwater should be improved and supported by means of appropriate research, pilot projects and knowledge and technology transfer.

Irrigated farming

In agriculture, effective traditional irrigation techniques should be promoted (e.g. subak irrigation in Bali). The deployment of new technologies and the farming of salt-tolerant crops or those adapted to water scarcity can help to save water. However the risks of biotechnological procedures should be borne in mind (WBGU, 1998a). Water-intensive production in agriculture and industry should be shifted where possible to countries with sufficient water availability, something that could be achieved by economic incentive systems and cost-covering water prices, for example. The construction of major hydraulic engineering projects (e.g. large dams) should only be given financial support after careful consideration of the social and ecological consequences.

B 2.6.3.3 Mitigation of effects

The rehabilitation of degraded freshwater resources is considerably more expensive and less effective than appropriate preventive measures. Nevertheless, in individual cases it will have to be supported with national or multilateral financing. A further option for mitigation of effects is seawater desalination, but because of the extremely high energy consumption involved, at present this can only be a feasible route in exceptional cases and in regions with sufficient renewable primary energy sources.

B 2.7 Regime-relevant attributes of global environmental problems

The cause-and-effect structures of global environmental problems have very different attributes – these are of major importance to the institutional design of environmental policy. Thus, for instance, once the scientific linkages are known, a monocausal problem can be solved at its root by targeted technical modifications to the political or economic system, whereas quite a different approach is required for a multicausal problem in which the cause-and-effect relationships are particularly complex.

There are many general attributes that are of great significance in the consideration of all global environmental problems, e.g. the major differences between North and South in terms of economic performance and biogeophysical makeup. Similarly, all environmental problems display, to differing degrees, some spatial segregation between problem-generating parties and damaged parties. This is best illustrated by climate change, which can be expected to affect small island states most although these have contributed least to its causation. However, environmental problems with more regional or local modes of manifestation usually also have a global component of causation, for instance through global economic conditions (world trade order). Socio-economic disparities between those generating environmental problems and those affected by them are a further important basic characteristic in which global environmental problems differ, as are disparities in financial and technological capabilities for coping, adaptation and prevention. These general factors play an important role in the design of regimes for dealing with such problems.

There are several further attributes that stem from problem-specific and societal constellations and are fundamental to the design of solutions. The following presentation concentrates on the specific attributes which especially distinguish environmental problems from one another, and to which regimes geared to dealing with these problems must give particular attention. The discussion of important attributes and associated key issues makes no claim to being exhaustive (Table B 2.7-1; WBGU, 2000a).

- *Causality:* Is the environmental problem essentially attributable to a clearly definable primary cause? Are simple technical solutions to this conceivable? Depletion of the stratospheric ozone layer, for instance, is caused above all by anthropogenic CFC emissions, for which harmless substitutes are already available. The causes of biodiversity loss are so diverse and dependent upon such disparate factors that a simple technical fix is out of the question; instead, regionally appropriate strategies need to be found. The easier it is to identify and gain an overview of causal patterns, the easier it is to operate a global regime successfully.
- *System complexity:* How complex is the causal web of the system? Must nonlinearities or sudden system swings be feared – perhaps even at the global level? The climate system, for instance, is

Table B 2.7-1
Regime-relevant attributes of global environmental problems.
Source: WBGU

	Causality	System complexity	Uncertainty	Common access	Spatial disparity	Temporal disparity (delay)	Irreversibility, persistency
Climate change	Monocausal (greenhouses gases)	Very high complexity, non-linearities, sudden system swings possible	Modelling and indicator definition possible, system knowledge still inadequate	Common access problem	Cause-and-effect pattern distributed globally (North-South problem)	Time lag of decades between emissions and climate impacts	Irreversible by human standards; millennia
Stratospheric ozone depletion	Monocausal (CFCs)	Manageable complexity of effects and measures	Modelling and indicator definition possible, still knowledge gaps in some details	Common access problem	Cause-and-effect pattern distributed globally (North-South problem)	Short time lag, a few years	High persistency of CFCs, but essentially reversible within decades
Oceans at risk	Multicausal	High complexity of effects, sudden swings are conceivable	Inadequate monitoring of water quality and of some fish stocks	Common access problem	Ubiquitous; cause-and-effect pattern distributed globally	Major time lags in some aspects	Fish stocks: years to decades; pollution: decades or longer
Biodiversity loss and deforestation	Multicausal	Very high complexity, non-linearities, sudden system swings possible	Basic knowledge and data inadequate, indicator definition and modelling scarcely developed	Property rights hard to define in some instances, common access problem for genetic resources in some cases	Causes and effects linked across all spatial levels, extremely uneven global distribution (North-South problem)	For ecosystem conversion slight time lag, for individual species up to decades	Species extinction is irreversible, success of ecosystem restoration uncertain
Soil degradation	Multicausal	High complexity of effects and measures, no sudden swings	Indicator definition possible, quality of global data sets still inadequate	Property rights definable	Cause-and-effect patterns essentially regional, but influenced by global trade, globally very uneven distribution	Time lag is short, a few years	Depending upon type partly reversible (decades), frequently irreversible (millennia)
Freshwater scarcity and pollution	Multicausal	Manageable complexity of effects and measures, no sudden swings	Modelling and indicator definition possible, quality of global data sets still inadequate	Property rights often not socially accepted, therefore common access problem	Cause-and-effect patterns regional (catchment areas), extremely uneven global distribution	Short time lag	Generally reversible within years or decades if appropriate measures taken

characterized by highly complex and nonlinear cause-and-effect mechanisms that are not yet understood satisfactorily and are of a fundamentally global nature. There is a risk of sudden system swings with wide-ranging consequences, for instance in the form of shifts of ocean currents (Section B 2.1). Complex consequences cannot be broken down into impact chains subject to individual influence, which might then be tackled independently from each other. Such a problem must be solved in its entirety – this complicates regime negotiation and adaptation. Addressing nonlinear systems, which can also behave in a counterintuitive manner, demands particular effort on the part of the scientific community to communicate the situation and requires careful monitoring in order to recognize surprising developments as soon as possible. Changes in 'guard rail' assessments need to be transposed rapidly into corresponding regulations. This means that regimes must be able to respond flexibly, for instance by adopting supplementary protocols.

- *Uncertainty:* How good is the knowledge on the environmental problem? Are the scientific issues largely resolved? Are there models, indicators, complete data sets? Here, too, environmental problems differ greatly. For the freshwater problem, interconnections at the regional level are fairly well understood (gaps persist rather at the level of global synopsis), while the biodiversity regime will presumably have to cope with fundamental gaps in knowledge for a long time to come. It is easier for political and legal systems to control a well known problem for which there are measurable indicators or even reliable models. Consequently, where the knowledge base is inadequate, there is a particular need to promote internationally coordinated research charged with two tasks: To elaborate basic knowledge and to keep track of the current state of affairs by means of indicator, monitoring and early warning systems. Regimes need to be adaptable and must be able to respond flexibly to changed understandings or situations (Munn et al., 2000).
- *Common access:* Can access to the desired resource be restricted? How simple is it to allocate and enforce property rights? Access to the atmosphere for the purpose of emitting greenhouse gases or CFCs is available to everyone worldwide. Similarly, the high seas have open access, be it for use as a sink for pollutants or as a source of biological resources. Land, in contrast, can be made subject to property titles. Personal interests and individual responsibility in resource management are linked closely to the security of property rights. Global common-access resources often suffer overexploitation because individual responsibility scarcely enters into the equation. Consequently, overarching regulations are especially important here. User charges are a particularly suitable tool for conserving such resources (Section E 3.2.3).
- *Spatial disparity:* Does the cause-and-effect pattern embrace the entire globe, or is the environmental problem essentially an accumulation of local or regional problems? In some instances, the generating and the affected parties can quite well be located on different continents (climate change, stratospheric ozone depletion). In such cases global agreements are indispensable, as only concerted action worldwide has the potential to remedy the problem. In the case of predominantly local and regional issues, such as the freshwater problem, generating and affected parties are usually connected at the regional level (here: catchment areas). Global agreements are then less essential, but can nonetheless be important as a medium for international financial and technological transfers. Environmental problems in which regional impacts accumulate to global effects demand a mix of global regulations and regional or local solutions (e.g. soils, biodiversity).
- *Temporal disparity, delay:* How much time elapses between causation and occurrence of harmful environmental effects? Do major time lags create a false sense of security? Discharging untreated wastewater to a river very soon has measurable effects. Other environmental problems are often characterized by a substantial time lag between cause and effect. The global climate system, for instance, has considerable inertia and will respond only slowly to reduced anthropogenic emissions, just as it responds slowly to rising emissions. Such delay effects can only be recognized if knowledge of the system is good. They are of particular importance to regime formation, as in some circumstances costly preventive strategies must be enforced before any perceptible and communicable damage has occurred. Measures that are unpopular but necessary from a scientific perspective therefore require special 'marketing' tools by which to communicate the precautionary action.
- *Irreversibility, persistency:* Are the effects of the environmental problem reversible? What are the time scales? If we assume that the 'human measure' of manageable time scales is in the order of millennia, then the six major environmental problems can be classified roughly into two equally large groups: Climate change, the loss of biological diversity and many forms of soil and land degradation are irreversible, because soil formation rates and species formation processes, for

instance, are slower by several orders of magnitude than the present rates of loss. In contrast, if suitable measures are taken, the freshwater problem, stratospheric ozone depletion and the ocean problem (with some exceptions, e.g. radioactive wastes) can in principle be resolved on time scales ranging from a few decades to a few centuries. Particular caution must of course be exercised when dealing with irreversible changes to the global ecosystem (WBGU, 1998a). These call for environmental regimes that concentrate above all upon preventing and avoiding such occurrences.

Many of these attributes underscore the key role of research for policy formulation. A general implication, therefore, is a fundamental need for improved environmental research in order to reduce uncertainties concerning causes, system mechanisms and effects. But improving knowledge alone is not enough; particular efforts also need to be made to communicate findings at the science/policy and science/public interfaces. Scientific policy advice and scientifically based reporting in the media are therefore essential tools that must be refined and used.

B 3 Linkages among global environmental problems

Global environmental problems do not develop in isolation from each other. There are many interactions, which only seldom exert a dampening influence and much more frequently have an amplifying effect. Linkages are of two types:

- Environmental problems can have common causes.
- Environmental problems can influence each other reciprocally (interfaces).

It is not always possible to distinguish interfaces and common causes unequivocally. The distinction is therefore made pragmatically. Common causes represent *indirect* linkages between environmental problems, while interfaces represent *direct* relationships (effects). The two types of linkage require different institutional approaches.

B 3.1 Common causes

The causal analysis conducted in Section B 2 illustrates that many of the environmental problems have common causes. Tables B 2.1-1 to B 2.7-1 list the main causal syndromes for each environmental problem. The present section summarizes and supplements these. Table B 3.1-1 provides an overview of which syndromes participate causally in the emergence of the six global environmental problems.

The number of causally implicated syndromes is an indication of the complexity of the global environmental problem. Moreover, the overview also provides an indication of whether efforts to remedy individual syndromes may have positive effects upon several environmental problems.

The same societal drivers can play a pivotal role for different syndromes and environmental problems. The following discussion therefore highlights which of these drivers (the 'Primary causes' column in the tables for the individual environmental problems in Section B 2) have particular relevance for many of the environmental problems. There are three key themes, each relating to different levels of the problems:

- *Common access*: A main problem in the utilization of global environmental resources is their overuse and overloading, as reflected in, for instance, the extinction of certain species, the exhaustion of resources and damage to natural ecosystems. Free access for all often leads to resource overuse and thus to environmental damage, because each user pursues his or her individual aspirations but no one can be held directly responsible for transgressions of limits in use (Frey and Bohnet, 1996; McCay and Jentoft, 1996; Section E 3.2.3). If people can make use of resources that are without cost to them or if such use is at least possible without major effort, then this leads to the often cited 'tragedy of the commons' (Hardin, 1968). A possible institutional approach is to introduce payments for the use of common property resources (Section E 3.2.3).
- *Unsustainable land use:* Almost all syndromes of global change and many of the global environmental problems have links to land-use issues. Unsustainable land use is one of the prime phenomena of global change. Environmental problems resulting from land-use changes occur in almost all countries. In Africa, Asia and South America, deforestation and the overuse and overgrazing of soils, in conjunction with agricultural activities, are the main causes of human-induced soil degradation (Section B 2.5; WBGU, 1995a). Moreover, demand for new utilizable land is rising steadily, with the associated conversion of natural ecosystems (WBGU, 2001). This process generates an array of amplifying impacts upon other environmental problems (e.g. climate change; Section B 3.2). Biodiversity loss, climate change and the modification of global biogeochemical cycles are all influenced crucially by land use. The problem correlates with the growing global population and growing wealth (through, among other factors, changes in dietary habits). A particularly important driver of unsustainable land use in the developing world is poverty, which, for lack of alternatives, forces people to overexploit marginal land to secure their survival.

Table B 3.1-1
Causation of global environmental problems by syndromes. ● means that the syndrome plays a leading role in the causation of the environmental problem; ○ indicates a less marked influence.
Source: WBGU, 1997, modified

	Climate change	Stratospheric ozone depletion	Oceans at risk	Biodiversity loss and deforestation	Soil degradation	Freshwater scarcity and pollution
Sahel S.				●	●	●
Overexploitation S.	●		●	●	●	●
Rural Exodus S.				●	○	
Dust Bowl S.	○		●	●	●	●
Katanga S.			○	○	●	●
Mass Tourism S.	○			○	○	●
Scorched Earth S.				○	○	
Aral Sea S.	○			●	●	●
Green Revolution S.	●		●	●	●	●
Asian Tigers S.	●	●	●	●	○	●
Favela S.			●	●	●	●
Urban Sprawl S.	●	●	●	●	●	●
Major Accident S.			●	●	○	○
Smokestack S.	●	●	●	●	●	
Waste Dumping S.			●	○	●	○
Contaminated Land S.			○	○	●	○

- *Lifestyles*: Industrial lifestyles, the spread of western patterns of consumption, mobility and urbanization also have a role in the causation of many syndromes and environmental problems. Industrialization and increasing urbanization, in particular, are characterized by inefficient and rising energy and resource consumption. They are linked inseparably with lifestyles and lifestyle changes, so that today efficiency gains in resource utilization are overcompensated by the absolute growth of per-capita consumption in industrialized countries and population in developing countries. Considering that today about 2500 million people have no electricity and more than half of the world's population lives in poverty, aspirations to catch up on amenities will surely be enormous. This makes the forecast that worldwide energy and materials consumption will at least double by the middle of the 21st century appear highly probable. It is crucial to meet the challenge of conserving global environmental resources while at the same time providing sufficient energy as a precondition to economic growth and quality of life. This can only be achieved through forms of sustainable growth that, over the long term, rely to a much greater degree on renewable sources of energy and upon resource recycling.

Global environmental policy needs to tackle these overarching themes, as this can generate broad-based effects for sustainable development. Section B 3.3 discusses the consequences for the institutional design of global environmental policy.

B 3.2 Interplay among global environmental problems

B 3.2.1 Overview

The analysis of environmental problems has already shown that in many cases the various problems influence each other strongly. This interplay adds a further level of complexity to the picture of global change, for the various problems cannot be examined or solved independently of each other. However, not all environmental problems are interconnected, and the import of such coupling varies. Table B 3.2-1 gives an overview of reciprocal effects. Many are insufficiently understood, so that a number of the table entries are still of a hypothetical nature; the appraisal of the strength of effects is also subject to major uncertainties. Unfortunately, conventional sectoral or disciplinary approaches to global environmental problems result in researchers concentrating on the problems and their causes as such, while attaching

Table B 3.2-1
Interactions among global environmental problems. The effects exercised by the problems are given in the respective columns headed by them. Strong interactions are indicated by bold type.
Source: WBGU

Effect of / upon	Climate change	Stratospheric ozone depletion	Oceans at risk	Biodiversity loss and deforestation	Soil degradation	Freshwater scarcity and pollution
Climate change		Possible dampening of the greenhouse effect		**Loss of CO_2 sink function**	Loss of CO_2 sink function, albedo changes	
Stratospheric ozone depletion	Possible promotion of polar stratospheric clouds (PSCs)					
Oceans at risk		Reduced primary production due to elevated UV irradiation		Loss of ecosystem functions	(indirectly through pollutant loading of rivers)	**Pollution of coastal regions**
Biodiversity loss and deforestation	**Shifting biome boundaries, coral bleaching**	Radiation damage to organisms	**Species loss through over-exploitation and ecosystem conversion**		**Ecosystem conversion and degradation**	**Ecosystem conversion and degradation, species loss**
Soil degradation	**Desertification, consequences of precipitation changes**			**Increased erosion through loss of vegetation cover**		**Salination**
Freshwater scarcity and pollution	**Changing precipitation patterns, desertification**			**Changed local water balance through deforestation**	**Changed local water balance, pollutant inputs**	

too little importance to possible linkages with other environmental problems.

Most connections have an amplifying effect, meaning that the manifestation of one environmental problem exacerbates the causes or effects of another. The sole exception is stratospheric ozone depletion, which may possibly have a dampening effect upon climate change (Section B 3.2.2.3). Figure B 3.2-1 illustrates schematically the interplay among the environmental problems and the associated global environmental agreements.

In a further step, the synergistic effects of jointly occurring environmental problems should lead to new points of departure for the institutional design of the environmental regimes in question. For example, soil degradation, freshwater scarcity and pollution and biodiversity loss and deforestation are coupled very tightly at the regional level. These interactions are thus best encompassed and managed by an integrative regional strategy (bioregional management, integrated catchment area management; WBGU, 1998a, 2001).

Other problems and their interfaces relate directly to global biogeophysical system control functions, such as the interplay between climate change, soil degradation and biodiversity loss and deforestation. This calls for a global institutional approach treating these interactions in an integrative manner, for instance by means of intensified collaboration among the existing convention processes or through new overarching institutional structures (Section F 2).

The following sections examine in more detail three examples of interplay and their institutional consequences.

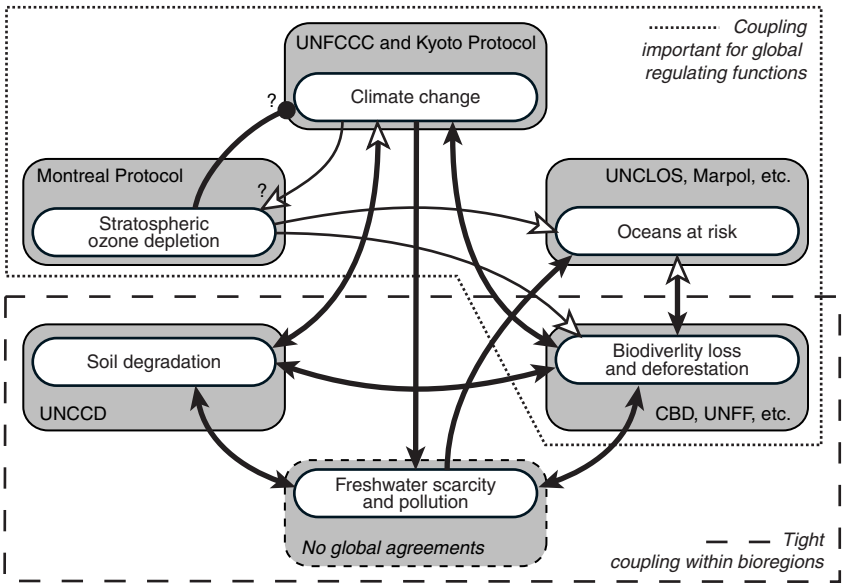

Figure B 3.2-1
Interplay among the global environmental problems. Arrowheads indicate amplifying effects, the circle indicates a dampening effect. Bold arrows and the bold circle indicate strong effects, outline arrows stand for weaker effects. The grey shaded fields state relevant global negotiating processes. Source: WBGU

B 3.2.2
Examples of interplay

B 3.2.2.1
Climate change and biodiversity loss and deforestation

Effects of climate change upon biodiversity loss and deforestation

Humankind not only influences worldwide ecosystems through direct interventions (e.g. ecosystem conversion and fragmentation; Section B 2.4). In addition there are – besides other important interactions – strong indirect effects of climate change upon the loss of biological diversity (discussed in detail in WBGU, 2001).

The climatic effects relevant to agriculture and forestry, in particular, have been identified fairly reliably by field experiments and models (McGuire et al., 1995; Peterson et al., 1999). These have included studies of the changes in plant growth brought about by elevated CO_2 concentrations, which forecast an exacerbation of the global imbalance in food supply (Hörmann and Chmielewski, 1998). There are findings concerning reactions to climate change in individual natural ecosystems and plant species in certain regions (Markham, 1998). However, due to the lack of reliable forecasts of the regional manifestations of global warming, the consequences for the ecosystems of the world can not yet be anticipated in detail (Graßl, 1999; WBGU, 2001). Furthermore, there has not been conclusive study of whether the inability of some species to move fast enough from one habitat to another will lead to biological diversity declining (IPCC, 1996b).

As concerns forests, it is considered probable that forest boundaries will shift polewards (Neilson and Drapek, 1998). In this process the expansion of the northern forest boundary in the northern hemisphere will probably be so slow that it will not compensate for the losses at the southern boundary. Climate change will therefore probably affect boreal forests more strongly in structure and function than e.g. tropical forests (Beerling, 1999).

The mass occurrence of coral bleaching in recent years can be attributed to elevated sea temperatures, which suggests a link to climatic changes (Hoegh-Guldberg, 1999; CBD, 2000). Over the longer term, the anticipated sea-level rise (by up to 1m over the next 100 years; IPCC, 1995) can be expected to pose a further threat to coral reefs.

Sala et al. (2000) draw the conclusion that in future climate change will be second only to land-use changes as the most important worldwide determinant of biodiversity loss. This applies particularly for ecosystems which are already exposed to climatic extremes.

Effects of biodiversity loss and deforestation upon climate change

The interplay between the biosphere and the climate system within the Earth System is so intensive that for an impact analysis a separate consideration in subsystems would only deliver unsatisfactory results (WBGU, 2001). Broad-scale biospheric changes, notably of vegetation structures, will therefore always entail changes in the climate system. Humankind is currently restructuring the biosphere

through land-use changes. Clearing and slash-and-burn of primary and secondary forests, in conjunction with humus-depleting land-use techniques, are increasing the biogenic sources of greenhouse gases and reducing the sinks. One-quarter of all anthropogenic greenhouse gas emissions stem from land-use change, with corresponding consequences for the climate system (WBGU, 1998b; Section B 2.1). Due to the non-linear dynamics of the coupled systems involved, sudden swings in system behaviour may be triggered. Earth System analysis is not yet able to reproduce these complex interrelations in a way permitting precise forecasts of all effects. However, what is definitely emerging is that not all regions have the same importance for these mechanisms. In its 1999 annual report, the Council carried out a biogeographical criticality analysis and identified a number of key regions which have particular functional importance within the Earth System (WBGU, 2001).

Consequences

In view of these scientific uncertainties, in the opinion of the Council the inclusion of all interactions within a comprehensive, interconnected explanation of global climate-biosphere interactions remains an unaccomplished task for the scientific community (WBGU, 1997).

Scientific policy advice on biodiversity within a global setting still has deficits (Section F 1). The new scientific advisory body proposed by the Council – the Intergovernmental Panel on Biological Diversity, IPBD – would need to cooperate closely with its counterpart in the climate sector – the Intergovernmental Panel on Climate Change, IPCC – in order to do justice to this important interplay.

As yet, the international policy negotiations within the context of the Biodiversity Convention and Climate Convention processes have also given too little attention to the impacts of climate change upon the biosphere, and to climate-biosphere coupling within the Earth System. A further reason calling for closer networking and cooperation between the two convention processes is that measures taken within the context of the climate process can have far-reaching consequences for biological diversity. Both synergisms and conflicts are conceivable, which makes close consultation between the two processes necessary. Particular attention needs to be given to possible side effects upon biodiversity when designing the details of the Kyoto Protocol and including biological sources and sinks in emissions reduction commitments. In particular, care needs to be taken that the crediting of sinks in developing countries, for instance through afforestation projects, does not lead to increased conversion of natural ecosystems and thus to accelerated loss of biological diversity. The Council has made proposals for preventing these negative effects in a previous special report on this issue (WBGU, 1998b).

B 3.2.2.2 Climate change and soil degradation

Effects of climate change upon soil degradation

Does climate change also play a role in soil degradation, in addition to the definite human impact and the influence of socio-economic settings? At present, the influence of climate change is scarcely comparable to that of direct human activities as a generator of soil degradation. However, the increased frequency of drought does lead to greater susceptibility of soils to degradation; arid areas, in particular, are extremely vulnerable (IPCC, 1996a, b). On the other hand, short-term fluctuations in precipitation cannot be taken as an indicator of the influence of climate change upon desertification, for these are typical of semi-arid and arid regions. Nonetheless, we can currently assume with some certainty that the rise in mean global temperature by 1.5–4.5°C will lead to a rise in mean annual precipitation worldwide by 3–15 per cent (IPCC, 1996a, b). While increased precipitation increases water yield, the higher temperature also has opposite effects, e.g. through elevated evapotranspiration. Even if a positive overall global net effect of climate change upon water availability is assumed, major uncertainties remain with regard to the regional and temporal distribution of precipitation. In the event of climate change as currently anticipated, changes in temperature, evapotranspiration and precipitation will probably differ greatly from region to region. There will be 'winner regions' and 'loser regions' in this respect (WBGU, 1998a).

It has been observed for some time now that in several regions of Chile precipitation levels are declining, particularly in areas where the El Niño Southern Oscillation (ENSO) phenomenon occurs with greater intensity. The ENSO phenomenon is linked to a warming of the eastern equatorial Pacific. It occurred increasingly in the early 1980s and 1990s, and was associated with a wave of drought in Africa and other regions and further extreme weather events. If, as presumed, climate change intensifies ENSO activities, then this will have an enormous impact upon the future development of soil degradation.

In the Sahel zone, too, precipitation levels over the past 25 years have not reached the average levels of the years 1931–1960. Although similar dry periods have already occurred in recent Earth history, there is much to suggest that the dry periods of the last

decades in the Sahel are part of an aridification on a continental scale (Nicholson, 1994). Increased precipitation variability, which according to observations by Hulme (1992) is mounting worldwide, is a typical accompanying symptom of this process. These highly variable conditions can trigger or intensify soil degradation. In a global perspective, however – apart from the Sahel zone and the regions influenced by the ENSO phenomenon – no increase is to be observed of drought frequency or intensity in arid and semi-arid areas (IPCC, 1996a, b).

While most terrestrial ecosystems have some capacity for buffering climatic changes, this does not apply to arid and semi-arid zones. Here even small climatic changes can already overstep stress limits, triggering irreversible soil degradation. Arid and semi-arid regions may therefore be among the first whose ecosystem dynamics undergo sustained change due to global environmental changes (West et al., 1994).

The influence of climatic changes upon soil degradation thus cannot be stated definitely at present, and has the potential to become an important factor in the future.

Effects of soil degradation upon climate change

What is the reverse relation? In principle, it is possible that desertification has repercussions upon local and global climate (IPCC, 1996a, b). When vegetation cover is reduced in arid and semi-arid areas, the surface temperature generally rises. A reduced moisture content in the soil leads to more rapid warming of the air, as less energy is 'lost' on evapotranspiration. Overexploitation of marginal soils not only influences the biosphere directly, but also the functions of vegetation for the local hydrological cycle. If this reduces water retention capacity, then ecosystem stability is also reduced and even minimal climatic changes can lead to sudden system swings. In addition, every sustained degradation of vegetation cover leads to the release of the greenhouse gas CO2. In the final analysis, however, the precise influence of soil degradation upon global warming is still largely unknown (WBGU, 2001).

Consequences

The major uncertainties in the assessment of regional and global interactions between soil degradation and climate change highlight a wide knowledge gap in this sphere. The Council consequently considers it urgent to improve scientific policy advice for international soil conservation in a manner modelled on the IPCC (Section C 4.3). One focus of this should be on the dynamics between 'loser and winner regions'. While the 'loser regions' will have to adapt to worsened environmental conditions on a relatively short time scale, the 'winner regions' (e.g. areas with thawing permafrost soils) will face new challenges, as, in a global perspective, they will have to provide compensation for the areas lost to agricultural production elsewhere. This underscores the need to develop over the medium term not only technical, but also social solutions.

B 3.2.2.3 Climate change and stratospheric ozone depletion

Effects of climate change upon stratospheric ozone depletion

Mounting research interest has centred in recent years on the interplay between ozone depletion, UV radiation and the greenhouse effect. Several studies have predicted that elevated CO_2 concentrations may lead to a cooling of the stratosphere, and thus could cause an intensification of arctic ozone depletion. Changes in the hydrological cycle and consequently altered circulation patterns could also have a strong impact upon ozone depletion. For instance, the influence of ocean temperatures in the tropics upon the water vapour content of the atmosphere could lead to altered atmospheric transport and changes in the critical temperatures for ozone depletion (Kirk-Davidoff et al., 1999). Shindell et al. (1998) have shown that elevated concentrations of greenhouse gases favour colder, more stable Arctic vortexes in winter, which accelerates the depletion of ozone at high altitudes.

Effects of stratospheric ozone depletion upon climate change

The warming of the Earth's atmosphere and thus climate change could be slowed down by ozone depletion: The increased UV irradiation caused by lower ozone levels leads to rising concentrations of free hydroxyl radicals in the troposphere, which contribute to decomposing methane, a greenhouse gas. It is estimated that this effect contributes to a 20–40 per cent slow-down in methane increase. More recent climate models take into consideration the influence of changes in the ozone layer upon cloud formation. Hansen et al. (1997) compute in their model that the Earth's surface is warming by 20–30 per cent less than would be expected from other factors.

According to the figures of WMO et al. (1998) the overall influence of stratospheric ozone depletion may have compensated up to 30 per cent of the global warming effect generated by greenhouse gases. This means that, over the last two decades, without the loss of stratospheric ozone, warming would have been greater by 0.1°C. It is consequently

thought to be possible that rapid restoration of the ozone layer may lead to the loss of its attenuating effect upon global warming.

Consequences

The inaccuracy of such estimates is still very great, as understanding of the complicated interplay between climatic warming and ozone depletion remains rudimentary. However, it can be expected that these interconnections have a much greater import than previously thought. There is a need in this field for greater coordination of research and intensified efforts. It is also recommendable to improve cooperation among the bodies of the Montreal Protocol and the Climate Convention in order to ensure an integrated approach to combat human-induced changes to the overall atmosphere.

B 3.3 Consequences for the institutional design of global environmental policy

Section B 2.7 elaborated those attributes of environmental problems to which greater consideration needs to be given in the global environmental-policy process when further developing global environmental regimes, in order to improve the precision of goals and their level of attainment. Moreover, the causal analysis of global environmental problems revealed the primary causes and mechanisms underlying the mechanisms of degradation and identified potential starting points for integrated actions (Section B 3.1). Finally, the interplay between the environmental problems and their common causes was demonstrated. The outcome of that analysis was that the interfaces between the problems and the approaches to the common causes of these problems call for improved institutional coordination (Section B 3.2). The following conclusions result for the design of global environmental policy.

Causes

Section B 3.1 identified the following three key themes for the 'primary causes' of global environmental problems. Unrestricted access to common resources ('common access'), land use (and rural poverty) and energy- and resource-intensive lifestyles (in connection with the industrialization and urbanization trends). Stepping up efforts to target these overarching causes can provide 'relief' for many environmental problems simultaneously.

For the last two key themes, poverty plays an important role. Rural poverty has a major influence upon land use in developing countries, which is mainly for subsistence, and hampers the transition to sustainable development. About one quarter of the world's population still has to manage on less than US$1 per day, although life expectancy and literacy rates have improved almost everywhere and nutritional status has also improved on average.

Population growth presents a particular challenge, as it has a fundamentally amplifying effect upon all environmental problems. Nonetheless, it is plain that reducing population growth alone does not guarantee that global environmental problems are mitigated. The level of resource throughput – and thus also the potential environmental impact – is determined, besides the absolute number of people, above all by their per-capita throughput and by the technological and organizational quality of resource usage. In developing countries with high population growth and low per-capita resource consumption, measures should initially seek to reduce population growth, in particular by improving the socio-economic situation of the poor. In industrialized countries with low (or even negative) population growth and high per-capita resource consumption, the focus should be placed on reducing resource usage. The overall efficiency of resource use needs to be improved substantially. A global environmental policy that works towards reducing per-capita consumption, promoting innovative and efficient technologies and organizational structures and facilitating socio-economic development in poor countries is ultimately more effective than a policy focusing solely upon population-related measures.

Assessing global environmental problems

In all global environmental problems, the science-policy interface plays an important role. Exchange needs to function in both directions. The latest research and monitoring findings need to be communicated to the policy realm as a basis for its negotiations and decisions; conversely, the scientific community needs to learn which problems and issues are considered particularly important in society or in the policy realm. Global environmental policy needs to give greater consideration to the system-specific attributes of global environmental problems (Section B 2.7), which in turn presupposes a functioning flow of information to the scientific community.

A further crucial function of this interface is its role as a precondition to improving enforcement. In many environmental problems, there is a major discrepancy between the planning and implementation of measures. Compliance with international agreements has been inadequate in the past and needs to improve substantially. An important precondition to this is that problematiques can be measured and compared, and likewise the successes achieved. This makes appropriate indicator and monitoring systems

essential. The scientific and political challenges associated with developing such systems are not to be underestimated.

In many instances, the available knowledge on environmental problems and their causes and effects is still unsatisfactory. In all global environmental problems, a need remains for further study. In particular, research needs to be intensified on the development of indicators, monitoring systems and early warning systems. The associated task of organizing research, which needs to be addressed in close exchange with the policy realm, has not been tackled with the same vigour for all global environmental problems.

The conclusion for public policy and regime design is that it is essential to ensure that science is integrated into negotiating processes, and that institutional structures and arrangements, in particular, must be sufficiently flexible to adapt to changing knowledge. For this, it is expedient to make provision for the possibility of expanding framework agreements by additional provisions negotiated later on in the process, for instance in the form of protocols.

With the exception of the climate regime, there are scarcely any institutional structures that have organized this science-policy interface effectively. Here there is a fundamental need for reorganization (Section F 1). These structures need to be not only problem-focused and interdisciplinary, but must also promote integrative perspectives.

Implementation

Because many political and economic decisions that impair the global environmental situation are taken at lower spatial or political levels and are generally decisions of individual entities, it is important to point global environmental policy in a more actor-specific direction. Relevant actors must be involved in policy design (e.g. through education, information and participation). Prime tools include creating incentive systems and motivating individuals to engage in more environmentally sound behaviour.

Regional peculiarities require distinct strategies and decentralized steps for operationalization, particularly with respect to soils, freshwater, land use, biodiversity and adaptation to and mitigation of the effects of climate change. Accordingly, global environmental policy needs a stronger regional focus.

Although an array of international agreements are already in place, environmental pressures persist unabated. This is exemplified by climate change: Despite the undisputed necessity to intensify climate protection efforts, the Council considers it justified to doubt whether a preventive strategy can still be implemented in time (WBGU, 1996, 1998a). Considering the risk that it may by now be impossible to prevent undesired climatic warming, the Council sees a need for further action to supplement global environmental policy with strategies for adaptation and mitigation of effects and to reduce vulnerabilities to global environmental changes.

Interconnections

No environmental problem can be solved in isolation. Section B 3.2 has shown that the number and import of interconnections among the global environmental problems is too large for isolated solutions to be able to achieve sustained improvements. For global environmental policy design, this means that no single global environmental institution can have sustained success if the impacts and effects of other global environmental problems are ignored or neglected. Integrative approaches and concepts can yield solutions that usually contribute to abating several environmental problems at the same time and generate synergisms. They also help to avoid measures that would be counterproductive for another environmental problem. The present institutional structure is essentially issue-focused and poorly suited to taking an integrative perspective beyond the narrow confines of the specific problems that the various institutions were created to address. There are already first moves towards improving cooperation among individual environmental conventions. However, the Council doubts that the present structures are adequate to this task. The Council sees an urgent need to strengthen assessment, coordination and integration functions at the global institutional level (Section F 2).

B 4 Intergovernmental actors for sustainable development

Within the United Nations (UN) system, a great number of specialized agencies, programmes and conventions are concerned with global environmental problems. The Council's 1996 annual report (WBGU, 1997) describes in detail the scientifically focused international programmes and committees on global change, most of which were established by one or several UN specialized agencies and ICSU (International Council of Scientific Unions). These programmes and committees include the World Climate Research Programme (WCRP), the International Geosphere-Biosphere Programme (IGBP), the DIVERSITAS biosphere programme, the Intergovernmental Panel on Climate Change (IPCC), the International Human Dimensions of Global Environmental Change Programme (IHDP) and the UNESCO programme 'Man and the Biosphere' (MAB). The following overview presents the institutions within the UN system that are of particular relevance to the present report (Fig. B 4-1).

B 4.1 Relevant UN specialized agencies

UN specialized agencies are international organizations established by intergovernmental agreement that address, at the global level, one of the tasks set out in Article 57 of the UN Charter (Unser, 1997). Specialized agencies can only be established with the approval of the UN General Assembly and must report regularly to ECOSOC (Economic and Social Council of the United Nations). Besides the World Bank Group (Sections B 4.5 and D 2), the following UN specialized agencies have particular relevance for international environment and development policy:

FAO (Food and Agriculture Organization; Rome) is the largest autonomous organization within the UN system. The mandate of FAO is to raise the levels of nutrition and standards of living of the populations of member countries, to secure improvements in the efficiency of agricultural production and to improve the conditions of rural populations. Areas of FAO activity include agricultural production, forestry, fisheries, food security and trade. Focal themes include sustainable agriculture, rural development and long-term strategies for the conservation of natural resources (FAO, 2000).

IMO (International Maritime Organization, renamed in 1982; seated in London) was founded in 1948. Its objectives are to stimulate the creation of uniform rules governing international merchant shipping, to introduce the highest possible standards of safety and to prevent and control pollution of the sea caused by ships. In 1999, IMO had 158 member states and two associate members. The most recent of the five main committees is the Marine Environment Protection Committee (MEPC), which was established in 1985; this is concerned mainly with international agreements to prevent and control pollution caused by ships, and their enforcement (IMO, 2000).

UNESCO (United Nations Educational, Scientific and Cultural Organization; Paris, 60 country offices) was founded in 1945. Its main areas of activity are education, sciences, culture, communication, peace and human rights. UNESCO addresses environmental issues mainly within the context of its programme on sciences, environment and socio-economic development. Here the fields of geosciences, Earth System management, ecology, natural disaster reduction, 'Man and the Biosphere', water resources, oceans and social transformation and development are addressed. Today 188 states are full and five are associate members (UNESCO, 2000; Unser, 1997).

WMO (World Meteorological Organization; Geneva) commenced its work in 1951. Its objectives are to facilitate international cooperation in the establishment of networks of observation stations, to promote the rapid exchange of meteorological information, and to promote the uniform publication of observations and statistics. Furthermore, WMO furthers the application of meteorology to aviation, shipping, water problems and agriculture and encourages research and training. In 1996, WMO had 185 members.

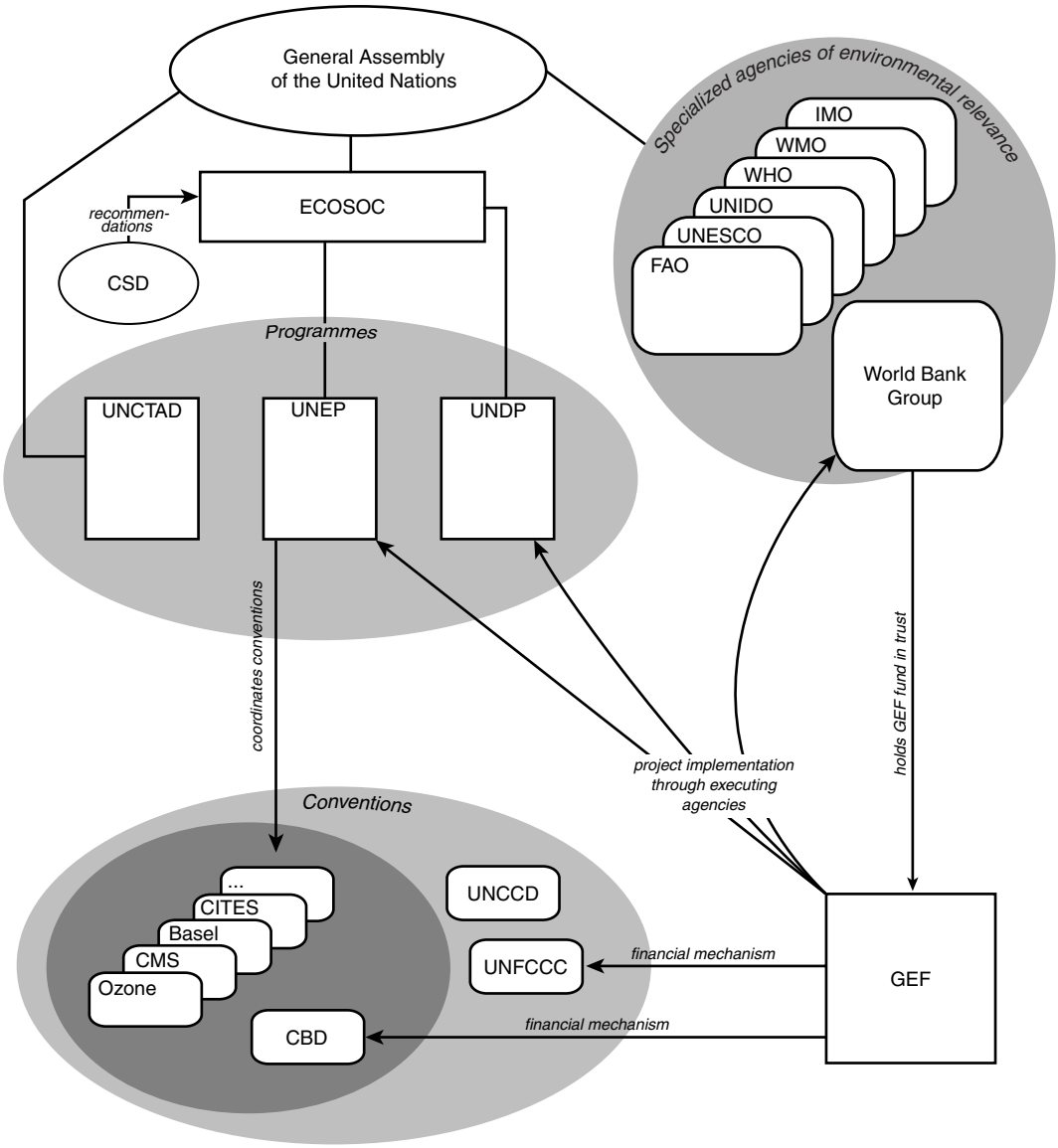

Figure B 4-1
Institutions of environmental relevance within the UN system.
Source: WBGU

B 4.2
Relevant programmes of the United Nations

Programmes of the United Nations are subsidiary agencies of the General Assembly set up by it to undertake special tasks. Most of these are agencies for financing and implementing development assistance programmes (Hüfner, 1992). UN programmes must report annually to the UN General Assembly, generally through ECOSOC. The General Assembly is empowered to take decisions binding upon the programmes. In contrast to the UN specialized agencies, the programmes have neither a specific basis under international law nor do they have separate legal personality; they do, however, have limited legal capacity.

UNCTAD (United Nations Conference on Trade and Development; Geneva) was founded in 1964 and is the main organ of the UN for integrated approaches relating to trade, finances, technology, investment and sustainable development. Its objective is to promote international trade for the economic development and integration of developing countries into the global economy. UNCTAD is considered an important forum for developing opinions and forging consensus within North-South dialogue

(Unser, 1997). The Conference meets every 3–4 years. In the interim periods, the Trade and Development Board (TDB) operates as a permanent body. 188 states are members of UNCTAD.

The objective of UNDP (United Nations Development Programme; New York) is to strengthen international cooperation for sustainable human development and serve as a major substantive resource on how to achieve it. The overriding goal is to eradicate poverty. UNDP operates 132 country offices and works in 170 countries and territories (UNDP, 1998).

UNEP (United Nations Environment Programme; Nairobi) was established in 1972 by the UN Conference on the Human Environment in Stockholm. Its objectives are to support national activities and regional cooperation in environmental protection and nature conservation, and to develop, assess and monitor international environmental and conservation law. The activities of UNEP include hosting and coordinating various convention secretariats (Basel, CITES, CBD, CMS, Multilateral Fund, Ozone), creating databanks and preparing environmental status reports (Global Environment Outlook – GEO), advising governments and financing advanced training and regional programmes. The UN member states are members of UNEP. Non-member states, other IGOs (intergovernmental organizations) and NGOs (non-governmental organizations) have observer status. The bodies of UNEP include the Governing Council and divisions for (1) environmental information, (2) environmental policy development, (3) environmental policy implementation, (4) industry and environment, (5) regional representation and (6) coordination of conventions (Korn et al., 1998).

B 4.3
UN Commission on Sustainable Development

The CSD (UN Commission on Sustainable Development; New York) is a subsidiary body of ECOSOC, the latter being one of the principal organs of the UN. It was established as a follow-up to the UN Conference on Environment and Development (UNCED) in Rio de Janeiro, 1992, in order to implement UNCED agreements, notably Agenda 21, enhance international cooperation and identify long-term strategic targets for sustainable development (Section E 1.4). Membership (53 members) rotates over three-year periods. Non-member states, other IGOs and NGOs participate as observers. The CSD has met yearly at the UN headquarters since 1993. The Division for Sustainable Development of the UN Department of Economic and Social Affairs functions as the CSD secretariat.

B 4.4
Relevant conventions

The international community has adopted numerous conventions for international environmental protection. Among these, only the ones of particular importance for the present report are presented briefly here. Chapter C discusses selected conventions in more depth. For a more detailed overview, the reader is referred to Beyerlin (2000).

The Convention on Biological Diversity (CBD; Montreal) was adopted at UNCED in Rio de Janeiro. Its principal objectives are the conservation of biological diversity, the ecologically sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources (Section C 3.4). Main organs of the CBD are the Conference of the Parties and the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) (Fig. B 4.4-1). The GEF is the funding mechanism of the CBD for technology transfer projects, for technical and scientific cooperation projects and for incentive measures for implementing the Convention. A Clearing House Mechanism (CHM) facilitates the exchange of information. Two working groups of experts are concerned with the Protocol on Biosafety (adopted in February 2000) and with marine and coastal biodiversity (Jakarta Mandate). 175 states have signed the Convention to date.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES; Geneva) regulates the protection of certain species from overexploitation. The Convention permits regulation of international trade in endangered species through a worldwide system of import and export controls and permit requirements. The CITES Appendices currently list some 34,000 plant and animal species. 151 member states have signed the Convention.

The Vienna Convention for the Protection of the Ozone Layer (Nairobi) was adopted in 1985 and regulates the commitments of states to protect the ozone layer jeopardized by CFCs and to cooperate in scientific research for an improved understanding of atmospheric processes. The Montreal Protocol (Fig. B 4.4-2) on Substances that Deplete the Ozone Layer was adopted in 1987; since then, its provisions have been tightened five times (Sections C 2.2 and C 3.2). The final objective of the Protocol is to reduce and ultimately terminate emissions of ozone-depleting substances.

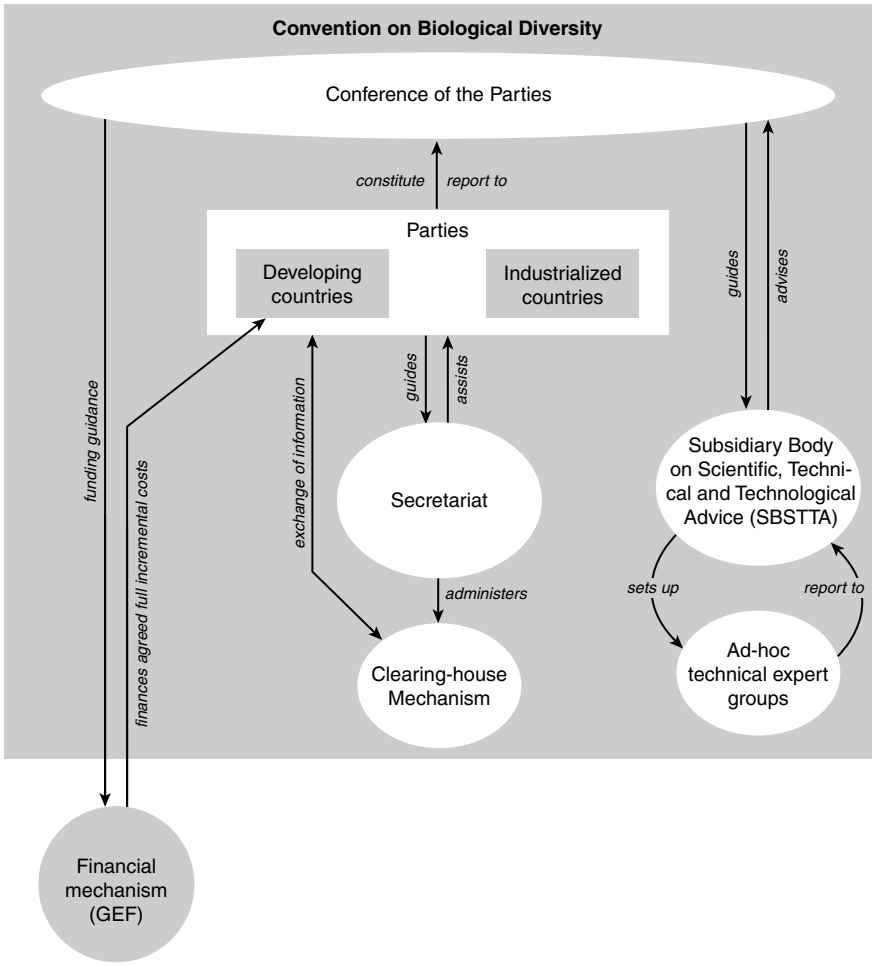

Figure B 4.4-1
The bodies of the Biodiversity Convention.

The United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD; Bonn) was put on track at UNCED in 1992, and entered into force in 1996. The objective is to combat land degradation in arid regions and to mitigate the effects of drought (Sections C 2.4 and C 4.3). For the purposes of the Convention, desertification means 'land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities'. The bodies of the UNCCD are the Conference of the Parties and the Committee on Science and Technology (CST). Conceptually, the UNCCD revolves around the National Action Programmes, which serve to implement the goals of the Convention with the active participation of civil society (Fig. B 4.4-3). To date, 159 countries have ratified or acceded to the Convention.

The United Nations Framework Convention on Climate Change (UNFCCC; Bonn) was adopted in May 1992 and entered into force in March 1994 (Fig. B 4.4-4). The ultimate objective of the Convention is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system (Sections C 2.3 and C 4.4). Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner. The Kyoto Protocol, adopted in 1997, sets out binding commitments on the reduction of greenhouse gas emissions. The Convention has been ratified by 181 states. The Kyoto Protocol has been signed by 84 states and ratified by 29.

B 4.5
Relevant financing bodies

The World Bank (a specialized agency of the United Nations; Washington) was founded in 1944 and is today the largest source of environment and devel-

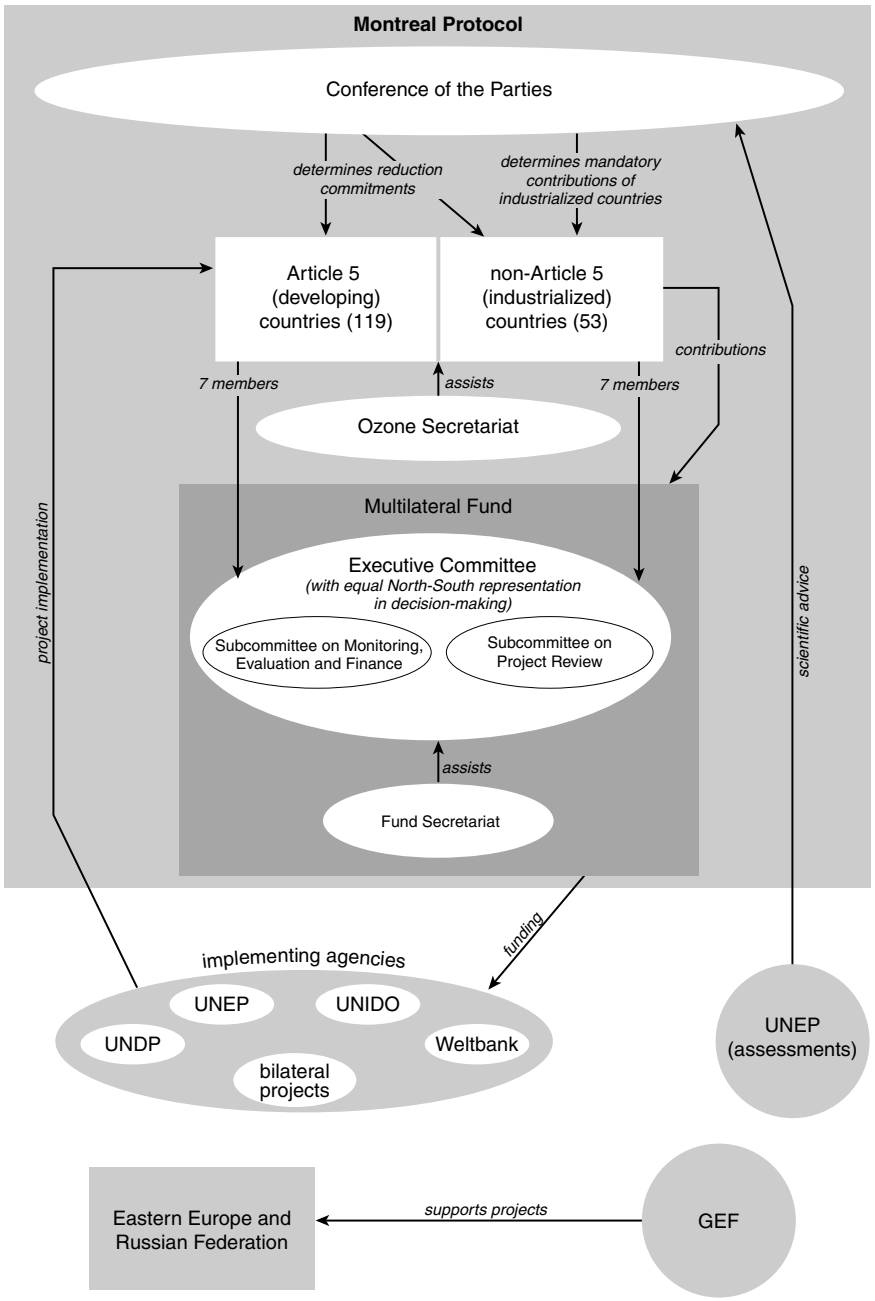

Figure B 4.4-2
The bodies of the Montreal Protocol.

opment finance (Section D 2.1). The objective of the World Bank is to reduce poverty and raise standards of living in developing countries. The Bank grants loans and provides political advice based upon sector analyses, technical assistance and, increasingly, services for knowledge exchange. The World Bank Group comprises five closely linked institutions: The International Bank for Reconstruction and Development (IBRD) grants loans and provides development assistance for medium-income countries and creditworthy poorer countries. The assistance provided by the International Development Association (IDA) concentrates upon the poorest countries, to which it grants loans with no interest charge; beyond lending, it also provides further services. The International Finance Corporation (IFC) works closely with private investors and provides financial resources for commercial companies in developing countries. The Multilateral Investment Guarantee Agency (MIGA; formally not a UN specialized agency) promotes foreign direct investment in developing countries by protecting investors from non-entrepreneurial risks. The International Centre for Settlement of Investment Disputes (ICSID) creates the preconditions for

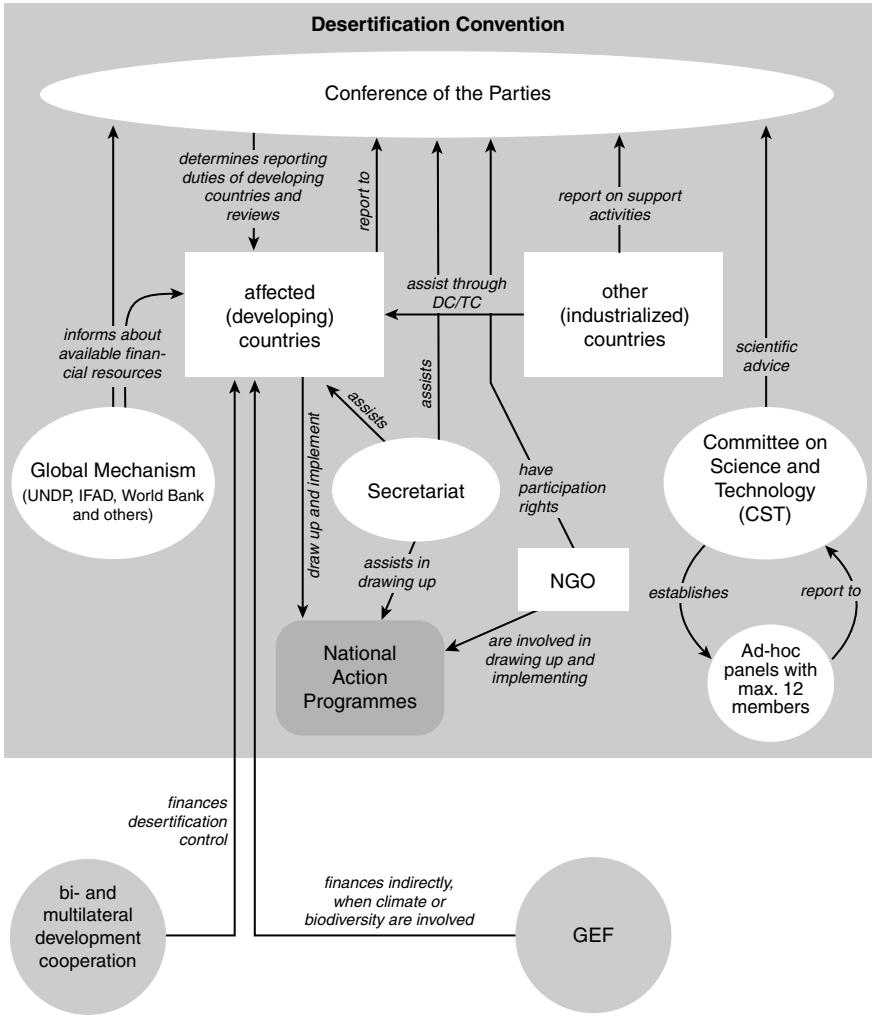

Figure B 4.4-3
The bodies of the Desertification Convention. Source: WBGU

settling disputes between foreign investors and their host countries. Today more than 180 states are members of the World Bank. These determine general policy and the budget of the Bank once a year through representatives (governors). Each of the five largest shareholders (Germany, France, the United Kingdom, Japan, USA) appoints an Executive Director; a further 19 Executive Directors are appointed by country groups, whereby China, Russia and Saudi Arabia form their own groups, each appointing an Executive Director of its own. The President of the World Bank comes traditionally from the USA. The priorities in granting loans are: Health and education, environmental protection, supporting private economic development, strengthening the capability of governments to provide services efficiently and transparently, supporting reforms to attain stable economic conditions allowing long-term planning, and social development and poverty reduction.

The Global Environment Facility (GEF; Washington) is an independent institution for the purpose of financing projects in four focal areas: Biodiversity and natural resource management; energy conservation and renewables; threats to the oceans, coastal and inland waters; and support for the phase-out of ozone-depleting substances in Eastern Europe (Section E 3.4.2). Soil protection projects can receive indirect support insofar as they involve the conservation of biodiversity or of freshwater resources. The GEF received its present structure in 1994, following a three-year pilot phase. Projects are implemented by the 'implementing agencies' UNEP, UNDP and the World Bank. NGOs, the scientific community and the private sector all play an important role in programme design and implementation. The GEF has 165 members, which meet every three years in the Assembly. The Council, the main governing body of the GEF, consists of 16 representatives from developing countries, 14 representatives from developed countries and two from countries with economies in transition to a market economy. The GEF Secretariat is supported administratively by the World Bank. The

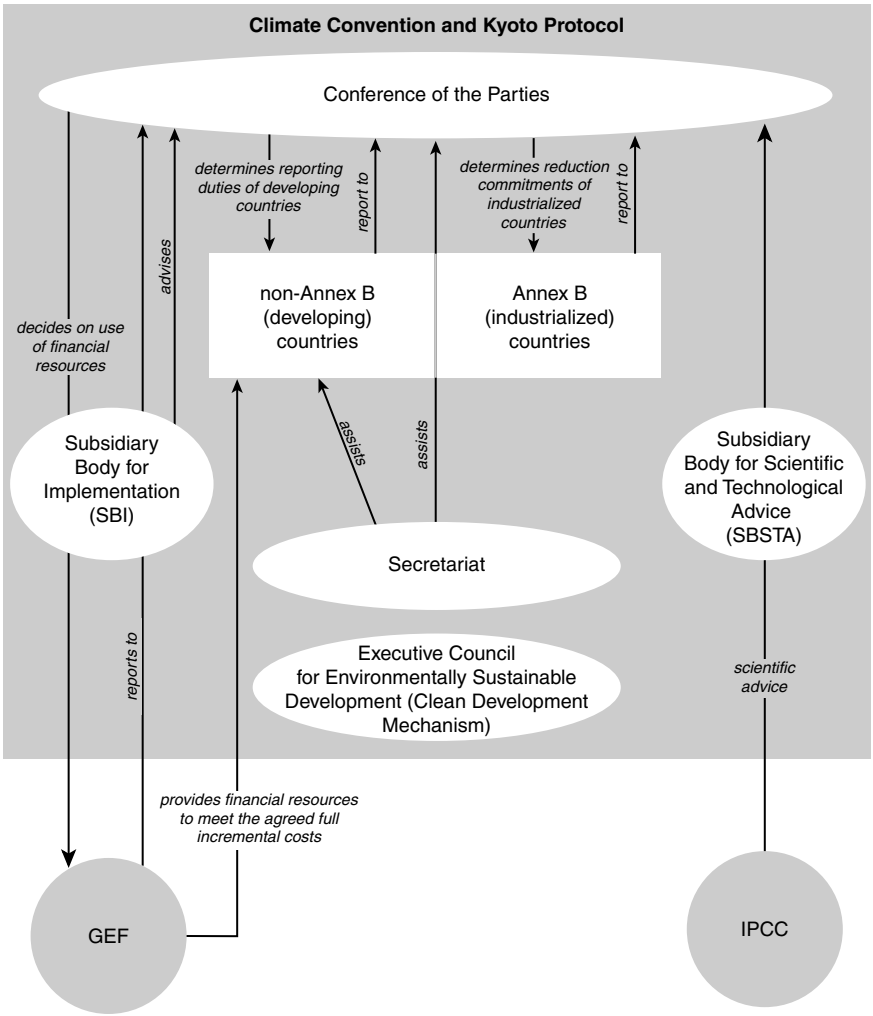

Figure B 4.4-4
The bodies of the Climate Convention and the Kyoto Protocol.
Source: WBGU

GEF serves as the financing mechanism for the Climate Convention and for the Biodiversity Convention. For the Montreal Protocol on Substances that Deplete the Ozone Layer, the GEF is a supplementary partner: While the Multilateral Fund for the Implementation of the Montreal Protocol supports developing countries in substituting ozone-depleting substances, the GEF can support transition countries in cases where their high levels of production and consumption of these substances exclude them from receiving financial resources from the Multilateral Fund (GEF, 2000).

The Multilateral Fund for the Implementation of the Montreal Protocol (Montreal) was established in 1990 and provides financial support for developing countries in reducing ozone-depleting substances. Of the 172 states signatory to the Protocol, 128 are developing countries. From 1991 to 1999, 32 industrialized countries channelled just under US$1000 million to the fund. UNDP, UNEP, UNIDO and the World Bank implement country studies and projects in the developing countries. In addition, several industrialized countries provide assistance on a bilateral basis.

Institutional deficits and remedies C

Institutions and organizations C 1

Institutions and organizations are at the heart of every type of environmental policy. 'Institutions' are common arrangements established (*instituere* – establish) by actors in society to regulate their relations, ranging from the United Nations prohibition of the use of force, through to the institution of marriage. In political science, the particular political importance of institutions has led over the past decade to a renaissance of the study of institutions with theories of 'New Institutionalism'. In international politics, the key institutions are termed 'international regimes', the term referring to a body of common principles, norms, rules and decision-making procedures among international actors (usually states). In most instances, institutions in international relations are connected intimately to 'organizations', the latter term meaning administrative units with their own budget, personnel and letterhead. This definition of organizations refers to establishments as administrative units with the above attributes, and not to the status under international law that any 'organization' within the UN system may have (Section E 2). The climate regime, for instance, is an institution that regulates the behaviour of its parties in the interests of climate protection and imposes certain obligations upon them; the Climate Secretariat in Bonn is a small international organization.

Institutions and organizations are created in the public policy process, and can be modified and optimized by that process. This has motivated the Council to examine in the present report the issues surrounding the reform and improvement of the system of international institutions and organizations, and 'institutional arrangements' (von Prittwitz, 2000) in global environmental policy in general. The present Chapter C provides the tools for this analysis: Prototypical examples of existing institutions are examined using a systematic matrix of analysis, and lessons are derived for designing new institutions and improving existing ones.

The Council follows the policy cycle commonly used in political science, modified slightly in order to take into account the conditions prevailing in global environmental policy and the needs of applied policy advice. Thus the role of institutions and organizations during *agenda setting* – the formulation and first negotiation of political issues – is discussed first (Section C 2). This is followed by a discussion of institutional issues in the phase in which international institutions are negotiated and refined (Section C 3) and an examination of the problems of implementation and compliance (Section C 4). These analyses proceed in the main from three global environmental policy problems selected for their analytical fertility; one is an exemple of success, one a moderately successful case and one a less satisfactory regime. In addition, the Council discusses the lessons that can be drawn from game theory and the prospects of private-sector transnational collaboration to protect global environmental resources.

Global environmental policy can only succeed if it is also implemented nationally and locally. For global environmental policy, the motto 'think globally, act locally' is apt. Nonetheless, in the present report the Council concentrates on policy processes as they pertain to international institutions, because their national and local implementation has already been discussed in depth in a series of previous annual reports, for instance on soil conservation policy (WBGU, 1995a), water resources conservation policy (WBGU, 1998a) and biosphere conservation policy (WBGU, 2001). Section C 5 makes explicit reference to these texts for the national implementation of global environmental policy, and once again highlights Local Agenda 21 processes and education policy aspects which the Council considers crucial.

C 2 The role of institutions in setting agendas

C 2.1 Introduction

What is the role played by institutions and organizations in the initial phase of an international negotiating process, when problems are defined, agendas structured and the process of negotiating a regime is put on track? Why do some environmental problems gain higher priority in international politics than others, even though the latter are perhaps just as severe in ecological terms? To what extent do institutions and organizations contribute to global environmental problems entering the international policy agenda, and what role do they play in the agenda-setting phase of a policy cycle? To analyse these issues, the Council has selected three key problems of global change (ozone depletion, climate change, soil degradation) that are regulated internationally with differing degrees of effectiveness and – this is decisive for their selection – have succeeded in attaining different levels of priority on the international policy agenda. Beyerlin (2000) provides a comprehensive overview of international environmental law.

C 2.2 Agenda setting in ozone policy

The response of the international community to the advancing depletion of the stratospheric ozone layer is widely viewed as an exemple of effective international environmental policy. In the meantime, the use of chlorofluorocarbons (CFCs) has been phased out almost completely in western industrialized countries. Overall, the ozone regime has cut worldwide consumption of CFCs, halons and methyl chloroform (MCF) by some 80 per cent; if we include all ozone-depleting substances, weighted accordingly, total consumption has dropped by 70–75 per cent (Oberthür, 1997, 1999a) (Section B 2.2).

C 2.2.1 The ozone issue on the international and national agenda

The threat of stratospheric ozone layer depletion caused by CFC emissions was only discovered in 1974 (Luhmann, 1996). Concern over the ozone layer arose first in the industrialized countries, which in the mid-1980s were responsible for almost all CFC production. The proponents of an international agreement included notably the USA; CFC use in spray cans was already banned in the USA and a number of Scandinavian countries by the end of the 1970s.

Because measures taken by only a few states were bound to fail on account of the global scope of the problem, Canada, Finland, Norway, Sweden, Switzerland and the USA – the so-called 'Toronto group' – launched an effort in the early 1980s to bring about an international treaty to combat ozone depletion (Kindt and Menefee, 1989; Parson, 1993; Benedick, 1998). However, at that time the other industrialized countries were still sceptical and sought a softer regime than the Toronto group. It is impossible to state conclusively which factors gave rise to this divergent degree of concern among industrialized countries. In the USA cultural factors, such as the high public standing of NASA and space research, may have played a certain role (Benedick, 1998). Later on, the particularly large potential hazard posed to the population at high latitudes – Canada and Scandinavia – contributed to the ozone problem being given high priority in these countries.

While ozone depletion was a subject of debate since the mid-1970s in the USA and Scandinavia, and to a lesser extent also in Japan and the European Community, the developing countries expressed no interest of their own in this environmental problem. Only 12 developing countries sent delegates to the Vienna intergovernmental conference in 1985. Even at the final Montreal conference in September 1987, which adopted the Montreal Protocol on Substances that Deplete the Ozone Layer, only 30 developing countries were represented (Biermann, 1998b).

How can this lack of interest in the negotiating process be explained? There is a widely shared perspective on intergovernmental environmental policy that casts such problems in terms of a conflict between generators of transboundary environmental pollution and those affected by it. In this view, 'generator states' block regime formation, while those 'affected' are more likely to take an initiative to press for comprehensive rules. In the case of the ozone problem, the industrialized countries are the main generators. In the mid-1980s, they consumed 90 per cent of total worldwide CFC production, corresponding to 20 times the per-capita consumption of developing countries. Moreover, limiting CFC release was considered expensive: For the USA alone, conversion cost estimates ranged from US$3 thousand million according to the US Environmental Protection Agency to US$135 thousand million estimated by the DuPont chemical corporation (Benedick, 1998).

In the initial phase, the lack of activity on the part of developing countries can be explained by a lack of information on the ozone problem, which UNEP and US diplomacy sought to remedy from the late 1980s onwards by means of information campaigns. However, information deficits were not the sole cause of the initial disinterest in the South. It rather appears that the major developing countries at first deliberately boycotted the negotiations or at least the signing of the 1987 Montreal Protocol, because its specific institutional design, notably its distribution of burdens among the states, was viewed as disadvantageous and 'unjust' with respect to their economic interests (e.g. for India, see Rajan, 1997). In the North, demand for CFC-containing refrigerators, refrigerating systems and air-conditioning systems was largely saturated, while developing countries, based on their economic growth, anticipated a steep rise in demand for these goods. The increased use of these goods was in turn viewed as a basis for further economic growth. To the extent that developing countries themselves produced CFCs, CFC-containing products or products dependent upon CFCs, they would have had to apply a part of their investment capital to convert production processes, although their sole benefit would have been the repair of an environmental problem generated primarily by past production and consumption patterns and lifestyles of industrialized countries.

The outcome of all this was that in the South the debate on reducing CFC usage was not understood as an environmental problem, but essentially as a North-South problem and as a development problem. Even today, in India, for instance, national ozone depletion control activities are not itemized in the environmental plan as a part of environmental policy, but as an element of 'international cooperation' (Chatterjee, 1995; Biermann, 1999). This indicates that the country continues to see no need to take action itself.

C 2.2.2 The role of institutions and organizations

There can be no doubt that, with respect to industrialized countries, the United Nations Environment Programme (UNEP) played a crucial agenda-setting role in the 1980s. As early as 1977, UNEP established the Co-ordinating Committee on the Ozone Layer (CCOL) and adopted a global plan of action for the protection of the ozone layer. In 1981, the UN expert conference on international environmental law held in Montevideo assigned top priority to elaborating legal norms for the protection of the ozone layer. The 1985 Vienna Conference on the Protection of the Ozone Layer was similarly an outflow of a UNEP resolution. In the early 1980s when, following the ban on CFC use in spray cans, public interest in the issue waned, it was above all UNEP that kept the international debate alive on the threat to the ozone layer (Benedick, 1998).

UNEP also played an important role in the policy formulation process in developing countries. This was particularly because, as a part of the UN system, it was viewed as politically neutral in the North-South conflict and was thus able to provide the necessary acceptance for the ozone problem in the South. UNEP hosts the Secretariat of the Vienna Convention and its Montreal Protocol, and organizes through its Paris office the transfer of CFC-free technology to developing countries. UNEP advises the Ozone Focal Points that have been set up in the administrations of most developing countries, whose tasks include raising awareness of the issue in their countries and seeking solutions in dialogue with industry. Not least, UNEP has organized the scientific assessment process on the state of the ozone problem, the numerous 'ozone assessments' (Jung, 1999b). It was the research carried out in the major industrialized countries, notably in the USA, that made this assessment process possible at all. However, it was UNEP that gave the research of individual countries the necessary stamp of political neutrality and acceptability, particularly in developing countries (Watson, 1998, personal communication).

Other UN organizations and programmes also play an important role, for instance in initiating, planning and implementing CFC conversion projects in developing countries. Likewise, these organizations provide information on the problems in the Eastern European states and particularly in the Russian Fed-

eration. In sum, we may state that without these international organizations – and particularly without UNEP – in most states the ozone problem would not have attained the priority in North and South nor the acceptance in the South that it has gained since the 1980s.

Although the ozone regime is widely considered one of the greatest success stories of international environmental policy, it needs to be kept in mind that a series of special factors contributed to this. Most notably US industry, having developed CFC substitutes early on, put up no resistance to the Montreal Protocol at the end of the 1980s, but in fact lobbied vigorously for its comprehensive implementation in as many countries as possible. To that extent, the ozone problem was a win-win situation for the industry of the North, which thus gained access to a significant new global market for substitutes and alternative production processes – a market tapped in many instances by the very same companies that had previously generated considerable revenue from selling CFCs.

C 2.3
Agenda setting in climate policy

In contrast to international cooperation on the protection of the ozone layer, climate policy has not yet succeeded in bringing about any substantial improvement in the environmental situation (Section B 2.1). CO_2 and other greenhouse gas emissions continue to rise worldwide. Human-induced global warming having become a topic of scientific debate in the late 1960s, it advanced to become an issue in the international policy arena in the late 1980s. This culminated in the negotiation of the United Nations Framework Convention on Climate Change (UNFCCC) from 1990 onwards, which was opened for signature in 1992 at the Rio de Janeiro Earth Summit. Building upon this foundation, the parties adopted the Kyoto Protocol to the Convention in 1997, setting out for the first time binding quantitative obligations of the industrialized countries to reduce their greenhouse gas emissions (WBGU, 1998b).

C 2.3.1
The climate issue on the international and national agenda

It was already considered proven in the late 1960s that the CO_2 concentration in the atmosphere is rising steadily. In the 1980s, the issue entered the international political agenda through a broad array of conferences. First the World Commission on Environment and Development (WCED) – the 'Brundtland Commission' – took up the issue in its 1987 final report. In 1988 it was debated for the first time at a high political level, at the G7 summit in Toronto and in the UN General Assembly. A further conference in Toronto in the same year put further developments on track, with a call to cut CO_2 emissions by 20 per cent (from a 1988 base-line) by the year 2005. For a decade, this 'Toronto target' was the benchmark of international climate policy.

Here the active role of international organizations was crucial. As early as 1988, the World Meteorological Organization (WMO) and UNEP, which had until then been the principal forums of international scientific debate, established the Intergovernmental Panel on Climate Change (IPCC) (Bodansky, 1993). The assessments delivered by the IPCC have become the widely recognized scientific basis of international climate policy (Section E 1).

The negotiations on a framework convention on climate protection initially encountered a wide range of conflicts of interest. The differences among the industrialized countries became apparent early on (Bodansky, 1993; Enquete Commission, 1990). In the one camp were the 'laggards', which included, besides the USSR and Japan, above all the USA. These states called attention to the scientific uncertainties and argued against wide-ranging commitments on emissions reduction (Breitmeier, 1996). In the case of the USA and the USSR (later: Russian Federation) it needs to be kept in mind that these two are among the world's largest coal, oil and gas producers. The open US political system, in particular, offers good opportunities for industry representatives to lobby for their interests. As concerns Russia's position, its perception of itself as a potential 'winner' of global warming was and continues to be of relevance (Oberthür, 1993; Oberthür and Ott, 1999).

In the other camp, the Europeans, in particular, spoke out in favour of binding commitments on the limitation of greenhouse gas emissions. However the impacts of global warming (sea-level rise, desertification etc.) were not the Europeans' only concerns. Their great dependence upon fossil fuel imports also makes climate protection measures relatively attractive, as these serve to reduce imports. Moreover, the penetration of environmental interests (associations and green parties) to actors across the political landscape had become and remains widespread. Box C 2.3-1 presents an example of the disparate negotiating positions of various nations on the issue of forest use.

Over a long period, the developing countries had no particular interest in the climate change problem (Bodansky, 1993). However, in contrast to the case of

Box C 2.3-1

Disparities in the negotiating positions of nations on climate change: The example of forest use

In the international climate change negotiations, a distinction is generally made between the concerns of the industrialized nations and those of developing countries, along a North-South gradient. The Kyoto Protocol even enshrines this differentiation by distinguishing between Annex I states, which enter into emissions reduction commitments, and non-Annex I states, which are permitted to trade in carbon units without having entered into any reduction commitment of their own. However, the further negotiations on the specific instruments for implementing the Kyoto Protocol have now shown that the interests of the nations are more complex than the dichotomy suggests. This is illustrated by the example of forest area distribution and forest management interests.

Six nations (Brazil, Canada, Indonesia, Russia, USA and Zaire) have 58 per cent of the global forest area (25 nations have 85 per cent) (FAO, 1999). The goals pursued with these assets vary greatly and depend upon the economic starting point: Per-capita income and per-capita forest area (Fig. C 2.3-1). Countries with high per-capita income are CO_2 sources, countries with low per-capita income are CO_2 sinks.

It is apparent that countries with high per-capita forest area use this forest above all for economic development, even if this is incompatible with environmental goals. Countries with low per-capita forest area and income depend upon timber imports from countries with large forest areas. This does not result in an alliance between countries that are CO_2 sources (Annex I states), but rather an alliance among countries that use the forest for economic purposes or are dependent upon imports, against those countries that pursue environmental goals. There are indications in the Kyoto Protocol that there, too, economic goals are more important than environmental goals (Clean Development Mechanism, CDM). To enforce environmental goals, there will be a need for major efforts to dismantle this constellation.

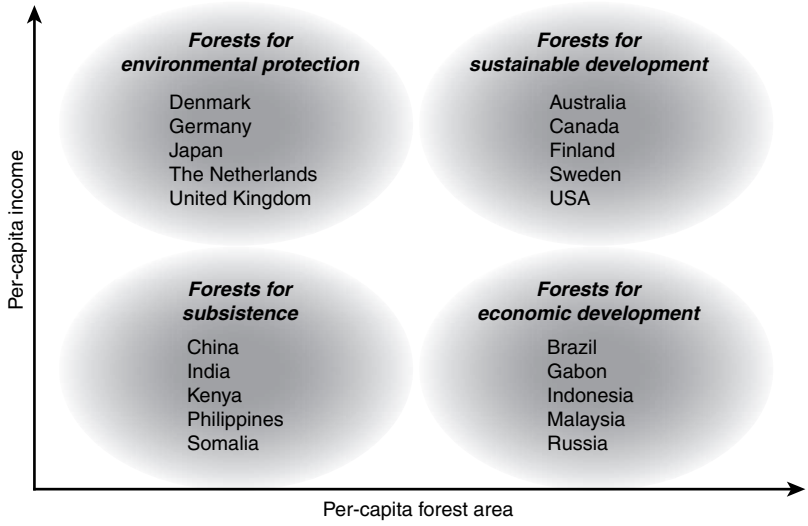

Figure C 2.3-1
Divergent goals of forest use as a function of per-capita income and forest area.
Source: WBGU

the ozone regime – and precisely because of the experience gained there that early decisions determine future negotiations – they were not slow to take part in the climate debate. They pointed particularly to the principal responsibility of industrialized countries for global warming, rejected for that reason any binding commitments of their own and called for financial and technology transfer (Biermann, 1998b). However, in this group, too, divergent interests rapidly became apparent in the early 1990s. Two groups articulated positions vehemently that deviated from the majority of developing countries. The oil-exporting OPEC countries, spearheaded by Saudi Arabia, resisted effective CO_2 emissions limitation, which they perceived as a threat to their export markets. In contrast, the Alliance of Small Island States (AOSIS), which saw its very survival threatened by sea-level rise, called early on for far-reaching emissions reduction commitments (Oberthür, 1993).

This actor constellation remained relatively stable throughout the 1990s. However, a number of non-European industrialized countries, in particular, which had originally represented the EU position and had formulated challenging national climate policy objectives, switched to the camp of the laggards (thus e.g. Canada) (Oberthür and Ott, 1999). One fairly persuasive analysis of this is that whereas the early phase of international climate policy placed the ecological dimension of the problem in the foreground (Bodansky, 1993), in the course of the 1990s this was increasingly dominated by economic aspects.

C 2.3.2
The role of institutions and organizations

Until official negotiations on a framework convention commenced, WMO and UNEP had a prominent position in the climate debate. They organized, together with the International Council of Scientific Unions (ICSU), a non-governmental organization, the first conferences on global climate change and the important World Climate Conferences. Moreover, WMO and UNEP financed the World Climate Programme and established in 1988 the IPCC (Enquete Commission, 1990; Loske, 1996; van der Wurff, 1997). Both initiatives made an important contribution to providing the scientific foundations for political action to combat global warming (Section E 1).

In the shape of the IPCC, both UN institutions continue to influence the progress of international climate policy. The IPCC itself has become one of the most influential international institutions in climate policy. In 1990, the IPCC even submitted a draft convention as a basis for the negotiating process (Oberthür, 1993). However, not all states – particularly not all developing countries – always felt themselves represented by WMO, UNEP and the IPCC (Bodansky, 1993). One reason for this was the initially inadequate representation of developing countries in the IPCC (Enquete Commission, 1990).

The developing countries therefore insisted that climate negotiations be institutionalized at a higher political level, namely the UN General Assembly (Bodansky, 1993). For UNEP, which had also sought to receive this mandate, this meant a defeat and a loss of importance in the climate policy arena (Oberthür, 1993). A growing number of additional actors entered the arena in the course of its development. For instance, climate protection became a focus of the Global Environment Facility (GEF) (Ehrmann, 1997), which was entrusted with providing the financing mechanism for the Climate Convention.

The ozone regime provided a model for the emergence and development of the climate change regime. This applies both to the legal structure of the treaty system (framework convention plus protocols) and to the approach of aggregating the controlled substances in a 'basket' and weighting them according to their harmfulness. However, there is also evidence of a negative orientation to the ozone model: In some instances, climate policy 'laggards' have lobbied successfully against a transfer of those aspects of the Montreal Protocol that are considered particularly effective.

C 2.4
Agenda setting in soil policy

C 2.4.1
The soil issue on the international and national agenda

The scale of worldwide land degradation first came to the attention of the wider international public in the early 1990s with the publication of the first global survey of soil degradation (GLASOD; Haber et al., 1999). This survey of the known cases of soil and land degradation, which had only previously been studied in a localized way, now revealed how these added up to an overall problem of dramatic proportions. Building on this foundation, the Council included the problem of soil and land degradation in its complex clinical pictures, or syndrome analysis, of environmental change (WBGU, 1995a). These analyses clarified the global nature of the problem of soil degradation and the need for international regulations. In particular it is necessary to draw together the existing non-binding declarations and to convert them into a form that is binding under international law. This would break new ground given that the complex theme of soils has only been tackled in a limited way up until now.

The first pedological associations established in the 1920s largely addressed soil as a factor of production. Then, however, the impression made by the observations of soil and land degradation gave rise in the 1960s to the first international scientific organizations whose aim was soil conservation: the International Soil Conservation Organization (ISCO) was founded in 1960, the International Soil Reference and Information Centre (ISRIC) of the International Council of Scientific Unions (ICSU) followed in 1966, and the European Society for Soil Conservation (ESSC) in 1980. In 1998 at the international workshop on Soil Protection Policies within the European Union, mounted by the EU Commission, the German Federal Environment Ministry (BMU) and the German Federal Environmental Agency (UBA), the Bonn Memorandum on Soil Protection Policies in Europe was drafted and in 1999, the first session of the European Soil Forum organized by the European Environment Agency called not only for globally oriented strategies but also for an international base-line catalogue of indicators.

The first political instrument for soil conservation was the European Soil Charter of 1972. The planned creation of a legally binding instrument foundered in the early 1990s. Another important decision at European level is the Council of Europe's Recommenda-

tion R(92)8 of 1992, in which governments are called upon to adhere to a series of principles for soil conservation.

Since the first Conference on the global Environment held in Stockholm in 1972, which called for a better level of information on the status and degradation of soils, worldwide soil conservation has also come into the United Nations' sphere of interest. In the aftermath of the disastrous droughts in the Sahel, public attention at the time was concentrated on soil and land degradation in arid regions. In 1977 the United Nations convened the World Conference on Desertification, but the Plan of Action subsequently adopted foundered due to financial and planning deficiencies. Finally, in 1981 under the auspices of the FAO, the World Soil Charter was adopted. At about the same time, the World Conservation Union (IUCN), UNEP and the World Wide Fund for Nature (WWF) were developing the World Conservation Strategy (1980). In 1982, soil conservation was incorporated into the World Charter for Nature. The theme gained new impetus from the 1992 United Nations Conference on Environment and Development (UNCED), when the problem of worldwide land degradation was addressed in several chapters of Agenda 21, although not in a separate chapter. Finally in 1996 the UN Intergovernmental Forum on Forests (IFF) passed an action programme for forest management dealing with soils and soil conservation in connection with plantation management and vulnerable ecosystems. These declarations have one thing in common, which is their non-binding status under international law and hence their limited effectiveness. Nevertheless, this process has given rise to an international frame of reference from which the actors could take their orientation and which contributed to wider public awareness of the problem.

International soil conservation policy gained a new quality when UNCED adopted a convention to protect soils in arid regions, the United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD). This binding instrument under international law came into being primarily at the instigation of the African countries, which see the UNCCD as 'their' convention. NGOs and the scientific community played an important role in negotiating the UNCCD through to completion, which is reflected in the prominent position taken up by NGOs in the implementation of the convention (Corell, 1999). Also the OECD countries pushed for NGOs to have a prominent position in the hope that the implementation of the convention's aims would bring about processes of democratization. For NGOs and for governments alike, this aspiration will call for a parallel learning process. Given this institutional design, the UNCCD could function as a future role model (Danish, 1995b).

Since the UNCCD is restricted to (arid, semi-arid and sub-humid) drylands, it only partially covers global land degradation, having come into being in the aftermath of the large-scale droughts in the Sahel and the failed 1977 Plan of Action to Combat Desertification. Thus the UNCCD has explicit links with poverty and is distinct in this respect from the other two Rio conventions on climate and biodiversity.

But the linkages to soils are becoming ever clearer in the parallel negotiation processes on climate and biodiversity. The discussion on counting biological sources and sinks towards commitments to reduce greenhouse gases is relevant to soil conservation, as is the debate on biodiversity conservation. These developments show that where global soil conservation is concerned, there is a regulatory gap at the international level and this gives rise to the question of whether the restriction of the binding regulations under international law to drylands only is still in keeping with the times (Pilardeaux, 1999).

The Council recognized this development at an early stage and as long ago as 1994 recommended the creation of a global soil convention, which contributed a decisive impulse to this debate (WBGU, 1995a). In 1997, the Protestant Academy in Tutzing, Germany took up this proposal and held an international conference attended by leading environmental scientists who recommended the preparation of a draft global soil convention. Finally, in 1998 a first multilingual draft was presented (TISC, 1998).
ISRIC and UNEP also took a leading role in promoting awareness of worldwide land degradation by compiling the GLASOD database. In gathering this database which presents worldwide soil destruction on the basis of expert assessments the extent of this insidious process was exposed for the first time on a global scale. Since then work has progressed on the compilation of a new global database on the condition of soils (Haber et al., 1999).

Meanwhile this proposal has also gained the support of the two major pedological organizations, the International Union on Soil Sciences (IUSS) and since 1996 the International Soil Conservation Organization (ISCO). Another decisive step is that the World Conservation Union's (IUCN) Environmental Law Centre in Bonn established a sustainable soils working group in 2001. The most recent support for a global soil convention comes from the German Council of Environmental Advisors (SRU) which also gives its backing to this proposal in its annual report for 2000 (SRU, 2000).

C 2.4.2
The role of institutions and organizations

It was the scientific community that first took an interest in soils, initially as an object of study, then as a resource requiring conservation. This stimulated a series of non-binding political declarations of intent on soil conservation. Critical experiences for the international community were the droughts and famines in the arid regions of Africa in the 1960s and 1970s, which made it clear that loss of soils could have existential consequences. Even today, these events have a strong imprint on the public perception of the continent in crisis. An initial political response by the UN was the convening of the World Conference on Desertification in 1977. Building on experience from the Plan of Action which was adopted there but later foundered, in the run-up to the Rio de Janeiro Earth Summit (1992) the African countries initiated the agreement of a convention on soil conservation, albeit restricted to arid regions. The Earth Summit was a historic opportunity to put this proposal into action successfully. The agreement of the UNCCD was thus also dependent on good timing and the exploitation of a favourable moment, in which the emphasis was on putting into practice the much-invoked spirit of Rio.

Another decisive step in heightening awareness of soil degradation was the presentation in 1990 of a first global status report on soils, which exposed this insidious process before the eyes of the international community. Thus the impulse for discussion of a global soil convention came once again from the scientific community. Carried forward by a German NGO, this discussion has now taken on an international character and a momentum of its own. If there is to be any extension of the UNCCD, the principal concern will be to take into account the background to its emergence and the interests of the developing countries, especially the link with poverty (Pilardeaux, 1998). Overall, past experiences show that in the initial negotiation phases of global environmental regimes, the NGOs, scientific establishments and the United Nations can assume an important pioneering role. At the same time, the timing of such a major advance is central to its success.

C 2.5
Recommendations for action and research

From the divergent experience gained in the ozone, climate change and soil conservation regimes, the Council concludes for the agenda-setting phase:

- *International organizations* that address environmental problems in a targeted manner are indispensable actors in periods in which no major state is willing to take the lead in developing and implementing solutions. They are also indispensable in their function as forums for states willing to take a leadership role, where such states can canvass for their initiatives within the community of nations.
- Independent *scientific advisory bodies*, such as the IPCC in the climate change regime, have special importance. Establishing an Intergovernmental Panel on Soils could therefore be a way to raise the priority of soil degradation on the international and national agendas.
- The priority accorded to environmental problems varies according to the specific setting and country; in developing countries, in particular, the environmental policy debates of the North can quickly become perceived as a threat to economic development goals. Consequently care needs to be taken in such cases from the very outset, including the agenda-setting phase, to ensure *multilaterally acceptable institutional design* in which economic and development policy issues, as components of the guiding vision of sustainable development, are not relegated to second place behind the environmental issue.

Institutionalization and regime dynamics C 3

C 3.1 Introduction

How can international agreement on certain problems of global change be reached in a better manner and more quickly? This section centres on the question of the extent to which certain 'institutional designs' or 'institutional arrangements' (von Prittwitz, 2000) are suited to ensuring swift and appropriate reactions to deficiencies in coping with existing problems or responses to new problems. These questions are discussed taking the example of three institutions, but also from the perspective of a generalizable arrangement that may serve as a model for future institutional designs.

C 3.2 The ozone regime: Institutionalization and dynamics

C 3.2.1 The process of institutionalization

One cornerstone of the success of the ozone regime is that a multi-stage process was pursued, moving from a framework convention over a protocol to subsequent, regular tightenings. Thus the 1985 Vienna Convention for the Protection of the Ozone Layer does not yet itself contain any concrete commitments to limit emissions of CFCs and other ozone-depleting substances, but only calls for 'appropriate measures' and creates a framework within which to cooperate in scientific research and systematic observations and to exchange information. In addition, it provides for regular conferences of the parties at which to debate the state of scientific research and consult on further measures (Greene, 1992). It was only the 1987 Montreal Protocol that introduced specific obligations of the parties to reduce the production and consumption of certain ozone-depleting substances. A remarkable aspect is that the Montreal Protocol already distinguishes between industrialized and developing countries, giving the latter a special position (Article 5).

However, the provisions of the Montreal Protocol were not yet sufficient, because the reduction targets did not go far enough, only some of the harmful substances were covered and important states such as China and India remained outside of the regime. A first amendment to the Protocol was therefore made in 1990. Importantly, this improved the conditions for developing countries, leading to China and India ratifying the Protocol (Hurlbut, 1993). By 1998, two further amendments and a total of four tightenings ('adjustments') of reduction targets were made. In 1999, further amendments and tightenings of reduction targets were decided on in Peking, but are not yet in force.

C 3.2.2 Effects of specific institutional design

Which institutional designs have proven particularly apt to promote the success of this regime and could therefore be transferred to other issue areas? A first noteworthy aspect is that a *framework-convention-cum-protocol approach* was chosen for the ozone regime, whereby each protocol must be ratified separately and is therefore only binding upon the ratifying states. Although this approach harbours the risk that many states make general declarations of intent without entering into any concrete commitments, the ozone regime has in fact shown that this must not be the case if commitments are linked to acceptable conditions. A related important aspect is that as many states as possible are integrated at an early stage into the regime and that a negotiating environment is created that facilitates later consensus. The Council therefore considers this to be a suitable model, considering that a convention imposing strict commitments would from the very outset keep a large part of the community of states away from further debate.

The Vienna Convention and the Montreal Protocol were accepted by industrialized and (following 1990) developing countries alike, regardless of the fact that, to this day, the ozone problem has not gained any particular prominence within developing countries (Section C 2.2.2). The fact that nonetheless much more than half of all the states that have ratified the Montreal Protocol until now are developing countries is attributable above all to the circumstance that the Protocol addresses their special needs (Birnie and Boyle, 1992).

This is done through the 'common but differentiated responsibilities' relating to reduction targets (Benedick, 1998) but also and particularly through the establishment of a multilateral fund to cover the incremental costs incurred by developing countries in implementing their commitments. The developing and industrialized countries each provide half of the voting members of the Executive Committee of the fund. Decisions must be taken by a two-thirds majority; balance within this majority is ensured by the requirement that it must comprise separate simple majorities among the developing and industrialized nations.

The provisions on technical assistance are also important. In addition to the commitment to provide technologies and ozone-benign substitutes to the developing countries under favourable terms, the Montreal Protocol also expressly states that the capability of developing countries to comply with their commitments depends upon the sufficient provision of financial and technical assistance (Parson, 1993).

Voting procedures have also been crucial to the further development of the Montreal Protocol. Amendments to the Protocol require ratification in each case in order to become binding; however, annexes to the Protocol or their adjustment (this concerns essentially the inclusion in the lists of controlled substances of new substances found to have an ozone-depleting effect) are binding through a two-thirds majority decision, even upon states that did not vote in favour. Such states have the opportunity to reject the decision expressly and in writing within a certain deadline ('tacit acceptance' procedure).

A particularly noteworthy aspect is the procedure for adjusting to new scientific findings ozone depletion potential (ODP) values and reduction targets for substances already controlled in the annexes: Here a two-thirds majority decision is binding, without individual states having the opportunity to reject the decision. To ensure balance between the industrialized and developing countries, here, too, decisions must be supported by separate simple majorities of each of the two groups. Such a procedure permits swift response to new scientific findings while at the same time giving due consideration to group interests. At the level chosen here, the loss of sovereignty associated with such voting procedures is slight. The Council therefore proposes to promote the use of such a procedure for comparable decisions in other issue areas, and recommends the system of majority decisions together with the rejection option in order to achieve a good compromise within the bounds of what is feasible.

Review mechanisms are a further institutional tool of the ozone regime. By these, the parties commit themselves to review, at certain intervals, the agreed control measures on the basis of new scientific findings. To prepare these reviews, the parties use a panel of experts to be convened specifically for the assessment. The Council considers such review mechanisms, and particularly the pressure created by deadlines, to be an important tool for ensuring continuous debate and adjusting the regime to new developments and findings. This system is readily transferable to other issue areas.

Furthermore, the Montreal Protocol prohibits (applying differentiated deadlines) trade in ozone-depleting substances with non-party states. One purpose of this is to prevent competitive advantages arising for non-party states. For an environmental problem the solution of which depends upon the global action of all states, such a measure is crucial, as it increases the attractiveness of accession to the regime, particularly for such states that may be able to profit from financial and technical assistance.

Non-governmental actors have influenced the ozone negotiations decisively, for instance by promoting research projects and influencing public opinion and governments (Benedick, 1998). Such actors have no participation rights, but can receive observer status at the meetings of the parties upon request, as long as this is not rejected by at least two-thirds of the states. The Council therefore reiterates its recommendation, already made in previous reports, that the rights of environmental associations to be heard in international environmental regimes be strengthened.

C 3.3
The regime for the protection of the marine environment: Institutionalization and dynamics

C 3.3.1
The process of institutionalization

Hardly any other problem of global change has such a complex web of causes and effects as the protection

of the world's oceans, one of the oldest activity areas of global environmental policy. Marine environmental policy is characterized by a unique degree of interplay between global and regional problematiques and interdependencies. While the ecosystems of regional seas are jeopardized by the discharges of their coastal states, they are potentially also damaged by global factors: International shipping, the activities of distant water fishing nations, long-range air pollution and, not least, stratospheric ozone depletion and impending climate change.

Political institutionalization is correspondingly complex. Instead of only one institution, as is the case for climate protection, here states have agreed upon common rules for specific issues in several dozen global and regional treaties and programmes of action. There is a considerable institutional dynamic in international marine environmental protection. For instance, the 1954 OILPOL regime was modified repeatedly, until it was finally replaced by the MARPOL agreement (MARPOL, 1973), which was no longer limited to oil discharges. MARPOL itself has subsequently been specified by a series of annexes, which generally require specific ratification; these, in turn, have undergone numerous amendments and tightenings (Beckert and Breuer, 1991; Biermann, 1994). An agreement adopted in 1972 largely prohibited the deliberate disposal at sea of wastes (dumping), apart from a few types of residues; here, too, the initially still weak agreement was successively strengthened through step-wise tightening (König, 1997).

In contrast, marine pollution from land-based sources, ranging from the pollution loads of rivers through to long-distance air pollution, is far less institutionalized (Nollkaemper, 1996). The only action taken here was the adoption, in 1995 in Washington, of a Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities. Its implementation since then has been sluggish (Biermann, 1998a, b). The only issue to have been addressed is that of discharges of persistent organic pollutants (POPs), for which a special regime under international law has been negotiated since 1998, which is expected to lead to an outcome in 2001 (Biermann and Wank, 2000).

C 3.3.2 Effects of specific institutional design

What lessons can be learnt from the specific institutional design of international marine environmental policy? It first needs to be noted that the main problem of marine environmental policy is land-based pollution, which is responsible for 80 per cent of total marine pollution. This includes long-range air pollution, pollutant discharges via rivers and from coastal settlements. The urbanization and utilization of coastal zones, particularly in developing countries, is continuing to intensify and will trigger mounting marine pollution (Section B 2.3). As yet, the only institutional response to this is the 1995 Global Programme of Action. This, however, has neither comprehensive global decision-making procedures nor monitoring and implementation procedures such as those available to the climate or ozone regimes. Marine pollution from land-based sources is first of all a problem of individual regions; however, the consequences of regional failure, such as the loss of near-coast biological diversity and, in particular, of corral reefs, makes land-based marine pollution a core global problem, too.

Until now, UNEP has tackled land-based emissions primarily through its Regional Seas Programme. This has succeeded in adopting, step by step, institutional arrangements for environmental protection among the coastal states of specific regional seas (Dejeant-Pons, 1987; Hohmann, 1989; Biermann, 1994). This UNEP initiative has primarily targeted Africa, Asia and Latin America, as the industrialized countries had already established regional marine environmental institutions of their own accord in the 1970s (Haas, 1993). The UNEP programme has had striking initial successes. Nonetheless, the Council would ask whether it suffices for African states to agree among each other to reduce their land-based discharges, or whether this regionalism of financially often overburdened developing countries should not rather be supported and supplemented by a global assistance initiative for regional seas.

The Council therefore recommends pressing ahead with implementation of the 1995 Global Programme of Action. It further suggests that such efforts should include providing financial, technical and administrative assistance to the overburdened states in Africa, Asia and Latin America. Furthermore, the Council reiterates its recommendation, already made in 1995, to establish stronger international institutions for combating land-based marine pollution. In the same vein, the legally non-binding Global Programme of Action should be substituted over the medium term by a convention binding under international law, with comprehensive monitoring and reporting duties, appropriate mechanisms for the transfer of finances and technology, and an intensified programme of research, advice and training. This could be modelled on selected elements of the conventions launched at the Rio Earth Summit, such as the Desertification Convention with its national and regional action programmes, or the Biodiversity Convention. Where there is definite scientific proof

of regional interdependence among coastal states, it may be appropriate to introduce an emissions trading scheme among these coastal states for certain emissions, as long as corresponding monitoring systems can be established.

In comparison, efforts to control pollution from shipping appear successful in general, although recurrent tanker spills bear testimony to the continuing need for action; it would be premature to declare the problem solved. The experience gained in this more than 40-year process of institutionalization cannot be transferred in all details to other issues, but does illustrate the importance of specific institutional design. This includes in the opinion of the Council the findings of Mitchell (1994), who attributed the initial failure and later success of the regulations designed to combat oil discharges at sea to changes in the specific design of the respective prohibitions: Maximum emission standards only make sense if they can be monitored by enforcement agencies, particularly at sea, but also in other issue areas – this is the main lesson to be learnt from the early OILPOL regime.

The success of the MARPOL regime is also based upon its specific system comprising a framework convention and annexes, in other words a system that links a general treaty, that can embrace almost all relevant states, to specific annexes. Some of these annexes are binding upon all parties, but some are only binding upon such states that wish to accept the annex in question. Upon the request of the coastal states of a regional sea – and with the agreement of the other state parties – annexes can be tightened or delimited, particularly endangered marine areas (termed 'Special Areas', such as the North Sea for certain types of discharge). Despite this essentially favourable assessment of the institutional design of the MARPOL regime, the Council considers further political efforts indispensable. In particular, it recommends to the German government that it should work towards broader application of the MARPOL standards. As this will generally concern developing countries, it will involve providing further financial, technical and administrative assistance.

A further institutional innovation of the MARPOL regime is its specific procedure for developing its annexes. This makes amendments agreed by majority decision binding upon all states, unless they object expressly ('tacit acceptance' procedure) (Oberthür, 1997). The Council considers such a procedure to be an ideal compromise between the requirement of being able to react swiftly to changing situations and the continuing insistence of states upon their sovereignty. This insistence makes true majority decisions, such as are possible under Article 2 para 9 of the Montreal Ozone Protocol (Section C 3.3.1), appear improbable at present in other issue areas.

A further interesting aspect of marine environmental policy is that it highlights the decisive role of international organizations. Thus the Secretariat of the International Maritime Organization (IMO) played a critical role in initiating, planning and implementing the decisions taken within the MARPOL regime. The World Maritime University (WMU) set up by IMO in Sweden, one task of which is to train administrative officials from developing countries, is another innovative element.

UNEP has also played a crucial role. In particular, the regional seas programmes in Africa, Asia and Latin America would not have got under way without the initiative of UNEP as the global institutional centre for these regional efforts. However, it needs to be noted that the initiative of UNEP, a relatively small institution, meets its limits here: UNEP can raise awareness in the capital cities of the coastal states of the need for regional policies to protect the marine environment and can disseminate information worldwide. Even a certain initial financing is possible, as was provided when the Mediterranean Action Plan was initiated in the mid-1970s (Skjærseth, 1993; Biermann, 2000a). However, UNEP cannot provide comprehensive financial and technological assistance for developing countries. This is the crux in the South, with its very densely populated coastal cities and almost complete absence of coastal environmental protection infrastructure. There are also numerous examples of the important role played by non-governmental organizations. For instance, the whaling ban regime would not have been put in place so quickly without the commitment of private-sector environmental groups; for some species it would probably have come too late altogether (Peterson, 1992).

A special feature of marine environmental policy is the broad-scale change that its political fundamentals have undergone, particularly through the recognition of exclusive economic zones (EEZs) of coastal states of up to 200 sea miles. This amounts *de facto* to an allocation of property rights to what was previously a common property resource – and on a major scale, considering that more than 90 per cent of fish stocks worldwide are situated today in the EEZs (Gündling, 1983). According to the theory of common property resources, we might expect that this allocation of property rights improves marine resource conservation. There are indeed indications pointing in this direction. As a consequence, improved use of stocks in the EEZs has led to intensified competition over fish stocks in the remaining high seas. This has created new lines of international conflict, as evidenced by the 'halibut war' between

the European Union and Canada. A new international agreement to be concluded in 1994, part of the Rio follow-up process, shall now improve this situation.

In summary, the Council wishes to note that the use of the high seas in particular, but also of the EEZs, for transportation and resource extraction (mining and fishing) may require stronger international institutions. While in many environmental policy arenas decentralized approaches are more promising, the 'freedom of the seas' presents an example of the need for international authorities that, as trustees of the global commons represented by the oceans, introduce certain uniform standards for the transport, fishing and mining industries. IMO in London and the International Seabed Authority in Kingston, Jamaica, represent first steps in this direction. It is recommendable to strengthen the regulatory powers of these organizations (see also WBGU, 1996).

C 3.4
The biodiversity regime: Institutionalization and dynamics

C 3.4.1
The process of institutionalization

The 1992 Convention on Biological Diversity (CBD) is a milestone in biosphere conservation policy. The Council analysed and evaluated this in great depth (WBGU, 2001), so that reference can be made here to the detailed recommendations elaborated in that report.

Concerning the institutional treatment of this problem, it is important to note that both the use of and threats to biological diversity are decentralized. The issue is thus not one of preventing worldwide emissions of certain substances, as is the case in the climate change and ozone regimes. Because, moreover, knowledge on biological diversity remains highly incomplete – there are no comprehensive status analyses, not to mention threat analyses, and measurements and comparisons are highly problematic – efforts to conserve and use biological diversity in a sustainable way and to share the benefits arising from the use of genetic resources remain exceedingly complex tasks.

Consequently, the CBD, which entered into force in 1993, contains no concrete, quantitative commitments for the 177 parties (still without the USA), but initially establishes, by formulating overarching objectives, principles and standards, a shared understanding of how to manage biological diversity (Suplie, 1995). The Convention thus contains neither species nor ecosystem lists, nor goals concerning overall areas to be given protected status, nor does it stipulate 'hard' restrictions. Instead, it creates the conceptual foundation for biodiversity management, by combining conservation, sustainable use and benefit-sharing. Implementation of this global framework needs to take place above all at the national level, in which the Convention provides assistance through knowledge and technology transfer and through its financial mechanism (Glowka et al., 1994).

In January 2000, a first Protocol to the Convention was adopted: The Cartagena Protocol on Biosafety. This Protocol, which has been signed in the meantime by more than 60 states, aims to promote the safe management of genetically modified organisms. It bears testimony to the developmental and functional capability of the Convention. The International Undertaking on Plant Genetic Resources may become a further protocol. The Undertaking is currently being renegotiated under the auspices of FAO in order to harmonize it with the CBD. A 'Forest Protocol' as proposed by the Council (WBGU, 1996, 2001) would be a possible and purposeful complement to the CBD.

A second avenue of substantive development is also open to the Convention: Working on sectoral themes by developing programmes of work or guidelines. Over the years, the Conference of the Parties has discussed a series of ecosystem types and cross-cutting issues. Nonetheless, institutional deficits remain (WBGU, 2000a), which led to a review of the existing institutional structures in the regime in order to identify critical points and possible gaps. Thus it was found that there is a need to improve the integration of scientific expertise and the review of implementation, and corresponding proposals were made for further institutional development.

C 3.4.2
Effects of the specific institutional design

Considering the unabated loss of biological diversity (WBGU, 2001), the impact of biodiversity policy is insufficient. In the following, the Council analyses whether the lack of success to date is attributable to design errors in the institutional architecture. The analysis examines only the CBD; the other agreements (e.g. CITES, CMS, Ramsar) and organizations for biosphere conservation are not discussed here (see on this WBGU, 2001).

Under the Convention, all states are subject to the same commitments, apart from the special commitment of industrialized countries to provide technol-

ogy transfer and to meet the agreed full incremental costs incurred by developing countries in implementing their commitments under the Convention. The Convention takes into consideration not only the concepts of nature conservation and access to genetic resources, which are particularly important to the industrialized countries, but also those of sustainable use and benefit-sharing, which are important objectives for developing countries. Consideration is thus given to the interests of both groups of states; this is an important precondition to the broad acceptance of the Convention (Biermann, 1998b).

The involvement of non-governmental organizations and of the scientific community (both within and outside of delegations) in negotiation processes has proven beneficial to the further development of the Convention. Here, again, the framework-convention-cum-protocol approach appears to be successful, as it has facilitated broad acceptance of the Convention and, moreover, permits flexible adjustment to newly emerging regulatory needs. The step-wise treatment of specific issues (ecosystem types, cross-cutting issues) by the Conference of the Parties is likewise expedient to provide concrete conceptual support to the parties in the process of implementation.

However, there is a major need to improve the institutional integration of scientific input. The role of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) lacks clear definition: Neither can it provide independent, scientific expertise, nor is it an entirely politically controlled body. SBSTTA is exhibiting a tendency to become a 'mini-COP'. Valuable negotiating time is often used for politically motivated debates. The result is, given the voluminous agendas of the meetings, that little time is left for scientific work. This work is then delegated to external workshops or to the convention secretariat, which is not really a solution. There is a lack of coordinated input from the scientific community comparable to that already realized by the climate regime in the shape of the IPCC (Section E 1). Regular reports from an 'Intergovernmental Panel on Biological Diversity' (IPBD), as already proposed by the Council elsewhere (WBGU, 2001), could remedy this situation and ensure the necessary independent scientific advice. SBSTTA would then function as a transmission belt between science and policy, using the IPBD reports to forge scientifically founded draft resolutions for the Conference of the Parties. In order to ensure broad acceptance of the reports, notably in developing countries, care would need to be taken that the selection of IPBD scientists is geographically balanced.

The voting procedure of the Convention currently rests on the principle of unanimity. This can lead to gridlock situations, which delay negotiations. Consequently, in view of the unabated loss of biological diversity, the Council recommends moving away from the veto principle towards a system of qualified majority decisions, modelled on, for instance, that of the Montreal Protocol, which provides for separate simple majorities among the developing and industrialized nations.

At present, the fact that no clearly quantifiable targets are stipulated and successes can therefore not be measured readily is hampering national implementation. There is a lack of jointly adopted, concrete and measurable goals, such as protected area targets or guard rails (WBGU, 2001). This is compounded by unresolved methodological issues of indicator development, and also fundamental resistance against the development of cross-national indicators. It would be valuable if the data for such indicator parameters could be published in the prescribed national reports. This would, first, facilitate a global overview of the state and trend of biological diversity and, second, would also generate political pressure in the states party to the Convention – this can accelerate implementation and awareness-building.

Thanks to the wealth of experience that NGOs have in practical implementation, collaboration with them is generally constructive and beneficial to the goals of the Convention. Involvement of NGOs in the Convention process – in many instances also in national delegations – has positive effects but can still be improved. The importance of side events during Convention meetings, at which environmental associations hold workshops or presentations on specific items of the agenda or on new issues or initiatives, is also not to be underestimated.

The notion of designing the Biodiversity Convention as an umbrella agreement had to be abandoned early on in the negotiations, because, among other reasons, the various biodiversity-relevant conventions have different membership constellations. Nonetheless, the example of collaboration with the Ramsar Convention in the sphere of inland waters has shown that it is indeed possible to tackle issues jointly, avoid duplication of efforts and divide labour. This example provides a model for cooperation with other conventions and organizations in overlapping areas.

C 3.5
Alternative avenues: International cooperation with non-state actors

Global environmental policy extends beyond governmental regulation through international regimes.

Increasingly, international environmental solutions are being formulated and implemented in processes of consultation and negotiation among state and non-state actors. Over the past decade, an array of international cooperative arrangements have emerged according to the motto 'governance without government' (Rosenau and Czempiel, 1992; Young, 1994; Zürn, 1998), in which private-sector actors, such as multinational corporations and environmental groups, have played a leading role. In his address to the 1999 World Economic Forum in Davos, UN Secretary-General Kofi Annan called upon international corporations to enter into a global pact in which they commit themselves to observe in their operations certain principles of human rights, labour rights and environmental protection, thus supporting corresponding government policies. This calls for a precautionary approach in environmental protection, and for initiatives to promote heightened environmental awareness and to develop and disseminate environmentally sound technologies.

In many instances, economic and civil society actors pursue common international environmental protection goals upon the basis of voluntary commitments. Empirical studies on globalization have shown that strategic alliances among companies have received a fresh impetus since the mid-1980s (Murray and Mahon, 1993; Beisheim et al., 1999). The aims of such alliances are to cut costs through joint research, tap new markets and distribution channels or have a say in the development of international environmental standards. The World Business Council for Sustainable Development (WBCSD) and the European Business Council for a Sustainable Energy Future (e[5]) are prominent examples.

The WBCSD, for instance, is a coalition of 120 companies drawn from 30 countries and 20 major industrial sectors united by a shared commitment to environmental protection and sustainable development. The WBCSD argues for this coalition by pointing out that an orientation to sustainable development is in companies' best interests, also with a view to competitive advantages and prospects of new sales markets and distribution channels (Schmidheiny, 1992). The WBCSD aims to participate in shaping framework conditions and promote sustainable developments and sees three preconditions to this: Economic growth, environmental balance and social progress (WBCSD, 1998, 1999). A further aim of the WBCSD's global network is to contribute to sustainable development in developing nations and nations in transition. The WBCSD seeks to define an improved understanding of what sustainable development really means for companies. When it is a matter of environmental quality targets, sustainable products, production processes or environmental management, companies often cooperate not only with other companies, but join forces with environmental groups, too, thus leading to the emergence of networks of cross-border and global alliances.

Worldwide product certification initiatives, frequently termed 'stewardship councils', are further players in this international non-state cooperation for environmental protection. For instance, in the certification of timber and fish products, companies commit themselves in cooperation with environmental associations and government agencies to utilize natural resources in a sustainable manner and to supply consumers with products that have been harvested and processed in an environmentally sound fashion.

The Forest Stewardship Council (FSC), for example, was founded in 1993 as an internationally independent, non-profit institution bringing together representatives from environmental groups, the timber trade, the forestry profession, indigenous peoples and forest product certification organizations. The FSC is an institution with official membership, and has a General Assembly as supreme body. The General Assembly has two chambers, each of which has voting rights and meets every 2–3 years. The first chamber represents economic interests with 25 per cent of voting rights, the second represents environmental interests and social concerns with 75 per cent of voting rights. In each chamber, voting rights are distributed equally between developing and industrialized countries.

The objectives of the FSC are to support environmentally appropriate, socially beneficial and economically viable management of the world's forests. The FSC does not certify products itself; rather it assures consumers that certification organizations are credible. The FSC provides this assurance by evaluating, accrediting and monitoring certifiers. The organizations thus accredited by the FSC carry out forest inspections and grant certificates if the criteria defined by the FSC are met. The FSC criteria can be applied to all types of timber. Their design is so flexible that national and regional standards are taken into consideration. Furthermore, national certification systems are strengthened by promoting forest management capacities through training and national certification initiatives. To this end, national, regional and local working groups are formed that ensure that certification is based upon actual, locally defined management practices.

In these policy avenues, particular importance thus attaches to the environmental associations: They generally represent public interests, such as the wish of consumers to have environmentally sound products. They also play an important role as opinion makers, by disseminating information and knowl-

edge on certified products to the public and thus contributing to their marketing. Moreover, environmental groups assist in implementing agreements and in monitoring these (Schmidt and Take, 1997; Take, 1998; Schmidt, 2000). Environmental groups not only monitor projects, but also provide back-up and support (Sollis, 1996). Due to lacking capacities and resources, political systems in developing countries are frequently unable to implement projects themselves, so that environmental associations from the North forge alliances with these countries (Bichsel, 1996; Take, 1999). In these strategic alliances, the governmental institutions involved don't play a regulatory role, but rather adopt a moderating function, for instance by supporting communication and coordination. It yet remains to be seen whether international cooperation among private-sector companies or certification initiatives will contribute to the sustainable use of global resources. Be this as it may, the Council views this as an incentive system that should be kept in mind as a valuable complement to intergovernmental cooperation.

C 3.6
Lessons from game theory for international negotiations

C 3.6.1
Introduction to game theory

Our look at agenda setting (Chapter C 2.2.2) showed why the political and public debate and media reporting tend to concentrate on particular environmental policy topics and negotiations. This heightened interest results from the experience that there is generally a yawning gulf between expectations upon the outcome of a round of negotiations and the results actually achieved for the global environment. Disappointment is registered over the duration of the negotiations, agreements that lack concrete goals or set unambitious targets, and poor enforcement.

One explanation for the problems encountered in arriving at tangible and effective negotiation outcomes in international environmental policy is provided by the theory of games in economics. The apparatus of game theory has been extended and refined over the past years in order to take account of the peculiarities of international negotiations relating to environmental policy (Barrett, 1997a; Endres and Finus, 2000; Finus, 2000). Game theory aims to analyse individually rational behaviour in specific negotiation situations. Individually rational behaviour on the part of politicians, staff within authorities and voters frequently prevents international agreements from coming into being and from being complied with. Global environmental problems are special in that they require concerted action by many countries. For an individual country, therefore, incentives for freerider behaviour arise; in other words, countries rely on other countries investing in environmental protection in order to reduce the damage. In this way they attempt to avoid the economic and social costs of environmental protection and the possible social conflicts associated with it in their own country. According to this view, a country behaves rationally if it waits for others to act. At the same time, an individual country on its own can only contribute very little to the protection of the global environment. The worldwide significance of Germany as an emitter of greenhouse gases is too small for it to make much of an impact on the global climate on its own by reducing emissions. In the extreme case, this could produce a constellation of circumstances in which individually sensible behaviour by individual states leads the negotiations into an impasse, in other words:

- No international agreement is reached because each country is afraid of being taken advantage of by the others, and of being unable to make any real impact itself on the global environment.
- An international agreement is reached but it is based on such a low common denominator that it will in fact do nothing to change existing environmental hazards.
- An international agreement is reached but it is not actually implemented, because violations of the agreement cannot be monitored nor sanctions imposed.

Thus the expectation that an international treaty will bring positive impulses overall for the global environment is not enough in itself to bring it about and ensure its implementation. Rather, in a world made up of individual sovereign states, for a country to enter into an agreement and also comply with it such an agreement needs to hold benefits for that country. This also enhances the certainty of expectations and independence from ethical-moral behaviour. If an environmental agreement benefits every country, then there is greater assurance that it will be implemented; there is also added protection against changes in the political balance of power and economic or social crises (Pies, 1994; Wink, 2000).

Most global environmental problems, however, are not very well suited to producing constellations that can offer benefits to every country via a joint agreement on environmental protection (Klemmer et al., 2000). Obstacles to this include

– the fact that countries are affected in different ways by environmental damage, an example of

this being the geographical differences in the expected consequences of global warming,
- the fact that countries view environmental damage, and the significance of the time horizon till it occurs, very differently, as can be seen for example in the different views regarding the loss of future options on use of the biosphere,
- the fact that the costs of preventing environmental damage differ, for example the divergent costs of restructuring power stations so as to reduce greenhouse gases,
- the fact that countries take different views of costs arising in connection with prevention of environmental damage, for example during a process of economic development in developing countries or in a period of structural unemployment in western industrialized countries.

As a rule, additional incentives are needed to encourage individual countries to participate, and these can be provided by international negotiations or by the content of environmental agreements. The economic theory of games has developed models for examining the impact of different designs of negotiations and treaty content on countries' willingness to enter into environmental agreements and to adhere to them. Finus (2000) and Bloch (1997) give an overview of the hitherto prevailing models of 'reduced games' and 'dynamic games'. Because of their theoretical origin, the results of game theory analyses can only in rare cases be transposed onto concrete environmental problems and negotiations. Despite its limited suitability for providing advice on concrete policy, it is nevertheless possible to distil from it some general conclusions that can highlight shortcomings in existing processes and at the same time provide clues as to promising strategies for the behaviour of state representatives in international negotiations.

C 3.6.2 Strategic design of negotiations

Positive incentives for negotiations are produced, first, by creating a climate for transacting through repeated negotiating and, second, by forming coalitions. Repeated negotiations situations are created by the agreement to hold regular conferences of the parties to international agreements, and by the sequence of general declarations of intent in conventions and continuous concretization of these in follow-up protocols. From a game theory point of view, repeated negotiations offer an opportunity for each partner in the negotiations to 'learn' from the experiences of the previous period (Camerer et al., 1993; Wink, 2000). Contraventions of agreements or unconstructive behaviour in negotiations then carry the threat of sanctions being brought by other partners in the negotiations. As it cannot be foreseen how often such follow-up negotiations will take place, the dynamics of the negotiations intensify overall and the certainty of expectations grows that concrete outcomes will be achieved. Moreover, by interlinking individual negotiations – for example the Framework Convention on Climate Change and the Convention on Biological Diversity – or by linking environmental agreements to the WTO, the IMF or the World Bank, a climate for transactions can be developed in which each of the partners in the negotiations has more to lose in the event of the negotiations failing or agreements being breached, than it can gain by short-term 'freeriding'. In this context, special emphasis must be given to the impact of such negotiations in terms of a country's reputation (Hoel and Schneider, 1997).

Coalitions among individual countries make sense especially in the case of certain environmental problems where there is a high degree of heterogeneity worldwide in terms of how countries contribute to generating environmental damage or to preventing it, and in terms of how environmental damage is viewed (Barrett, 1997b; Botteon and Carraro, 1997; Finus and Rundshagen, 1998). Such heterogeneity makes it unlikely that worldwide solutions of substance can be arrived at via negotiations. An agreement among just a few individual states, if those states are important as regards a particular environmental problem, can achieve greater impulses for global environmental protection than laboriously trying to arrive at a universal agreement that includes all countries. Thus, for climate protection we can assume that an agreement to reduce greenhouse gas emissions among the Annex I parties would be able to contribute significantly to solving the problem if countries such as China and India could be persuaded to join in a coalition.

In contrast, game theory models show that little impact is likely to be achieved by individual countries trying to take on the role of pioneer, although there are often calls for this (Hoel, 1991; Endres, 1997; Finus and Rundshagen, 1998). Unilateral emissions reductions as a rule take the pressure off other countries and simply encourage them to exploit the willingness of the pioneer to carry on doing the groundbreaking work in future, too. In the worst-case scenario what happens is that pressure on the global environment is reduced less and the pioneer country is faced with additional adjustment costs. Often it is more important to increase incentives for other important emissions-producing countries to enter into coalitions and to agree to joint implementation. The Council therefore recommends to the German government that at future negotiations on interna-

tional environmental policy it should devote more attention to the importance of coalitions of major emitters and to the incentives that repeated negotiating creates.

C 3.6.3 Strategic design of the content of negotiations

The concrete attractiveness of any negotiations and of any agreement is inseparably linked to the effects expected from the outcome of the negotiations. Five basic options are available for enhancing incentives to conclude an international agreement: Transfer and compensation agreements, sanctions, issue linkages, monitoring commitments, and agreements on concrete instruments.

Agreeing transfer and compensation measures is to be recommended especially in cases where there is a high degree of heterogeneity among the countries involved and a treaty has international distributional effects. In this way it is possible to cushion against social hardships and build technological and institutional capacities for fulfilling the treaty. With such an agreement it is important to pay attention to incentive effects (Mäler, 1990; Heister, 1997). From the perspective of the donor countries, precautions must be taken to ensure compliance with provisions relating to implementation, while for the recipient countries the reliability of the transfer is crucial. Disciplinary effects are to be achieved by setting short time limits for checking up on the disbursal and use of user charges, and through structures for reciprocal control; the latter are in place in some funds in the shape of a double majority requirement for decision-making (a majority among both donor and recipient countries). However, the attractiveness of such rules must be assessed in the light of each individual environmental problem. Arguments against non-monetary transfers such as technology and equipment include the fact that decisions on the part of the donor countries may not 'fit' the circumstances of capital-poor countries, and the lack of flexibility in the event of breaches of agreements. The Council is therefore in favour of reviewing the design of transfer agreements on a case-by-case basis. The Council also places special emphasis on the importance of a linkage with measures geared to strengthening the involvement of private investors (Chapter D).

In game theory models the intensity of agreed sanctions is a gauge for assessing the predictability of treaty compliance (Barrett, 1992; Finus and Rundshagen, 1998). Rational actors will only adhere to treaties if the expected costs of adjustment to the treaty do not exceed the sanctions that may be expected in the event of contravening the treaty – taking into account the likelihood of the contraventions being exposed. Ideally, a sanction should be tough enough to have the effect of deterring parties from violating the treaty. At the same time it has to be soft enough to bind violators to the treaty subsequent to sanctioning, but not so soft as to encourage violations. And lastly it should not entail disadvantages for the other parties to the treaty. In view of these difficulties, it is no wonder that we have seen poor treaty discipline and few tough sanctions to date (Chapter C 4.5.1). However, case-by-case examination is required to ascertain how incentives to comply with treaties can be developed. 'Soft' sanctions, such as publicizing treaty violations and linking timely signalling of problems relating to implementation with transfers, frequently prove more effective than 'tough' measures. Indeed, the low level of political mobilization among the general public concerning certain areas of environmental policy compared to international trade agreements curbs any orientation towards 'tough' measures.

In referring to trade agreements we are at the same time touching on a kind of agreed treaty content that is based on issue linkages (Heister, 1997; Botteon and Carraro, 1998; Finus, 2000). These packages contain elements that are considered to be advantageous for each country while at the same time containing concessions vis-à-vis other countries, which entail adjustment costs. In contrast to transfer payments, what is offered in return here relates to other areas of policy. Thus, signing up and adhering to the content of a treaty can be linked to access to particular technologies or markets, as was the case for example in the Convention for the Protection of the Ozone Layer. Difficulties arise, however, where elements of the treaty are not entirely stable, or they are exclusive, or they are incompatible with other bodies of regulation (such as those of the WTO). This strategy is therefore best suited to persuading individual especially significant emitters to become involved in treaty coalitions, or to pushing through an agreement to counter immediate environmental hazards.

In the case of most international environmental agreements, monitoring has often been agreed and developed only over the course of time (Chapter C 4). Through monitoring, incentives for adhering to the agreement are strengthened, and occasionally international 'benchmarking' processes are introduced in order to present a positive image to the international public. Problems arise as a result of individual countries having poor incentives to monitor themselves or to expose contraventions of the treaty in their own countries. Impulses for better monitoring can come from involvement of non-governmental organizations, but also from labelling strategies pursued by private enterprises (Karl and

Orwat, 1999). A precondition for effective monitoring, however, is interest on the part of the global public. Not until treaty violations become the subject of public debate and domestic political power processes do the results of monitoring begin to carry weight and are quests for innovative systems of environmental protection triggered. The Council therefore recommends that the German government should support the setting up of independent monitoring systems and private-sector information tools.

The attractiveness of international environmental agreements may be influenced not least by the choice of tools adopted to promote compliance with the provisions agreed. From an economic point of view the efficiency potential of flexible instruments based on market processes, such as international trade in emissions certificates or agreeing international liability rules, is given special emphasis (WBGU, 2000a). Set against this, however, lack of practical experience and greater uncertainty with regard to the distributional consequences and feasibility of implementing these makes international emissions quotas appear the preferable option (Endres, 1997; Finus and Rundshagen, 1998). Climate policy nevertheless shows how important it can be to link emissions quotas with mechanisms for international trade in emissions. From a game theory perspective this course seems particularly suited to achieving relatively rapid and stable outcomes from negotiations. The Council therefore recommends to the German government that it should participate to a greater extent in developing international emissions trading mechanisms in the context of the Framework Convention on Climate Change, while taking into account the need to define more precisely how carbon sinks are to be dealt with (WBGU, 1998b).

C 3.6.4 Outlook

Game theory analysis of negotiations in international environmental policy is still in its infancy. In particular, application of theoretical findings to concrete negotiations is lacking, as are efforts to arrive at more realistic assumptions concerning the level of information and the conditions for action of those involved (Becker-Soest, 1998; Endres and Ohl, 2000). In future, research impulses are expected especially in the following areas

– taking into account politico-economic incentives,
– taking into account uncertainty relating to environmental risks and in the course of adjustment to international agreements,
– including incentive effects in multi-level institutional systems like the EU,
– taking into account an evolutive perspective on negotiations along institutional time paths,
– analysing learning processes that take place during negotiations.

In spite of the above, however, the Council sees the available findings of game theory as an important lead into the analysis of international negotiations.

C 3.7 Recommendations for action and research

Institutional design is not the sole determinant of the success of a regime; external factors are also decisive. It is, for instance, striking that the problem of ozone depletion has attracted great attention worldwide, not only among scientists, but also among the broader public and is generally perceived as a direct threat. The same cannot be said of the problems of land-based marine pollution and biodiversity loss, and this may well have contributed to the relative success of the ozone regime. The complexity of these three issues differs similarly. For the ozone regime we can say that certain substances are responsible for ozone depletion, and that the obvious answer to the problem is therefore to stop the production and consumption of these substances. The causes of the pollution of the oceans and of biodiversity loss are more diverse. Both aspects have played a major role in the development of the three regimes.

Nonetheless, expedient institutional design is essential for a successful regime. Besides concrete commitments geared to solving the problem as such, an important goal of institutional design is to achieve a high level of acceptance of the agreements and mechanisms established. Such acceptance facilitates implementation and rapid and issue-focussed further development of the regime. The experience made with the international institutions analysed here yields a number of lessons for expedient institutional design in order to facilitate negotiations:

- *The framework-agreement-cum-protocol approach is successful.* The model of general, broadly acceptable framework agreements in combination with specific protocols or annexes that do not need to be approved by all states has proven its utility. This was the approach chosen for the ozone regime, the MARPOL regime and the biodiversity regime. Although the reason for this choice was rather that the signatory states were initially unable to agree on concrete commitments, at least the first two above-mentioned regimes subsequently institutionalised repeated tightenings of their provisions that gained broad-based support. Proponents of an idealistic, but scarcely realistic maximum position, who complain that a frame-

work-agreement-cum-protocol approach weakens environmental protection because individual states do not go beyond signing the framework agreement, fail to realize that these states would not support stricter agreements from the outset and thus might possibly walk out of the negotiating process early on. A framework-agreement-cum-protocol approach has the advantage of integrating as many states as possible from the outset into further negotiations.

- *Promoting the tacit acceptance procedure*. A further common attribute of the Montreal Protocol and the MARPOL regime is the use of a tacit acceptance procedure for the further development of annexes. In one important area the Montreal Protocol even goes a step further, providing for qualified majority decisions to tighten reduction targets for substances already listed in the annexes. Both procedures serve to accelerate decisions considerably. The tacit acceptance procedure is certainly suited for transfer to other regimes.
- *Giving consideration to the special needs of developing countries*. One reason for the great success of the Montreal Protocol is that it gives consideration to the special needs of developing countries. This is done in particular through the agreements on financial and technical assistance, and through the system of 'common but differentiated responsibilities and respective capabilities'. It is thanks to these agreements that the Montreal Protocol has gained high acceptance among developing countries. These countries generally command over neither the financial nor the technical capabilities to implement environmental agreements effectively. Moreover, they fear that their development process may be impeded, and frequently assume that the problems were generated in the past by the industrialized nations. Consideration of the special situation of developing countries will therefore continue to be crucial in future negotiation processes. The Biodiversity Convention, which is more recent than the Montreal Protocol, also gives attention to the special needs of developing countries, although the financing mechanism has not yet been determined conclusively. It should further be noted with respect to global and regional interdependencies that problems which may initially appear regional can develop global relevance if actors in a certain region initially lack financial and technical resources and global interests, such as biodiversity conservation, are endangered. In such cases global institutions and strategies are essential.
- *Strengthening regime review mechanisms.* In the opinion of the Council, the review mechanism is a further successful tool of the ozone regime. This effectively forces state parties to review the provisions of the regime regularly in the light of new findings. In this connection, the deployment of scientific panels whose expertise forms the foundation for negotiations is particularly important. Such a review mechanism is particularly suited to promote the further development of a regime and is readily applicable to other problems. Care needs to be taken to ensure geographic balance in the appointment of panel members, in order to ensure acceptance of the panels in developing countries.
- *Intensifying advisory input from private interest groups.* The Council reiterates its recommendation made in previous reports to further strengthen the hearing rights of private interest groups in international institutions and organizations, whereby balanced representation of groups from the North and the South would be desirable. One way to achieve this goal would be to provide financial support for conference participation by civil society representatives from the developing world. Greater support for civil society 'think tanks' in developing countries would also be conceivable.
- *Building the capacities of international organizations and programmes.* International organizations are important actors in a number of issue areas, notably in the initiation, support and review of regime formation processes, and should therefore be strengthened accordingly.

C 4.1 Introduction

It does not suffice to create ambitious international institutions for environmental protection – these also need to be implemented in practice. How can policy ensure, through appropriate institutional design, that the implementation of global agreements is monitored adequately and – if necessary – non-compliance sanctioned? Here three elements need to be considered:

- Suitable procedures and mechanisms for collecting information on the status of implementation.
- Appropriate procedures for assessing reports and other findings and for engaging in initial debate on international responses to implementational deficits.
- Tools by which to respond to any difficulties or implementation deficits identified.

These are the elements of appropriate institutional design for improved implementation of international agreements. They are discussed in the following using three case studies: The regime for the protection of the Great Lakes in North America (as an example of transboundary water resources), the desertification control regime and the climate change regime. Because of the (once more) particularly innovative role of the ozone regime, its compliance procedure is also presented in a Box.

C 4.2 Compliance among the institutions for transboundary water resources management in North America

C 4.2.1 Background

Since the early 20th century, the USA and Canada have cooperated closely in monitoring water pollution in the Great Lakes region (WBGU, 1998a). In 1909, the two countries concluded the Boundary Waters Treaty, containing first provisions governing the prevention of water pollution and mechanisms for settling disputes, notably those concerning water quality. In view of major problems with phosphate pollution and eutrophication in some of the Great Lakes, the two countries adopted in 1972 the Great Lakes Water Quality Agreement, which was expanded in 1978. A 1987 implementation protocol attempts for the first time to implement effectively an ecosystem approach with the goal of safeguarding water quality.

To some degree, implementation of the Agreement is organized decentrally, in that both national governments have devolved principal responsibility to the regional states or provincial governments. However, the International Joint Commission (IJC) already established by the 1909 Boundary Waters Treaty plays a crucial role. Of the six members of this Commission, three come from each country, appointed in the USA by the President and in Canada by the Prime Minister. The mission of the Commission is to prevent and resolve disputes relating to water use and quality and to advise the governments of both countries. In the meantime, all boundary waters between the USA and Canada are regulated by the IJC.

C 4.2.2 Compliance and monitoring

The IJC, which is charged with monitoring implementation of the decisions taken in the two countries, is responsible for ensuring compliance with the boundary water agreements. To help it in this, the Commission has set up more than 20 boards, which provide advice on compliance and monitoring. These are joined by eight task forces with specific responsibilities, which develop strategies for implementing certain goals of the agreements. In all bodies, experts from the USA and Canada have equal representation. A noteworthy point is the duty upon the IJC to submit biannual reports on goal achievement to the

participating federal and regional governments; these are based upon the information received from the monitoring and advising bodies. The budget of the Commission only meets the costs of its own work, but does not permit any financing of environmental policy programmes. This disparity between the power to issue instructions for implementation of the goals set out in the agreements and the lack of funding to implement these is a main cause of frustration and disappointment experienced by many stakeholder groups in the region (Renn and Finson, 1991).

There are in total four advisory bodies for the Great Lakes (Science Advisory Board, Water Quality Board, Council of Great Lakes Research Managers, Annex-II Advisory Committee), and the International Advisory Board on Air Pollution as a supraregional advisory body. These bodies have an important supervisory function, as they support scientifically the monitoring programmes, assess these and identify problems. The resulting information and recommendations are submitted to the IJC.

Among these bodies, the Water Quality Board and the Science Advisory Board are the most important. The Water Quality Board is the principal adviser to the IJC on all aspects relating to compliance with the Great Lakes Water Quality Agreement. The members of this body represent the federal and regional state authorities responsible for drafting and enforcing environmental policy. The task of this body is to transpose the recommendations of the Commission into practical directives for the authorities and to evaluate the effectiveness and appropriateness of programmes by comparing, inventorying and analysing all data and information. The Science Advisory Board was set up in 1978 to provide the Commission and the Water Quality Board with scientific advice relating to their tasks. According to Renn and Finson (1991) the Water Quality Board is far more cautious and conservative in its political formulations than the Commission and the Science Advisory Board. This is presumably a reflection of the administrative preference for continuity of established programmes and for taking decisions in agreement with the – often conflicting – stakeholder groups.

For their part, the two parties to the agreements meet annually to coordinate the action plans for implementation of the agreements and to review progress. The 1978 agreement stipulates a commitment of the two countries to report on their policies implemented to ensure compliance with the agreements, but a regular report is only required every six years. For certain programmes (including the further development and implementation of the Remedial Action Plans and Lakewide Management Plans), which are listed in the Annex to the Agreement, the treaty parties must submit since 1987 biannual reports to the Commission. In 1988 the first series of reports was compiled in the USA by the national Great Lakes programme office of the Environmental Protection Agency (EPA), in Canada by the governments of Canada and Ontario. The difference in the locus of responsibility for the reports also reflects the differing strategies of the two governments in implementation (Renn and Finson, 1991). The obligation of the governments to prepare reports on work relating to the Great Lakes leads to adjustments of the environmental policies of both countries and to an ongoing process of evaluation of the successes and failures of previous policies. These country reports have thus enhanced accountability and communication.

C 4.3
Combating soil degradation in drylands: Compliance and monitoring

C 4.3.1
Introduction

There are no precise base line data or monitoring systems (Oldeman, 1999) for the observation and evaluation of soil and land degradation in drylands (Section B 2.5). Similarly, the United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD) also contains no concrete reduction commitments with specified timetables, for instance for soil and land degradation. Nonetheless, the mechanisms described in the following aim to contribute to providing an international evaluation of implementation status, and to identify and remedy deficits.

National action programmes are reviewed regularly by the Conference of the Parties, where states report on progress made (Art. 10 para 2 UNCCD). Some of the regional annexes for Africa, Latin America, Asia and the northern Mediterranean make highly detailed stipulations concerning the implementation of these action programmes. An innovative element in this context is the obligation of developing countries to involve civil society in the elaboration, implementation and evaluation of National Action Programmes (NAPs, Art. 10 UNCCD). While under the ozone regime NGOs have no participation rights, in the Desertification Convention process they are a component of the official programme and an essential catalyst of implementation. Thus the NGOs, which already played a part in the negotiation of the UNCCD, are integrated more comprehensively than

in any other convention (Danish, 1995a; Rechkemmer, 1997; Corell, 1999).

The key monitoring tool of the Desertification Convention is the obligation to submit detailed reports to the Conference of the Parties, which at irregular intervals determines the timetable for such submission (Art. 26 UNCCD). Where a need arises, the Secretariat supports countries in preparing reports. The reporting obligation relates above all to the elaboration and implementation of NAPs; however, the industrialized countries, in their donor function, are also involved and report for their part on their technical and financial assistance. Industrialized countries have not only a supportive function in implementation – a considerable number of industrialized nations count themselves among the group of 'affected countries', for instance Australia, the USA, Canada and the northern Mediterranean countries (apart from France).

The first national reports on implementation of the goals of the Desertification Convention were submitted in 1999 at the third Conference of the Parties (Pilardeaux, 2000a). However, there are major deficits concerning the review of these reports by the Conference of the Parties, which did not carry out any in-depth analysis. Therefore, in December 2000 an ad hoc working group to review national reports was established.

C 4.3.2 Compliance and monitoring

Efforts of the Conference of the Parties (COP) to assess all implementation measures are based not only on the national reports, but also and above all upon the recommendations made by the Committee on Science and Technology (CST). However, temporal overlap of COP sessions and CST meetings make it impossible to feed the scientific outcomes effectively into the Conference of the Parties. It is therefore recommendable to convene CST meetings at different dates than the COP sessions, as is common practice in the biodiversity and climate change regimes (Section E 1).

Furthermore, the CST has been unable to fulfil its function sufficiently until now because its membership comprises mainly political negotiators instead of scientists; as yet, it has devoted too little attention to the scientific issues of implementation (Pilardeaux, 2000a). However, the CST can draw from a roster of experts to set up ad hoc working groups; these have at most twelve members and membership must be regionally balanced. In the opinion of the Council, issues presenting a major need for additional knowledge include, in addition to the detailed analysis and evaluation of national reports, the examination of the Clean Development Mechanism (CDM) of the UN Framework Convention on Climate Change and its relevance to the Desertification Convention, and also the question of guard rails for soil and land degradation. Whether present knowledge needs can be met by the CST will depend upon its future mode of operation. Alternatively, it merits consideration whether scientific expertise might not better be institutionalized externally, for instance in the form of an Intergovernmental Panel on Land and Soil (IPLS). The relationship between the IPLS and the CST could be analogous to that between the IPCC and the SBSTA in the climate process, the function of the CST being to present scientific findings to the Conference of the Parties in a form suitable for political deliberation.

A 'Global Mechanism' is responsible for the financial issues relating to implementation. This mechanism, which is administered by the International Fund for Agricultural Development (IFAD), receives support from UNDP, UNEP, the World Bank, GEF, FAO, the Secretariat of the Desertification Convention and the regional development banks. The main purpose of the Global Mechanism is to provide information to affected countries on the funds available through bilateral and multilateral cooperation. Bilateral and multilateral development cooperation, which was already in operation before the convention existed, thus provides the main financial basis for its implementation (besides the own contributions of affected countries). However, the national reports of donor countries do not make it sufficiently transparent how the funds available for combating desertification have developed over recent years. One reason for this is presumably that all measures for rural development, poverty alleviation or food security also contribute to combating desertification and a clear attribution of funds is difficult. What is certain, however, is that the contributions of OECD countries for development cooperation, measured as percentages of gross national product, have now reached the lowest level for fifty years (Section E 3).

The Desertification Convention defines no criteria for the level of the financial commitment of the North. Consequently, when the 0.7 per cent target called for by the 'world conferences' of recent years (such as UNCED, Habitat II, the World Summit for Social Development or the World Food Summit) is not met, we cannot speak of 'non-compliance', although this certainly affects implementation of the convention directly, as it is financed mainly through bilateral and multilateral cooperation. The GEF has no dedicated window for the Desertification Convention because it only supports developing coun-

tries in projects that are in the global environmental interest. Only incremental costs are covered. In the view of the GEF, desertification until now is not an inherently global problem (Kürzinger, 1997). Nonetheless, since 1996 funds can be deployed for desertification control measures if these relate to climate change or biodiversity.

International soil conservation policy shares with biodiversity policy (WBGU, 2001) a lack of sufficient scientific advice. A first scientific overview has been created in the shape of the FAO/UNESCO Soil Map of the World, the 1990 Global Soil Degradation Database (GLASOD) and the annotated World Atlas of Desertification created by UNEP in 1992. However, this work has not been updated and refined on an ongoing basis. Moreover, GLASOD data are primarily qualitative and based upon expert opinions (Oldeman, 1999). An interesting recent development is the establishment of a Global and National Soil and Terrain Digital Database Program (SOTER). SOTER shall create over the next 10–15 years a database on soils, soil uses and soil degradation (Oldeman, 1999). Over the long term, however, there is a need for a post-SOTER structure that monitors soil changes. This goes along with by a pressing need for advice on the role of biological sinks in the implementation of international environmental regimes, on the estimation of global guard rails for soil and land degradation and on the development of indicators. Establishment of an 'Intergovernmental Panel on Land and Soil' would be a valuable step. Such a body could bring together leading worldwide scientific expertise, as has already been done in the climate change regime.

C 4.4 Compliance in climate policy

C 4.4.1 Introduction

The first commitment period under the Kyoto Protocol to the UN Framework Convention on Climate Change (UNFCCC) is due to commence in the year 2008 (Section C 2.3). Compliance procedures are one of the most important points in the negotiations preceding the Protocol's entry into force. This concerns both the obligation to prepare national annual reports on greenhouse gas sources and sinks and on measures taken including an assessment of their success, and the obligation of the parties listed in Annex B to the Kyoto Protocol (industrialized countries) to limit their emissions. Provisions on this were already agreed upon in the Convention and in the Kyoto Protocol, but need to be specified further. Negotiations on compliance mechanisms under the Framework Convention itself are also ongoing.

The agreements provide for a Multilateral Consultative Process, the purpose of which is to provide advice to parties experiencing difficulties in implementing the Convention, promote the understanding of the Convention and prevent disputes from arising. This process can be initiated by an individual party, a group of parties or the Conference of the Parties, but not by the Secretariat. No decisions have yet been taken on the size and composition of the institution. This has been above all because of disagreement on the issue of whether experts should be appointed according to geographically balanced quotas or should be nominated with equal representation from industrialized and developing countries (Oberthür and Ott, 1999).

The basis for ascertaining compliance with the commitments under the Kyoto Protocol is provided by the national communications of the parties and the reviews of these communications. These commitments are regulated in Articles 7 and 8 of the Kyoto Protocol. Article 8 provides 'expert review teams' for the review process. These are coordinated by the Secretariat and report to it. The Secretariat forwards the reports to the parties and informs the Meeting of the Parties to the Protocol. The terms of reference of the expert review teams have not yet been specified. Proposals range from a review of national emissions inventories, over regular expert meetings, through to visits of the state parties by the experts. More far-reaching proposals to involve private sector auditors have also been made (Hargrave et al., 1999). Models of such auditing schemes already exist in the arms control regime, the International Labour Organisation (ILO) and the UN Human Rights Committee (OECD, 1998). The involvement of intergovernmental organizations, such as the National Greenhouse Gas Inventory Programme of the IPCC, OECD and IEA, in the review of national inventories and in monitoring compliance with commitments is a further option that merits consideration (OECD, 1999).

C 4.4.2 Compliance and monitoring

Article 18 authorizes the Meeting of the Parties to the Protocol to take action in the event of non-compliance or to delegate this authority to another body. The critical importance of compliance demands the establishment of a permanent Compliance Body in order to secure continuity of work and thus create a setting in which trust can grow (Hargrave et al., 1999). A small organization is envisaged, comprising

scientific, technical and legal experts. Negotiations on the composition of this body are currently under way. Three alternatives are being discussed: Geographically balanced representation from the five regional UN groups, equal representation of Annex-I and non-Annex-I Parties or, finally, a stronger representation of Annex-I states that are affected by the decisions of the Compliance Body. The consultation of external experts remains a controversial point.

The arguments put forward for involving the private sector in the review process are cost efficiency and low prices due to competition among firms tendering their services. The argument is that this would prevent the emergence of bureaucratic structures and would provide more immediate contacts on the ground in the countries being reviewed, this permitting swifter responses to potential non-compliance. Further advantages put forward include the establishment of a larger pool of auditors, their independence from governments and their accountability when mistakes are made. The main argument put forward against involving private auditors is that their independence is jeopardized by excessive financial dependence upon the client. It is further argued that the complexity of the tasks could require a larger organizational structure than private auditors can develop.

An essential precondition to involving private-sector auditors would be to establish a system of quality assurance through certification by the Secretariat or by a body charged with this task. It is equally important that the function of auditors is limited to that of an 'initial' technical audit in which details are checked, the findings of this audit then being submitted as readily accessible inventories to the Secretariat and to the 'expert review team'. These bodies must retain responsibility for the maximum accuracy of information. Whether the two components of compliance – facilitative measures and enforcement measures – should be addressed in one or separate bodies and how the transition between the two should be regulated is a further unresolved issue. The EU and many environmental associations prefer, for instance, a Compliance Committee with two separate branches, arguing that facilitation and enforcement call for fundamentally different approaches.

Nor has it yet been agreed upon which information can be used to trigger action by the Compliance Body. Proposals range from limiting information to that provided by the parties to the other extreme that the Body can decide itself which sources it considers appropriate. The latter proposal would imply that independent experts – and thus also environmental groups – could submit information to the Body, the Secretariat or another organization that passes the information on to these. The Council considers a limitation to information provided by the parties as too restrictive; the admission of independent experts should therefore be considered.

Various models have been proposed to prevent non-compliance arising at the end of a commitment period. These include an annual review of the balance between emission rights and actual emissions (Hargrave et al., 1999). Emissions trading will be a special feature of the Kyoto Protocol. There is a danger that parties sell emissions rights prematurely, and then need them themselves at the end of the commitment period. This could be remedied by prohibiting the sale of emission rights over which a party does not yet effectively command, for instance because it anticipates these rights as an outcome of future abatement measures. A further issue important in connection with emissions trading is that of liability, i.e. whether the seller, the buyer or both are liable in the event of non-compliance of the selling party (Hargrave et al., 1999).

It has not yet been decided how the procedure for determination of non-compliance is to be designed and which consequences can follow. Prior information on the consequences of non-compliance promotes predictability and compliance efforts. A particularly important aspect is, in the opinion of the Council, that the consequences of non-compliance are such that the damage caused by non-compliance (that is to say the excess emissions) is remedied by measures that save at least the same quantity of greenhouse gases without any major delay. An interesting proposal in this context is the establishment of a Compliance Fund (Wiser and Goldberg, 1999) into which parties could pay that are at risk of non-compliance. The fund would be used to finance projects that have a reliable greenhouse gas abatement impact. This fund would have the potential to develop an additional technology transfer benefit if projects were carried out preferentially in developing countries. The drafts of the working group that are to be debated at the next sessions of the Conference of the Parties also discuss a 'compliance action plan' that would give the parties the opportunity to prepare a detailed restoration plan soon after determination of non-compliance.

As possible forms of punishment for non-compliance, political, economic or Protocol-internal sanctions are under debate. This could mean, for instance, the loss of voting rights in the Meeting of the Parties to the Protocol, public announcement of non-compliance, money fines and trade restrictions, or, finally, an obligation to purchase emission rights or a curtailment of the right to engage in emissions trading. In the interests of achieving the objectives of the Climate Change Convention and the Kyoto Protocol, it is key that an expedient balance between 'soft' man-

agement measures and 'hard' punishment measures is found that enjoys broad-based acceptance, provides strong incentives to implement commitments and thus largely prevents non-compliance.

Because of the particularly important role of the ozone regime, not least in the design of the climate change regime, its compliance system is presented in Box C 4.4-1.

C 4.5 Recommendations for action and research

The case studies present an array of useful elements of institutional design that play a considerable role within the context of international compliance systems. Previous sub-sections have already highlighted continuing deficits in design and possible improvements to the various regimes. The institutional design of international compliance systems harbours a special potential to contribute to the success of the overall regime and should therefore be organized accordingly. Although the specific structure of each core problem of global environmental change can call for special features, the characteristics set out in the following are particularly promising.

Box C 4.4-1

Compliance in ozone policy

As in other issues, too, the ozone regime was innovative in compliance issues and pointed the way for the development of the climate change regime. At first sight, both the 1985 Vienna Convention for the Protection of the Ozone Layer and its 1987 Montreal Protocol make provision for the normal methods under international law by which to handle non-compliance of individual states with a treaty. Thus parties can submit a case to the International Court of Justice (ICJ), can establish arbitration tribunals or seek the 'good offices' of third parties, and enter into mediation and conciliation procedures. However, such bilateral and – particularly with regard to the ICJ – more confrontational methods hold little promise of success in real implementation. After all, a state usually does not infringe such important agreements as the Montreal Protocol deliberately, but rather due to lack of capacity or due to general financial problems.

Consequently, the states agreed in 1987 in Montreal to create a special non-compliance procedure which was finally enshrined in 1992 when the Montreal Protocol entered in force (Ehrmann, 1998; Ott, 1998; Victor, 1998). This procedure revolves around an autonomous body of the state parties, the Implementation Committee, made up of ten representatives of states elected by Meetings of the Parties according to a regional key. This Committee has two functions. The first is information procurement: It collects data on potential non-compliance by individual parties, can commission the Secretariat in Nairobi to collect further information, and can also carry out investigations itself within the countries concerned with their approval.

In addition, the Implementation Committee is also a forum for negotiations on agreeing appropriate measures if a state is actually found to be in non-compliance. Every party can submit complaints about other parties to the Committee and the Secretariat can notify the Committee of potential non-compliance by individual states. Not least, parties can notify the Committee themselves if they are unable to comply with reduction commitments under the Treaty or other provisions.

In such cases, the Committee should seek to arrive at a solution by common consent. In each case the Meeting of the Parties takes the final decision, and has already adopted a list of conceivable remedies. The Meeting of the Parties can thus provide positive incentives to bring the state back into compliance, for instance by offering to provide assistance in the form of funding and pollution control technologies. Theoretically, the Meeting of the Parties could also create negative incentives, for instance by withdrawing certain rights of the parties, or imposing trade restrictions pursuant to Article 4 of the Protocol. In the case of a developing country, the right to financial and technology transfer could be withdrawn as a 'punishment' for non-compliance. However, it is scarcely conceivable that the entitlement of a developing country pursuant to Article 5 to delay for ten years its compliance with the control measures set out in the Protocol is really withdrawn if the country fails to comply within that ten-year grace period. Moreover, the London Amendment to the Protocol determined de facto (although not de jure) that developing countries are to be exempted from the non-compliance procedure if the country can furnish proof that non-compliance was caused by inadequate assistance being provided by the industrialized countries (Biermann, 1998a, b).

Until now, the non-compliance procedure has concerned mainly Russia and other eastern European states. In 1987, when they still acted jointly within the context of the Council for Mutual Economic Assistance (COMECON), these countries had agreed to the same reduction commitments as the western industrialized countries. However, following the upheavals of 1989, it became plain that in eastern Europe and the Russian Federation the phase-out schedule for CFCs and the other substances would no longer be achievable. Moreover, most eastern European states failed to make their payments into the Multilateral Ozone Fund for developing countries, demanding instead financial support for themselves. Here the Implementation Committee has pursued a cooperative strategy: The GEF provides funds to advance CFC phase-out in eastern Europe and Russia, and the relevant international organizations and programmes (UNEP, UNDP, UNIDO and the World Bank) contribute to supporting Russia (Victor, 1998).

The great 'test' of the non-compliance procedure will come when the developing countries as a group are obliged to cease producing and using CFCs and other ozone-depleting substances. The Council recommends continuing to pursue here, as before, the cooperative, non-confrontational approach of the Montreal Protocol.

C 4.5.1
Procedures for acquiring information on the state of implementation

The case studies have shown that efforts to gather relevant information on the state of implementation rest above all on reporting. The in some cases highly detailed obligation of governments to report on their national implementation efforts permits a review of successes and failures of past policies, thus building a basis for improved, forward-looking measures.

- Past experience shows that the *obligation to report* on policies taken by member states to implement their commitments is an indispensable prerequisite to international compliance systems. At the national level, the obligation to take stock of efforts and outcomes yields a review of the relevant policy measures while at the same time strengthening the accountability and communication of national authorities. In order to ensure that reports are uniform and comparable, it is recommendable to prescribe detailed, standardized international reporting formats. The example of the desertification regime shows that it is expedient for the secretariat to provide support to countries in preparing their reports where any such need arises.
- Moreover, the Council recommends more far-reaching information acquisition rights, such as the queries and ad-hoc on-site inspections by international bodies provided for in the ozone regime and in the CITES regime. Where there is a need, targeted queries can be made to clarify imprecise or incomplete statements. Besides enhancing the information value and thus comparability of reports, such procedures can have a preventive effect by inducing states to provide information that is as precise and truthful as possible.
- The example of the desertification regime shows that, besides state reports, participation and support by non-governmental organizations is important, particularly in the early stages of compliance procedures. In the desertification regime, NGOs can participate in the elaboration and initial execution of action programmes, and are thus involved directly in implementation. NGOs serve as a valuable interface between the local, national and international levels, and ensure that civil society concerns are heard. The Council recommends also creating such communication channels in regimes in which NGO participation is not integrated directly. At the very least – as in the Great Lakes regime – regular workshops should ensure such feedback.
- Involvement of environmental groups has also proven useful in gathering and processing information, and in preparing guidelines for implementation and training programmes. CITES is an example of valuable cooperation in this regard (WBGU, 2001). In other regimes where there are reservations against or reticence vis-à-vis an institutionalized transfer of tasks, it is important to select NGOs in such a way that trust is built. The implementation of the goals of the Desertification Convention means a learning process for governments and NGOs alike; as a result, the Convention fulfils an important function in promoting 'good governance'. Because, due to its strong links to poverty alleviation, the Desertification Convention has, as a 'development convention', a special position among global environmental agreements, it could also be used by donor states to provide stronger support to the social development of poor countries.
- An interesting option is under debate in the climate change regime, namely to involve *certified* private-sector auditors in the acquisition of information. These would need to be linked formally, through appropriate reports, to the secretariat or – where such a body exists – a special committee. This would have the advantage that such auditors would be on site more often, possibly continuously, in the countries party to the agreement, and could check country data independently and painstakingly.
- The role of (already existing) autonomous scientific bodies in compliance systems also needs strengthening. As exemplified by the desertification regime, more effective monitoring of compliance requires the development of a 'core set' of global indicators and guard rails. In contrast to the Climate Change Convention and the Montreal Protocol, the Desertification Convention process has not (yet) stipulated any quantitative, definable and verifiable reduction or protection targets for a given period. This would presuppose the definition of, for instance, permissible maximum limits of soil and land degradation. To determine such a reference parameter, guard rails of worldwide soil degradation would need to be estimated (WBGU, 1998a), i.e. concrete values whose transgression would lead to a state of the environment that is irreversible and poses a threat to human life. In this field there is an urgent need for research.
- By providing the most recent scientific knowledge, regular scientific-technical inventories of the environmental situation make it possible to concretize treaty commitments, for instance by identifying guard rails as a basis for reduction or protection targets. This enhances international

responses. Appointments to such a scientific body should be geographically balanced. Members should be independent scientific experts; this is essential in order not to create a second political subsidiary body and in order to ensure that it concerns itself exclusively with scientific tasks. In general, the way in which such a body is organized and operates could be modelled on the IPCC, which fulfils this task within the context of the climate change regime.

- For the above reasons, the Council proposes the establishment of an international, independent scientific panel of experts for global soil protection – an 'Intergovernmental Panel on Land and Soil'. The output of such a panel could lend more objectivity to the debate on international soil protection. The scientific community would also benefit from improved coordination and networking. When establishing a land and soil panel, the Council recommends building upon the experience gained with UNEP and the IPCC in order to avoid design flaws from the outset.

C 4.5.2
Procedures for assessing reports and for deciding on international responses to implementation deficits

When assessing available information, appraisal and decision-making functions remain the purview of the principal organs in which representatives of state parties meet (Conference of the Parties, Joint Commission). In regimes with a large number of member states, these are often preceded by reviews and summaries carried out by, for instance, the secretariat (ozone regime), expert review teams or an implementation committee.

- Past developments in the regimes studied underscore the expedience of transferring the task of organizing and summarizing national reports to the secretariat or a special body. This facilitates processing, assessment and summarising – of both factual and legal aspects – of the numerous and voluminous reports.
- Concerning response measures, the Council recommends considering the establishment of a special, legitimized body. This makes it possible to address implementation difficulties rapidly and to find solutions by common consent, even during the intersessional phases between meetings of the Conference of the Parties. In the ozone regime, this strategy has demonstrated its value in the case of Russia and a number of eastern European states, and appears transferable to other regimes. The sessions of this body should permit the following procedural steps, among others: Evaluation of relevant information, questioning of the member state concerned, analysis of reasons for implementation deficits, deliberation and negotiation on necessary measures and, where the case requires, taking a decision or making a recommendation concerning a measure to the Conference of the Parties, with an explanation of the reasons for this decision. In view of its crucial decision-support tasks, the body should be composed of representatives of states according to a previously defined key, to which a number of experts and scientists are attached. Firm procedural criteria can build trust. Continuity of work can be ensured best through a standing body that becomes active upon the request of previously specified actors or bodies.
- The desertification regime illustrates the problem that implementation is often reduced to elaborating national action programmes and their financing by OECD countries. The Desertification Convention, however, provides a much broader framework, because it has the potential to serve as the starting point for developing comprehensive sustainability policies for the countries concerned and for developing democratic structures. Its special value lies in this function as a catalyst of comprehensive social development. The Council is therefore of the opinion that stronger financial commitment is essential for the conventions ability to continue to advance its goals. The Council recommends reversing the downward trend in funding for official development cooperation, in order not to jeopardize the implementation of the Desertification Convention over the long term. As the Council has recommended repeatedly elsewhere (WBGU, 1994, 1998a–2001), it would be appropriate in view of the mounting pressures in the age of global change to aim at a target of 1 per cent of gross national product for official development cooperation (WBGU, 2000a). The World Summit on Sustainable Develepment could be used as a springboard from which to take the plunge.

C 4.5.3
Tools for responding to difficulties and implementation deficits

Concerning responses to implementation deficits, the case studies reveal a great variety of arrangements. While in the Great Lakes regime the Joint Commission can only make recommendations, there would appear to be agreement in the climate change regime that provision should certainly be made for political,

economic or protocol-specific sanctions for non-compliance. Although hard responses could have been forthcoming, in the ozone regime the Implementation Committee took a largely cooperative stance in the case of Russia and a number of eastern European states. In the desertification regime, too, hard measures would not appear to make any sense, as non-compliance can scarcely be determined. For this, there is a lack of both concrete commitments with specified schedules, and sufficiently accurate base line data and monitoring systems for observing and assessing soil and land degradation in arid regions.

These findings and the fact that most instances of non-compliance are attributable more to incapacity than to a lack of will bring cooperative avenues to the fore. Such non-confrontational measures enhance international relations through their partnership aspects and thus promise more transparency and honesty. However, guaranteed tools to support compliance that are not linked to preconditions can be undermine the motivation to implement commitments out of a party's own financial means. Moreover, it needs to be noted that in some cases concerted sanctions have indeed contributed to swiftly remedying implementational deficits (CITES is a case in point, see WBGU, 2001). The Council therefore recommends providing for various avenues by which to respond to implementation difficulties and non-compliance, in order to permit flexible decision-making from case to case that is appropriate to the reasons for the implementational difficulties. The painstaking evaluation of all relevant information that this requires can be ensured by the special committee discussed above. The option of being able to take both confrontational and non-confrontational measures also has the benefit of reducing the risk that, due to reliance upon external assistance, less national budget funds are earmarked for implementation activities from the outset.

The concrete implementation of response decisions should be supported by the implementation body recommended above. After an appropriate period of time, it is further recommendable to review the impacts and expedience of the measure chosen.

Particularly considering the present debate on compliance in climate policy, it is essential to concentrate on non-confrontational measures in order to place countries in a position to implement their commitments. Overall, this would do more good to the climate than strict sanctions, which could have the further disadvantage of making accession to the Protocol and adoption of commitments unattractive to many states. Nonetheless, there is a tendency for many states to desire a stricter compliance system, because the legally binding nature of the commitments and the binding goals of the Protocol require means by which to enforce them. Consequently, besides supportive policies, for competition reasons among others it is necessary that the compliance system is not all too weak, in order to encourage parties to implement targets and avoid 'freeriding'. Consequently, the Council is opposed to introducing 'borrowing', i.e. utilizing emission rights from later commitment periods.

In the technical review of compliance, an involvement of the private sector in the shape of certified auditors is recommendable. However, arrangements must be found that guarantee strict neutrality of review. Here a participation of private actors as sources of information (via submission of such information to the secretariat) and as observers in non-compliance procedures is desirable.

Concerning the debate on automatic sanctions, the degree to which these should be introduced needs to be weighed carefully. An indicative list of consequences of non-compliance is albeit called for by Article 18 of the Kyoto Protocol, and has the potential to shorten protracted negotiations and to provide a reliable basis for predictable responses. Nonetheless, both the negotiation of such a list and its later application are problematic. An all too strict application of automatic sanctions could lead to some states feeling themselves treated unjustly and others shying away from signing and ratifying the Protocol. The Council therefore considers it advisable to keep responses to infringements of obligations flexible within certain limits and to adjust them to the individual case in hand.

C 5 Local and national implementation: Education and Local Agenda 21

C 5.1 Introduction

The effect of international agreements is only as good as the implementation of their global aims on the national and local level, and the extent to which this is done effectively, efficiently and equitably. Conventions must ultimately manifest themselves in changes to products and production practices, but also in changes to environmentally relevant attitudes, values and patterns of behaviour, in other words, to lifestyles in general. These types of implementation can initially be launched through laws or economic measures with immediate effect, but also by means of strategies for raising awareness over the longer term. Such strategies include public discourse, round tables or environmental education programmes geared to different target groups.

Most international agreements on global environmental problems commit governments to promoting awareness-raising and transforming lifestyles, but also to increasing knowledge and transferring skills relevant to more prudent use of natural resources. In this context, explicit reference is made to education processes in schools and universities, and indications are given of the range of non-school contexts in which learning for sustainable development takes place. Thus the Framework Convention on Climate Change (Article 6), the Biodiversity Convention (Articles 12 and 13), the Desertification Convention (Article 19), the Rio Declaration (Principle 10) and Agenda 21 (Chapters 28 and 36) contain appeals to all governments to support and implement such educational processes. An important forum for an integrative discussion of environment and development problems is the UN Commission on Sustainable Development (CSD) (Section E 1.4).

Implementation of Agenda 21 and CSD recommendations takes place on different levels. Thus in the EU, for example, numerous institutions have been set up and entrusted with national implementation of solutions to (global) environmental and development issues. These have produced such programmes as the 5th (EC) Environmental Action Programme as instruments for implementing the aims of sustainable development. There is intensive exchange between the various committees and working groups of the EU and the CSD. In the EU, EUROSTAT provides a statistical foundation for sustainability policy. EUROSTAT is also involved in the CSD work programme to develop sustainability indicators. In 1993, the European Environment Agency (EEA) came into existence, an institution devoted to providing environmentally relevant information.

For activities relating to worldwide education programmes, the responsible body is UNESCO. Thus any CSD activities in the educational sphere come into UNESCO's remit, whereas other CSD projects are managed by the CSD Secretariat in New York, which makes unified or networked activities more difficult.

C 5.2 Learning for sustainable development – status and progress

In this chapter, illustrative analysis will be made of two action areas that are closely interlinked. The first concerns approaches in the area of formal education (e.g. in schools or universities), and the second concerns programmes and activities at municipal and regional level (especially those pursuing LOCAL AGENDA 21 (LA-21) processes).

C 5.2.1 CSD initiatives

PRINCIPLES FOR THE LEARNING PROCESS

In 4th and 6th sessions of the CSD, a work programme was passed for implementation of Chapter 36 of AGENDA 21 on 'Promoting Education, Public Awareness and Training'. In 1997 an international conference was held in Thessaloniki, Greece, on this theme for which UNESCO had prepared the pioneering document 'Educating for a Sustainable

Future: A Transdisciplinary Vision for Concerted Action'. This cleared away a number of misconceptions surrounding the concept of 'learning for sustainable development':

- The objective is not learning *about* sustainable development but learning *for* sustainable development (including the options for action).
- Learning for sustainable development is not restricted to environmental education, but must also include and take equal account of social and economic dimensions.
- Learning for sustainable development is not the responsibility of the education ministries alone, but touches on all policy areas (environment, employment, transport, etc.) and affects all social groups (and not just school and university students).
- Learning for sustainable development must not be confined to children, but needs to be understood in sustainability terms as part of a lifelong process.

UNESCO carries out information work in an attempt to disseminate this specific understanding of the concepts. At the CSD's 6th session (1998), education for sustainable development was given further concrete definition.

Public awareness and understanding

For people to be able to participate effectively in activities on sustainable development, they need to have some prior background knowledge. Local activities present the best prospects of success in this respect, because they are more likely to awaken individual interest, which opens up the opportunity for informal education processes at municipal level, as well as for local environmental programmes in industrialized and developing countries (UN-CSD, 1998).

Since the facts underlying environmental and development issues are very complex, and hence difficult to communicate, educational approaches for sustainable development must start with simple examples from everyday life without neglecting, however, to place the problem in its global context. It follows that education for sustainable development must be geared to the specific target group, embrace many domains of knowledge, and integrate learning into all spheres of life. This necessitates improved cooperation between the different disciplines of the social and natural sciences (WBGU, 1996; UN-CSD, 1998).

Changes required in the formal education system

It is of prime importance to make space in the curriculum for the interrelationships between ecology, economy, culture, and social development. This also includes the transmission of ethical values, cooperative behaviour and solidarity of action. These changes must be carried through at all levels (school, vocational training and professional development) (UN-CSD, 1998).

Interdisciplinary approach

Education for sustainable development calls for interdisciplinary analysis and problem solving. Admittedly, subject-specific theory is a prerequisite for deep-seated knowledge and understanding; however, many discoveries which bring about important future advances are made at the boundaries between different disciplines (WBGU, 1994, 1997). The rigid boundaries that still persist between academic disciplines should be made more flexible; the same opportunities for professional advancement must be made possible within interdisciplinary contexts (WBGU, 1994; UN-CSD, 1998).

C 5.2.2 National activities on education for sustainable development

Since the 1992 Rio Earth Summit, educational activities have been initiated in almost all nations of the world which transcend mere environmental protection to cover the complexity of the sustainable development approach (WBGU, 1996). A general increase in educational endeavours can be noted, but this varies widely from nation to nation. Now as ever it is difficult to gain a systematic overview and thus to undertake any evaluation of global activities. However the following examples of national initiatives give a good insight into the breadth of variation among the programmes.

In *Germany* environmental education has been a familiar concept for over 20 years. Since UNCED the economic and socio-cultural dimensions have increasingly been integrated, in line with the principle of education for sustainable development. In spite of this, the term 'sustainable development' is only familiar to 13 per cent of the German population (Kuckartz, 2000). In 1998, in a forward-looking initiative the Permanent Committee of the Federal Government and the Federal States on Education, Planning and Research Promotion (BLK) issued a guidance framework on education for sustainable development (BLK, 1998). Meanwhile a comprehensive project was launched under the title 'Learning to shape life in the 21st century', one element of which is implementation of the CSD-defined model in the secondary school curriculum of each German federal state (BLK, 2000). The total volume of funding for the project, in which 14 federal states are involved, amounts to DM25 million over five years. Likewise,

concepts for higher education contain similar objectives to those developed in the CSD papers. Thus, in accordance with the guidelines, there should be increasing promotion of cooperation between the natural and social sciences, environmental education should be oriented towards 'ecological futures research' and should incorporate the idea of feedback loops between human action and natural systems. Research and theory should also contribute to finding local solutions to problems. To this end, transparency must be improved between universities, business, local government and citizens (BLK, 1998).

In *The Netherlands* the government programme 'Extra Impulse to Environmental Education', comparable to the BLK guidance framework, is overseen by the National Committee for International Cooperation and Sustainable Development (NCDO). Furthermore there is also a Dutch Inter-Departmental Steering Group on Environmental Education, a composite body from six ministries. Such a pooling of sustainability activities has been seen in very few other countries to date. This approach offers special advantages in international consultation and cooperation. It is a way of avoiding duplication of effort and parallel developments.

Where can evidence be found in school and non-school learning contexts of the reforms to educational institutions which are so widely called for?

In *Germany*, school-based education still often places the emphasis on the environmental dimension. But here and there, some schools are already addressing the theme of sustainable development on several levels. For instance, in Duisburg there is an 'Agenda school' where the school curriculum, architecture, equipment and school routine have been redesigned according to aspects of Agenda 21. The motto 'Think globally, act locally' is borne out, for example, in the use of rainwater for flushing toilets, in the rooftop planting schemes and in the pedagogic emphasis on social learning and environmental and media education (caf/Agenda-Transfer, 1999). Within higher education, the concept of the Sustainable University of Lüneburg is an equivalent example. The German UNESCO Commission launched an Internet training programme for teachers in the summer of 2000 to deliver professional training on sustainable development (www.blk21.de).

An evaluation of non-school-based environmental activities in Germany from the years 1998/99 revealed that, with approx. 4,600 institutions involved, a far greater number of activities in the sphere of environmental education were on offer than had been thought (Giesel et al., 2000). However the themes of Agenda 21, energy production and energy saving, consumption and quality of life, which should gain in importance as the discussion proceeds on a sustainable Germany, are only dealt with in barely a third of the environmental education establishments surveyed. This shows that the progress of public discourse on sustainable development outpaces the capacity of institutions to respond to it successfully. Studies demonstrate that there are many institutions critically examining the classic environmental issues of exploration of, experience of and sensitization to nature, and the 'traditional' style of education on environmental protection and nature conservation. For these establishments, extending their programmes across all the themes of Agenda 21 including the social and economic aspects would entail a fundamental change of identity. The Council recommends founding new institutions which specialize in tackling the issues of technology, consumption, mobility, etc., to move them forward with campaigns and to support them financially. In the evaluation it was shown, moreover, that most of the institutions tend to follow traditional teaching methods: Innovative and participatory methods, such as futures workshops, interactive learning programmes and creative methods are only in use in less than one-tenth of the institutions. The Council recommends raising awareness of these methods by presenting successful examples and supporting professional development for such approaches.

Thanks to a multinational initiative launched by the United Kingdom, Germany, The Netherlands and Sweden entitled 'Sustainability Centres in the North Sea Region' (SCNR), support has been granted for the establishment of so-called sustainability centres in Europe. Some of the goals to be pursued in these centres are establishing indicators and criteria for sustainable spatial planning, and gathering pilot projects in which the principles of sustainability have already been manifested in practice. The project involves local authorities working together with planners, universities, NGOs and private actors. A subsidiary goal of the SCNR is the formation of a university network for sustainable development, the Sustainability Centres Universities Network. Such networks still have great rarity value and the Council rates them as outstanding models which are worthy of support.

In the *Czech Republic* more than 1,000 schools are involved in 15 environmental education projects. In part these are international projects (e.g. GLOBE on the subject of ozone). The projects have undergone a transformation from purely knowledge-based to largely activity-based learning units. A pilot project for environmental education exists in Northern Bohemia, the region with the worst damage to the landscape and the highest levels of air pollution in the Czech Republic. In cooperation with a German partner organization, model programmes are to be

Box C 5.3-1

Pilot bottom-up projects: Implementing sustainable water supply

Time and again the importance of bottom-up movements is emphasized if projects are to operate successfully. This is demonstrated for example by the Water Bank Project in Thailand where villagers and NGOs were actively involved in the construction of a rainwater capture basin, also motivating other people to participate. Often people from smaller ethnic groups or from rural regions are very distrustful at first when approached by outsiders; in some cases, showing respect for their religion can be a major factor in obtaining access to particular population groups. Ideally, development workers should live alongside them in their village and become familiar with the village routine in the place where innovations are to be implemented, as demonstrated by a water project in Deccan Trap, India. Here the inhabitants of three villages were presented with new irrigation techniques by assistants who had based themselves in the village and shared the usual hardships of everyday life with the village population, which strongly raised the efficacy of the project (UN-ECOSOC, 1998). Key factors in successful projects are also public information campaigns and close cooperation among different institutions (such as cooperation between the local administration, health authority and citizens in the successful implementation of water and sanitation projects). Where new technologies are being implemented in a developing country (for example a solar cooking system in Kenya and the Honduras) it is important that future users from different cultural contexts, with particular habits and socio-cultural norms, are given targeted instructions and that plans are made for education or training accordingly. moreover, the maintenance and care of these items of equipment must be ensured, for example by a voluntary helper, in order to maintain successful developments in the long term. This was made clear by a water pipe project in Nepal in which a village was equipped with new sanitation pipes. Particularly in projects on freshwater management, it is seen time and again that water is not only an economic but also a social resource (WBGU, 1998a): Joint activities on water management can lead to better relations between neighbours and shared experiences of success, as was the case in the above cited Water Bank Project in Thailand. In tandem with a reward system, maintenance projects in which inhabitants of different neighbourhoods work side by side can take on a folk festival character, as a municipal sanitation project in Ghana showed. There, a monthly prize awarded to the cleanest region led to community campaigns which brought together members of several neighbouring districts and which were very positively evaluated by the population (UN-ECOSOC, 1998).

developed here. To step up the LA-21 process, which has not yet advanced very far in the Czech Republic, better communication shall be fostered between locally active organizations and institutions and teacher training events shall be supported.

The *Baltic coastal states* have given birth to the Baltic Sea Project, a school-based environmental education project. The emphasis of the programme is on raising pupils' awareness of environmental problems which affect the Baltic Sea and its cultural, social and ecological dimensions. The 'Baltic Sea Project' is a positive example of international networking of educational initiatives in the school sector. Such networking should be reinforced by ensuring that initiatives launched by the various conventions, LA-21 activities and individual organizations (e.g. UN, UNESCO, OECD) and NGOs are coordinated to avoid competition or duplication of effort.

International conferences, even if they are not always productive in scientific terms, are important in that they draw attention to cross-border problems and appropriate management strategies. International conferences on environmental education have in the past been organized by individual nations, such as the 7th Conference of Environmental Education in Europe, in Italy (2000). A world conference on education for sustainable development could promote the theme even better.

C 5.3 Successful Agenda 21 activities

The aims of AGENDA 21 and various conventions are to some extent also implemented by means of LA-21 processes (WBGU, 1998a). There has been a strong upturn in these activities worldwide. In 1996, 1,812 LA-21 processes were counted in 64 countries (ICLEI, 1997). The bulk of these processes were in Europe: 1,576 European municipalities (87 per cent) engaged in a LA-21 process, 236 LA-21 processes (13 per cent) were counted in Africa, Asia, Australia, the Middle East, North America, the Caribbean and South America. Despite these figures it should be borne in mind that public awareness of such projects is still very low: Thus in Germany only 15 per cent of respondents stated that they had heard of a LOCAL AGENDA 21 group in their own district (Kuckartz, 2000). According to ICLEI estimates, by now there are around 5,000 municipal bodies working on the issues of LA-21. The trend has shifted since 1997: Most of the LA-21 processes are still being carried out in Europe (approx. 75 per cent), but a rising number of local authorities are involved in Africa, Asia and South America (ICLEI, 2000). In many countries, thriving examples of bottom-up movements can be seen, for instance implementing local water projects. Often these projects are not directly attributable to the LA-21 initiative, but nevertheless it is pre-

cisely here that the 'spirit of Rio' is being put into practice (Box C 5.3-1).

Support for German LA-21 processes is expected to come from three landmark steps taken by the German federal government in accordance with its resolution of 26.07.2000: A 'Green Cabinet' (*Staatssekretärsausschuss für Nachhaltige Entwicklung*) was convened, a 'Council for Sustainable Development' (*Rat für Nachhaltige Entwicklung*) was founded and a new 'Sustainability Strategy' was passed as a maxim for political action. These three elements should contribute to implementation of the resolutions adopted in 1992 at the Conference on Environment and Development in Rio de Janeiro.

Findings from awareness-raising projects

Experience from projects with young people indicates that when dealing with sustainable development themes, it is important to 'speak the students' language' because otherwise there is a danger that they will sideline the activities as 'green issues' and show no further interest. A successful approach to enthusing young people about environmental and health education was an interactive radio show in Kenya, for example, in which information and entertainment were combined in a highly effective way (UN-ECOSOC, 1998).

In local education work, the experiences and knowledge of older people should also be utilized, since they can often call on skills that external development workers do not possess. When indigenous knowledge comes into play, however, it is often the case that different people suggest different practices. If curriculum development draws on the knowledge of indigenous people or long-time local residents for ideas, examples from different regions should be gathered (UN-ECOSOC, 1998).

Evaluation

In so far as it is possible at all to gain a reliable overview of the activities, methods and outcomes, it is evident that to date there has been no scientific basis and, more pertinently, no systematic evaluation of outcomes or effects. The link with a sustainability strategy as a global mission for solving global problems is often undiscernible. Moreover, there is a widespread lack of integration between the different projects and also between different countries, so that there is little opportunity for learning from one another, for raising the motivation to take part and to continue to play a part, but most of all, for systematically pooling and further developing the insights gained. Better coordination of programmes and their sponsoring or initiating institutions could and should bring about more rapid and effective progress in municipal activities focusing on sustainable development throughout the world. Even if the diversity of responsibilities and institutions among individual countries and cross-border cooperation initiatives apparently represent insuperable barriers, the Council makes the case that learning for sustainable development deserves 'sustained' support as a key policy area, and that international organizations such as UNESCO, above all, should be put in a position to work more effectively on the global level.

C 5.4 Recommendations for action and research

Recommendations for action

- Learning for sustainable development (in the sense of formal education measures and local government sustainability processes) must be conceived of as a key component of environmental policy and systematically linked with other strategies (e.g. legal, economic, technological).
- The tendency to mount disparate programmes and projects without follow-up must be countered by integration, coordination and, most importantly, evaluation of actions. To this end, national and international conferences and transnational networks should be supported.
- In all the follow-up conferences to the conventions on environment and development problems, the themes of awareness-raising, education and municipal Agenda 21 processes should be standing items on the agenda, so that recognition is given to the long-term nature of these processes.
- Measures in the educational sphere which pursue the concept of sustainable development and satisfy verifiable criteria of meeting educational objectives successfully must be prioritized for support. All national governments should present a report on this every two years, as is already the practice in Germany.
- There must be better networking within governmental and non-governmental projects and between the two realms; education measures must be more strongly integrated into the (wider-ranging) local government learning processes.
- There should be increased support for cooperation between institutional educational establishments (schools, universities) and Local Agenda 21 initiatives.
- Internal organizational and structural reform of educational establishments on the principle of sustainable development (e.g. in the form of environmental audits, resource conservation, etc.) must be supported.

Recommendations for research

- National and international evaluation studies that go further than the previous practice of collecting 'success stories' must be given more intensive support.
- Investigations of promising educational strategies for sustainable development must be carried out taking greater account of different contexts (economic, technological, socio-cultural framework conditions), different target groups and differentials between educational settings.
- Increased support must be given to interdisciplinary research on new learning concepts, new organizational structures for learning, and innovative awareness-raising strategies on issues and strategic aspects of sustainable development.

Institutional interplay D

International trade regimes and the environment D 1

D 1.1
Globalization processes – the millennium challenge for international environmental policy

Images of street violence during the WTO Conference and the shattered window panes which marked the World Economic Forum in Davos are not the only clear signs that the terms 'free trade' and 'globalization' have gradually become embattled concepts, symbolic of an erosion of social standards, an increase in global differentials between 'rich and poor', a problematic readjustment of consumer lifestyles and for many, not least, contributory causes of worldwide environmental destruction. The two phenomena are also closely connected. Thus, along with the absolute and relative fall in the significance of transportation costs, the removal of trade barriers has been the other principal factor which has accelerated globalization, made it easier to gain access to natural resources worldwide and, by creating additional growth impulses, increased resource consumption and hence also raised emissions. So the processes of globalization also encroach into the field of tension between growth and the environment.

The Council is aware of the contentious nature of the issue, and would like to take a critical look at the field of tension between trade, globalization, economic growth and global environmental problems in a future report, should the occasion arise. The following sections serve primarily to make initial distinctions in the often ideologically-loaded debate on the possibility of disciplining global market forces and, more particularly, to consider the political options for action from the viewpoint of international environmental policy (on controversial assessments Daly and Goodland, 1994; Klemmer, 1999). In view of the theme of this report, the latter is of particular importance.

The globalization of capital, sales and procurement markets, the internationalization of decisions on company locations and the migration of skilled employees rank among the basic characteristics of economic and social development in the past decade which have had simultaneous repercussions on the conditions and options for international environmental policy action (on these developments, see among others Bender, 1998; UNCTAD, 1999; WTO, 1999). There is argument over the ambivalent consequences this has for environmental policy:

- On the one hand, a rise in global environmental problems due to the increase in transportation, growth-induced consumption of resources, increasing incursions into the natural world, expansion of the worldwide volume of production using materials and processes with the potential to harm the environment, along with diminished options for national controls and protective provisions against multinational enterprises and cross-border value-creation chains;
- On the other hand, an expansion of worldwide knowledge transfer, improved development opportunities for countries which are economically weak and therefore dependent on natural resource extraction, together with an export of standards for conservation of the natural environment in response to increasing global public attention.

Hence the Council warns against a blanket demonization of free trade, the globalization processes it has initiated, and its other consequences. With regard to research it advocates a differentiated investigation of the interplay between trade, globalization and the environment, while under the environmental policy aspect it favours the introduction of supplementary institutional incentives for identification and reduction of global environmental damage. The Council seeks an institutional incentive system which lessens the problematic consequences for the global environment, since these can not be prevented altogether. Beside the question of how such incentives are to be triggered, the principal subject of many debates is the question of who should be responsible for their administration. In particular the role of the World Trade Organization (WTO) and its relationship to worldwide environmental standards is a contentious political issue. Many believe that the interests of the environment would be better served by

selectively influencing world trade first and foremost.

D 1.2
The WTO and international environmental standards

The WTO came into being as part of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT). Its aim is a global liberalization of trade by means of principles such as most-favoured nation and national treatment, banning import quotas and generally preventing discrimination against trading partners (on the structure and development of the trade regime see Helm, 1995; WBGU, 1996; Leirer, 1998; Moncayo von Hase, 1999). From the environmental policy perspective, this function can have critical significance. Protectionist subsidies of environmentally harmful products can be restricted, capital-poor nations are given better access to international markets and foreign investments, poverty and enduring dependency are lessened in this way and possible poverty-induced environmental degradation is alleviated. Competition also creates incentives by encouraging innovation processes so as to make more efficient use of available resources. In sustainability terms this is generally to be welcomed. It is certainly true that – due to growth – other environmental risks may arise, but the causes will have to be sought more in the tensions between growth and the environment rather than in the web of linkages between trade and the environment.

It is worth highlighting the successes of the GATT/WTO regime in reducing protectionist regulations, and the increasing acceptance of international dispute settlement over the former preference for imposing unilateral sanctions (O'Neal Taylor, 1997; Knorr, 1997). As outlined below, such progress perhaps also constitutes an opportunity to enhance environmental protection. However, the continuing disadvantages of the developing countries in the agrarian and textiles markets are noted, and these are inevitably associated with negative impacts on the global environment (such as more intensive land use in the European Union (EU) and discouragement of multifunctional land-use in developing countries). The Council has already commented on this in past reports (WBGU, 1996).

Since the WTO, among its many tasks, must also inspect national regulations for compatibility with non-discriminatory world trade, it can come into conflict with national regulations on environmental protection. It must be said, though, that even though no exhaustive legal clarification of the relationship of the WTO regime with national and international environmental standards is in place, it is already possible to take environmental factors into account by means of various general exceptions in GATT. The main one of these is Article XX of GATT (Box D 1.2-1) where, admittedly, the environment is not explicitly cited as an exceptional case permitting trade restrictions, but measures are declared permissible if they are required to protect human, animal or plant life or health (Art. XX lit. b) and if they relate to the conservation of exhaustible natural resources if made effective in conjunction with restrictions on domestic production or consumption (Art. XX lit. g). However this only applies when trade restrictions based on environmental policy represent neither covert trade barriers nor arbitrary or unjustifiable discrimination between countries where the same conditions prevail.

This article is supplemented by regulations in the ancillary agreements to GATT:

- In particular the Agreements on Application of Sanitary and Phytosanitary Measures, and on Technical Barriers to Trade within the WTO regime likewise allow exceptions to protect human, animal or plant life and health. Moreover, the Agreement on Technical Barriers to Trade expressly mentions the environment as a legitimate purpose.
- In the Agreement on Agriculture, state parties receive a specific exemption from their commitments to reduce national agricultural subsidies for

Box D 1.2-1

Article XX of GATT

General Exceptions

Subject to the requirement that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, nothing in this Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures:
...
(b) necessary to protect human, animal or plant life or health;
...
(g) relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption. ...

Source: WTO

direct payments made on specific conditions under environmental programmes.

- Finally it is worth mentioning that the 1994 Agreement Establishing the World Trade Organization, in contrast to GATT 1947, expressly mentions and thus recognizes the necessity for environmental protection and the goal of sustainable development.

At least since the failed Millennium Round in Seattle (Box D 1.2-2) the call to embed environmental policy standards more firmly in WTO law attracted many supporters in the industrialized nations and their environmental organizations. The EU also supports proposals of this kind. These demands are controversial in that they potentially signal an intention to evaluate production and manufacturing processes in other countries, in which case the other countries, especially developing countries, regard them as unjustified interference in their internal affairs, or even as 'environmental colonialism' on the part of the North.

Cases that have become more widely known are the tuna fish-dolphin conflict between Canada, Mexico and the USA, and the shrimp-turtle case between the USA and several Asian countries. So according to the American law on endangered animal species, American shrimp catchers must use particular nets which prevent or at least reduce the by-catch of sea turtles. Since 1989 the USA has banned the import of shrimps caught by foreign fishers using other types of nets, which led some of the countries affected, such as India, Malaysia, Pakistan and Thailand, to proceed with a case before the Appellate Body of the WTO (WTO, 1998; Altemöller, 1998), in order to defend themselves against the costly impact of the externally imposed process standards.

The challenged US legislation was criticized to the effect that it was not concerned with preventing environmental damage in the country of import, but with enforcing production standards and hence specific environmental protection measures in relation to the country of production or export, which was seen as problematic. Whilst the USA lost this case due to inconsistencies in its legislation – in a step which is fundamental, and important in terms of trade and the environment, restrictive trade practices aimed at excluding products where the production processes were problematic from an environmental point of view were recognized as permissible environmental-policy exemptions under Article XX of GATT. This shows that it would be perfectly possible to use decisions of the WTO court in the course of dispute settlement procedures to give higher status to particular environmental aspects. Thus the Appellate Body of the WTO could set useful precedents for environmental policy.

Should this most recent decision of the WTO court mark a U-turn in environmental policy, a potential for conflict could emerge because many developing countries resolutely resist the *unilateral* imposition of production standards – and here we find an Appellate Court (a kind of expert panel) engaged in a dispute settlement procedure which is setting out an environmental policy that applies to all countries. It remains to be seen how the developing countries would react to such a change of course in environmental policy. The panel in this case undertook a very cautious interpretation of GATT Article XX. The turtles concerned have already been classified as under immediate threat of extinction under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) but the provisions of CITES are not directly applicable because it only bans direct trade in endangered turtles (Art. I-X CITES), but not unintentional killing of turtles in the course of fishing or other human actions such as polluting the oceans via rivers, etc. On the other hand, the parties to CITES expressly acknowledge in their preamble that 'peoples and States are and should be the best protectors of their own wild fauna and flora', which again contains a certain obligation to take account of aspects of endangered species conservation.

On the one hand, the USA could not resort to the argument that it was using its trade laws to proceed against developing countries' breaches of CITES, because – as long as there was no international trading in the unintentional by-catch of turtles – the standard shrimp-catching methods did not constitute a breach. On the other hand, the CITES preamble contains 'voluntary commitments' and the turtles' migrations cover both the high seas and territorial waters within the exclusive economic zone, so that here the USA was able to assert a particular conservation interest, which was also acknowledged by the court. In the judgement of the WTO Appellate Court, however, there was no possible justification of the USA's import ban according to GATT Art. XX, one reason being that the USA had failed to enter into negotiations with the governments concerned over protection of the sea turtles. In the final analysis it is wholly justifiable to take account of environmental aspects in the course of dispute settlement procedures. However, representatives of the developing countries retort that instead of unilateral import bans, the protection of turtles in the Indian Ocean should be supported in the form of direct technology transfer, for instance by way of the Global Environment Facility (GEF).

These two types of measures must not be seen as stark alternatives, but instead an environmental approach must be found which involves a balanced

Box D 1.2-2

The World Trade Organization (WTO) Ministerial Conference in Seattle – An environmental evaluation

The third WTO Ministerial Conference in Seattle in December 1999 failed in its attempt to launch a new multilateral liberalization round. The reasons for this failure are varied and reflect the extremely heterogeneous interests of the individual states and groups of states. The intention of the European Union (EU) was to introduce a comprehensive new liberalization round in the WTO framework (the so-called 'Millennium Round'). The foremost aim of such a round would have been the further advancement of efforts to liberalize international trade. Furthermore, almost all of the themes currently under discussion as part of the process of international trade regime formation would have become the object of WTO negotiations, for example extending regulations in the sectors of agriculture and services, dismantling duties for non-agricultural products, creating a multilateral framework of regulations covering international investments, international competition policy and the treatment of environmental and social policy aspects.

The comprehensive agenda requested by the EU was at odds with the substantially more restrained interests of the USA and the developing countries. In particular in the clarification of many unresolved questions in relation to international trade and environmental protection, the EU found itself on the defensive and virtually without allies on such issues. Whereas the USA showed little interest in environmental policy questions and concentrated more on improved market access – e.g. in information technology and services – the developing countries vehemently opposed any increased consideration of environmental and social standards in the WTO regime because they see low standards as a key competitive advantage in the global market. They reject the demands of industrialized nations for harmonization of environmental and social standards with the accusation that their only interest is to use environmental protection as a subterfuge for sealing off their domestic markets against products from developing countries ('eco-protectionism'). The developing countries emphasize their need to catch up in economic development terms before they are in a position to introduce the same standards as the industrialized nations.

These conflicts of interest make it clear that the dismantling of trade barriers collides in many cases with the goal of avoiding negative environmental impacts from trade activities. The relationship between trade and the environment includes numerous points of intersection, which so far have not been satisfactorily regulated under international trade and environment law. Only a small number of aspects were articulated in Seattle. From the environmental policy perspective, clarification would have been desirable particularly of the following questions:

1. How can the relationship of the WTO to multilateral environmental agreements be regulated?
2. What criteria and procedures should be applied in determining the permissibility of trade restrictions based on production standards and environmental labelling?
3. How can the precautionary principle be anchored in the WTO agreements?

These essential aspects of environmental policy were not given systematic treatment in Seattle. Accordingly, there remains a great need for action. Along with agriculture, which has fundamentally close links with the environment, centre stage from the environmental policy perspective was given to biotechnology. The USA and Canada pressed to achieve better market access for genetically modified products. For this purpose, they wanted a working group to be deployed within the WTO framework to investigate the linkages between biosafety issues and trade aspects. The EU took a fundamentally different line on genetically modified organisms (GMOs). Emphasis was placed on the precautionary principle, which is intended to give states the right to impose import restrictions where there is insufficient scientific knowledge of the potential risks of GMOs. At the same time, treatment of the issues within the scope of the WTO agreements was rejected, reference being made instead to negotiations on the Biosafety Protocol which had not yet been concluded at that time.

During the course of negotiations the EU retreated from its original viewpoint and thereafter supported the treatment of biosafety questions by a WTO working group. Ultimately the Ministerial Conference could not reach agreement on a joint statement, and therefore no WTO working group on biosafety issues could be convened. This is a positive outcome from the environmental policy perspective. The treatment of biosafety questions should remain the brief of the Biodiversity Convention process. Thus, the agreement achieved in Montreal at the end of January 2000 on a Biosafety Protocol to the Biodiversity Convention is to be viewed as a major success. If the decision had been taken in Seattle to establish a WTO working group on biosafety, then this could have been interpreted as according higher value to WTO rules. This would have set a worrying precedent that could have critically weakened other multilateral environmental agreements.

The discussions in Seattle on the right forum for dealing with questions of biosafety highlight the great need that exists for clarification of the relationship between multilateral environmental agreements and trade aspects. Since the WTO Ministerial Conference failed in this respect, these aspects will be dealt with as before in the WTO Committee on Trade and Environment. Legally binding decisions, however, can only be taken at the next Ministerial Conference.

Nonetheless, the events of Seattle should have an enduring influence both on the further institutional design of the international trade regime as well as on international environmental policy. More than ever, the Ministerial Conference has aroused an extraordinary level of public attention. The violent protests on the streets of Seattle, which ultimately led the city to declare a state of emergency, summon the National Guard and impose a curfew, will not be forgotten quickly and should have a considerable influence on the process of future WTO negotiations. The protests are an expression of how the political responsibility for the negative consequences of globalization processes is increasingly attributed to the WTO. In future, discussions and negotiations on the relationship between trade and the environment will have to be conducted under the watchful eye of a highly alert civil society.

combination of both. The Council believes that under certain circumstances the dispute settlement procedure could become an useful option for the inclusion of environmental concerns in the world trade regime, although it remains to be seen how much use the Appellate Body will make of the powers available to it for environmental purposes. This applies most of all in relation to so-called unilateral standards.

Unilateral standards, as the protests in Seattle showed, are what numerous environmental pressure groups want. They are calling for general environmental standards which embrace production processes in order to protect global environmental resources. The consider the sanction mechanism of the WTO, which permits unilateral trade sanctions, an effective lever for the implementation of otherwise 'toothless' environmental agreements (WBGU, 1996; Chittka, 1996). In contrast, developing countries continue to fear the use of such environmental protection standards as a method of protectionism for undermining their competitive advantages, which are often based on comparatively cheap labour costs and the plentiful availability of natural resources. This constellation leads to a coalition between environmentalists, trade unions and enterprises in structurally weak economic sectors in the industrialized countries against representatives of the developing countries and 'new', trade-dependent economic sectors.

The latent danger is that accusations of 'environmental dumping' in this context, due to a lack of adequate definitions and terminological clarity, pay too little heed to different values attached to environmental use around the world (WBGU, 1996; Karl and Ranné, 1997; Klemmer and Wink, 1998; Klemmer, 1999). Hence the Council observes with concern that a potential for conflict is developing between the countries of the North and the South. The Council sees a risk that rather than giving effective impulses for environmental conservation, countries may revert to periods of protectionism in which both the developing countries and the environment may be the losers (Klemmer, 1999; Biermann, 2000b; Langhammer, 2000b). The Council also notes the objection that unilateral standards are at odds with the underlying principle of the Rio Declaration, which requires that international policy should be shaped principally by means of consensus. Precisely because of the resistance that may be expected, the Council is afraid that using the dispute settlement procedure as a route for including environmental aspects in the world trade regime is not appropriate under all circumstances as the sole way forward. The most important challenge is to encourage countries to join forces on environmental policy.

The only possible solution to this problem – appropriate enforcement of environmental standards versus environmental colonialism or covert protectionism dressed up as environmental concern – is to confine acceptance of standards to those which are the outcome of a *multilateral* consultation process. The critical question is thus: how can legitimate trade restrictions be distinguished from non-legitimate restrictions under the WTO dispute settlement mechanism? The answer is that, normally, restrictions with *multilateral* backing could be allowed whereas unilateral restrictions could be prohibited. Because of the wide range of multilaterally agreed environmental standards, this would make it possible to link environmental policy with trade policy, which could ultimately lead to a comprehensive and joint international 'greening' of the WTO.

Therefore the prime concern for the future is to toughen up the many *multilateral* environmental agreements with standards for dealing with international environmental resources together with the WTO regime (Baker, 1993; Leirer, 1998). Agreements such as the Montreal Protocol on Substances that Deplete the Ozone Layer already contain the option of trade restrictions for non-signatory states and – as part of a comprehensive non-compliance procedure – for parties to the treaty who violate the regime (Section C 3.2).

What fundamental possibilities exist, then, for integrating environmental aspects into the world trade regime, or for enforcing more global environmental protection by means of sanction mechanisms, as has recently been attempted? As this report has already shown, there are two options which both appear relevant. The first way is essentially to undertake no concrete reforms to the WTO regime, thus leaving the interpretation of trade law to the WTO dispute settlement mechanism and to some extent transferring decisions away from the political and into the judicial sphere. This option is supported by WTO reforms already accomplished and the judicializing of the dispute settlement mechanism. Moreover the GATT regulations as interpreted under general international law leave considerable scope for bringing free trade and environmental conservation into concordance while observing the proportionality principle. This way fundamentally allows for more rapid action and creates greater flexibility. Whether the Appellate Body can become a setter of precedents is questionable, however. It will not be capable of decoupling itself fully from the sentiments of its members. For that reason, as regards its environmental policy precedent-setting function, may well fall short of expectations. Another problematic area could be the lack of political control over the decisions, and it seems doubtful that the aims of environ-

mental protection, free trade and an inclusive world order can be served when fundamental decisions on the relationship of trade and the environment are taken by legal experts rather than at the negotiating table. In the long term, this could undermine the political acceptance of the WTO, especially in developing countries.

The second way, which should at least be combined with the first, consists of explicitly clarifying the relationship of multilateral environmental agreements to trade law by means of negotiation, and of setting clearer standards for the states' dispute settlement mechanism in the shape of politically determined, highly binding 'guard rails'. Suggestions for this are found in the literature (Biermann, 2000b) and the Council views them as worthy of attention and would like to see this option at least debated. In this way it would be possible to:

1. Negotiate and resolve *restrictive trade practices* motivated by environmental policy directly within the world trade regime (WTO Environment Code / Agreement on Environment);
2. Grant a *waiver* to individual parties to the treaty for trade restrictions motivated by multilateral environmental agreements according to Art. IX paras 3–4 WTO Agreement;
3. Clarify the relationship of international environmental treaties to obligations based on the world trade regime, giving greater definition to Art. XX lit. b and lit. g GATT by means of an *amendment*;
4. Or to work towards a *decision on interpretation* of the Ministerial Conference according to Art. IX para 2 WTO Agreement, giving a binding interpretation of the environmental exceptions mentioned in Art. XX GATT and explicitly recognizing certain multilateral environmental agreements as exceptions to the core WTO regulations.

The negotiation and ratification of a WTO Environment Code or an amendment to the treaty (possibly modelled on Art. 104 NAFTA) involve great political effort and bearing in mind the current resistance of many governments to environmental clauses, it is unclear whether ratification by a two-thirds majority of the 136 WTO members would succeed. The possibility of a waiver for trade restrictions motivated by environmental treaties, in contrast, does not seem commensurate with the significance of the environment theme, because 'waivers' under the WTO Agreement are intended for temporary special cases and must regularly be reviewed by the Ministerial Conference. This contradicts the intended purposes of restrictions on trade (such as those of the CITES regime) which are specifically not time-limited but are intended as part of the overall normative framework of a global governance structure which also embraces ecological principles. Thus a decision on interpretation by the Ministerial Conference seems the most promising route to take.

Were the community of nations to agree on such an interpretation resolution, whereby unilaterally imposed restrictions on trade with extraterritorial effects would be clearly distinguished from broadly accepted restrictions on trade based on international environmental treaties, then clear criteria must be determined for making this distinction. Firstly a *quantitative* criterion could be defined whereby trade-restrictive provisions of an international environmental treaty should take priority over WTO law if, for instance, x per cent of WTO parties were also party to the international environmental treaty in question. A rigid rule of this nature might be inadequate in individual cases, however, so that the Ministerial Conference also needs to define some scope for establishing case-by-case justice. Secondly, a *qualitative* provision could determine that an international environmental treaty must have certain characteristics, irrespective of the number of parties, to claim priority over GATT. For example, it would be possible to insist that the international environmental treaty has been negotiated under the auspices of the United Nations or its specialized agencies; has been approved *ex ante* by the United Nations Environment Programme; has been negotiated by a range of countries from different global regions and of different degrees of economic and social development; that it only deals with cross-border or global problems, and precisely defines the extent of permissible restrictions on trade or guarantees finance and technology transfer to developing countries.

A qualitative definition *ex ante* would need to be so broad that all current and comparable future international environmental treaties are acceptable, but also tight enough to avoid abuse by a minority of nations. However the completion of negotiations on this might require considerable political resources. Since the requirements imposed by future environmental problems cannot be predicted, the Ministerial Conference would in any case have to retain the option of giving future international environmental treaties priority over GATT if they fail the qualitative test but are otherwise widely viewed as legitimate. Overall a quantitative *ex-ante* provision would not always do justice to individual cases, while a qualitative *ex-ante* provision would require substantial political resources, if it were to succeed at all.

If on this basis the international community wished to agree on a decision on interpretation by the Ministerial Conference, it would be advisable that the specific treaties to be included are spelt out in the ministers' resolution. With a certain quorum, the Ministerial Conference could determine a list of international environmental treaties that fulfil the

exceptional conditions of Art. XX GATT. This may include regional and global agreements. The list could also be supplemented whenever new environmental treaties are agreed. A first draft of this annex, i.e. a list of specific environmental treaties, would be an integral element of the Ministerial Conference's decision-making process.

The detailed structure of such an interpretation resolution may conceivably take a variety of forms. As an example, a draft from the specialist literature is reproduced in Box D 1.2-3. This contribution to the discussion would effectively halt unilateral environmentally-motivated import bans directed at production processes abroad, and thus enact a 'greening' of the WTO in a strictly multilateral way.

Even if such a procedure currently appears to be the only option with any prospect of success, there are lingering doubts about an environmentally beneficial modification of the *status quo*. In the context of this option, it is above all important to examine whether unilateral measures should be permitted in specific, exceptional cases governed by strict precon-

Box D 1.2-3

Example from the specialist literature of one possible formulation of a decision by the WTO Ministerial Conference on Trade and the Environment

Draft Decision on the Interpretation of Certain Provisions Relating to the Protection of Human, Animal or Plant Life or Health, or the Environment

The Ministerial Conference,

Recalling Principle 12 of the Rio Declaration on Environment and Development that trade policy measures for environmental purposes should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade, that unilateral actions to deal with environmental challenges outside the jurisdiction of the importing country should be avoided and that environmental measures addressing transboundary or global environmental problems should, as far as possible, be based on an international consensus,

Reaffirming that the relations of Parties in the field of trade and economic endeavour should be conducted with a view to raising standards of living, ensuring full employment and a large and steadily growing volume of real income and effective demand, and expanding the production of and trade in goods and services, while allowing for the optimal use of the world's resources in accordance with the objective of sustainable development, seeking both to protect and preserve the environment and to enhance the means for doing so in a manner consistent with their respective needs and concerns at different levels of economic development,

Concerned that disputes about the interpretation of Article XX lit. b and lit. g of the General Agreement on Tariffs and Trade have given rise to conflicts which may threaten both effective environmental policy and the expansion of world trade,

Hereby decides as follows:

1. Article XX lit. g of the General Agreement on Tariffs and Trade may allow any Member of the WTO to enact trade policy measures that address transboundary or global environmental problems, including such measures that may provide for standards related to processes and the production of goods, provided that these measures are prescribed by any one of the multilateral environmental agreements listed in Annex I to this decision.
2. Trade policy measures that aim at protecting human, animal or plant life or health, or the environment, and that are prescribed by any one of the multilateral environmental agreements listed in Annex I to this decision shall be deemed to be necessary in the context of Article XX lit. b of the General Agreement on Tariffs and Trade.
3. The provisions of any one of the multilateral environmental agreements listed in Annex I to this decision shall be deemed, to the extent that they prescribe technical regulations or standards, to be international standards in the context of Article 2, paragraphs 4 and 5, of the Agreement on Technical Barriers to Trade (1994).
4. Sanitary or phytosanitary measures which are prescribed by any one of the multilateral environmental agreements listed in Annex I to this decision shall be deemed to be international standards in the context of Article 3, paragraphs 1 to 3, and presumed to be in accordance with Article 2, paragraphs 1 to 3, of the Agreement on the Application of Sanitary and Phytosanitary Measures (1994).
5. Any Member of the WTO may initiate a proposal to amend Annex I to this decision by submitting such proposal to the Ministerial Conference. The Ministerial Conference shall decide, at its next session, whether the Annex shall be amended accordingly. Such decisions shall be taken by a three-fourth majority.
   In its considerations, the Ministerial Conference shall take into account that lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation where there are threats of serious or irreversible damage.

ANNEX I

Convention on International Trade in Endangered Species of Wild Fauna and Flora, done Washington, 3 March 1973.

Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, done Basel, 22 March 1989.

Protocol (to the Convention on the Protection of the Ozone Layer of 22 March 1985) on Substances that Deplete the Ozone Layer, done Montreal, 16 September 1987, as modified by the Amendment adopted in London, 29 June 1990, and the Amendment adopted in Copenhagen, 25 November 1992, according to the rules laid down in the Montreal Protocol."

Source: Biermann, 2000b

ditions. To this end the decision on interpretation could also be appended with an open-ended clause giving the dispute settlement mechanism latitude to allow further unilateral import bans (e.g. 'The foregoing does not affect in any way the competences of the Dispute Settlement Mechanism to decide on further exceptions'). Whatever the case, the Council recognizes a substantial need for research in this area.

In view of the deficits in enforcement and the slow progress in the negotiations of numerous international environmental treaties, as well as the comparatively marginal significance of relevant UN organizations, the call is often heard for the establishment of an additional parallel organization to the WTO with responsibility for protecting the environment (Esty, 1994a; Biermann and Simonis, 2000). The Council will discuss the possibilities of a World Environment Organization in greater detail in Chapter E 2. At this juncture, though, the Council points out that corporate decisions on international locations present a lesson in how environmental and social standards can be cost factors which detract from the attractiveness of a location for investment, or the competitiveness of a national economy. Even so, the Council still perceives deficits in the area of raw materials extraction. For the agreement and implementation of international environmental standards it is thus important to emphasize the advantages of appropriate investment in environmental protection and its preconditions (human and social capital). Under the precondition that the institutional conditions in particular countries take appropriate account of environmental protection, the Council sees the mobilization of private incentives for the development and implementation of environmental standards as a critical lever in obtaining these advantages. These include private agreements on conservation labels and environmental quality standards, the reinforcement of cross-border liability for environmental damage and the promotion of international investment in environmental protection by modifying charitable trust and taxation law (Chang, 1997; WBGU, 2001; OECD, 2000). The Council will deal in more detail with these institutional approaches in its prospective future report on the relationship between trade and the environment.

Contrary to various media reports and statements from certain environmental groups, the GATT/WTO regime also represents an opportunity for worldwide environmental protection, with its approaches for preventing discrimination against foreign trading partners in combination with the exemptions mentioned above which make provision for taking environmental concerns into account. Only access on equal terms to international markets and the creation of legal stability for international investments offer the prospect of overcoming the widely censured threats to the environment from poverty, protectionism and counter-productive subsidies, in particular in the areas of agriculture and fisheries. However, the WTO should not be mistakenly viewed as an environmental organization with an explicit mission to develop international standards for environmental protection. This view is made inappropriate by the interests and (lack of) capacities within the WTO, together with the limited options for enforcement of international standards in a globalising world. On the contrary, the Council identifies as a major opportunity the activation of the forces of the globalization process to benefit private initiatives towards international environmental standards, and makes the following recommendations to the German government:

- To work on speeding up the abolition of subsidies, in particular in the agriculture and fisheries sector.
- In the EU, to work towards ensuring that trade-restrictive measures within the GATT/WTO regime are based on multilateral consultation processes or multilateral environmental agreements.
- To improve the conditions for strengthening private initiatives (labels, standards and charitable foundations).

D 2.1 The World Bank Group and global environmental policy

The structure of the World Bank Group

The World Bank Group (Section B 4.5) consists of the International Bank for Reconstruction and Development (IBRD) and the International Development Organization (IDA) (Hoering, 1999). The IBRD owns two subsidiaries: The International Finance Corporation (IFC), which invests in private companies in developing countries and the Multilateral Investment Guarantee Agency (MIGA), which secures foreign investors in developing countries against non-market risks. Officially the World Bank is a specialized agency of the UN, but it is not subject to UN control. The World Bank Group's principal role is to support its borrowers in reducing poverty. Its loans are to improve the preconditions for economic development in the recipient countries and thus to improve living conditions.

IBRD and IDA differ in their roles and provision of funding: the IBRD belongs to the governments of 181 nations (1999), which have subscribed to capital shares according to their economic and political significance. The number of subscribed capital shares determines the weighting of a country's vote in decision-making (weighted voting rights). To finance its loans, the IBRD predominantly borrows on the international capital markets. Loans are issued on interest terms in line with the international capital markets. Hence the IBRD – unlike the IDA – is also categorized as a 'hard credit' lender. Loans are principally granted for projects and structural adjustment programmes.

The IDA focuses support on poorer developing countries with an annual gross national product per head of population of under US$925 (1997). This currently applies to 70 countries. The loan terms are substantially more favourable than those of IBRD loans since the IDA draws its financial resources primarily from contributions from the more industrialized or developed member countries, either from the proceeds of taxation or transfers of IBRD profits. At three-year intervals, replenishment negotiations are held.

'Greening' the World Bank

From an environmental policy perspective in particular, the World Bank's lending policy has been criticized for not requiring any investigation of the environmental impacts of funded projects (Mikesell and Williams, 1992; Rich, 1994; Hoering, 1999). Well-known examples of the World Bank's poor performance in this respect are for instance the Polonoroeste regional development programme (Northeastern Brazil Integration Development Program) or the coal-fired power project in Singrauli, India, which is currently the world's largest single source of CO_2 emissions (Sharma, 1996). Furthermore the World Bank's financing of dams and other major projects has attracted widespread criticism. Here, large-scale, comprehensive reshaping of natural landscapes has been undertaken without sufficient impact assessment, and has often included forced resettlement of affected population groups in large numbers.

As a result of mounting criticism, in the 1990s the World Bank made an astonishing breakthrough in considering the environmental and socio-economic impacts of its financing policy, so much so that the past criticism can no longer be upheld across the board. A particular impetus for integration of environmental and socio-economic issues into the World Bank's business management came from the UNCED resolutions in Rio. The new environment and development policy model of sustainable development was adopted into the World Bank's canon of aims. This process was widely termed the 'greening' of the World Bank and can be traced on two levels (World Bank, 1999):

1. *Developing environmental assessment procedures for projects financed*. To avoid potential negative effects from World Bank projects on the environment and vulnerable population groups, special environmental assessments and safety measures were introduced for planning and implementation. Because not all projects have the same envi-

ronmental relevance, meaning that case-by-case environmental assessment is required, the World Bank divides the projects into three categories:
- Category A: Full assessment of environmental impacts (for the fiscal year 1999, 10 per cent of projects were placed in this category).
- Category B: Limited assessment of environmental impacts (35 per cent).
- Category C: No assessment of environmental impacts (55 per cent).

2. *Targeted support for environmental protection*. In addition to introducing the environmental assessments and safety measures, a targeted support programme was developed for environmental protection. This programme covers not only measures to finance investments in environmental protection, but is planned more comprehensively as an approach to support sustainable development processes. In order to achieve this goal, the World Bank is increasingly concentrating on reinforcing environmental policy capacities, particularly in developing countries. In trying to integrate environmental aspects into the economic policy strategies of the countries concerned, the World Bank is going far beyond the first step, the avoidance of negative environmental impacts.

As the lead institution of the Global Environment Facility (GEF) the World Bank is also increasingly committed to the area of global environmental financing. Usually in collaboration with the GEF, it supports projects in five key areas:
1. Conserving biodiversity;
2. Phasing out the production of ozone-depleting substances;
3. Protecting the global climate;
4. Protecting international waters;
5. Indirectly, conserving soils in arid zones, if climate protection or biodiversity conservation are affected.

In its function as an implementing institution of the Montreal Protocol, the World Bank is supporting programmes in 20 countries to help avoid the use of ozone-depleting substances. Due to the importance of China to the successful implementation of the Montreal Protocol, the support of the Chinese programme for phasing out CFC production should be rated a particular success (World Bank, 1999). Alongside the activities with the GEF and the Montreal Protocol, the World Bank is also involved in other initiatives relating to global environmental protection. In 1999, the prototype of a CO_2 fund was introduced (PCF – Prototype Carbon Fund). The function of this new fund is to inform and support technical CO_2 reduction measures within the context of the 'flexibility mechanisms' established by the Kyoto Protocol (World Bank, 1999).

Despite this progress, the World Bank still comes under criticism from many environmental groups. In particular its forestry policy and the effects of its structural adjustment policy on environmental policy are central focuses for criticism. On this matter, the World Resources Institute (WRI) presented a study in which the effects of World Bank structural adjustment programmes on forest conservation were investigated (Seymour and Dubash, 2000). According to this, in highly forested countries, the conditions attached to loans, aimed at supporting structural policy with a macro-economic focus, actually produced many unexpected shifts in the structure of incentives for the utilization of wood resources. In particular, logging in tropical rainforests was strongly encouraged. The World Bank had varying success in altering its forestry policy (e.g. in Papua New Guinea, Cameroon and Indonesia). In order to support the necessary reforms in national forestry policy, the World Bank – according to the study's recommendations – should take greater account of the conditions in the respective developing country. For example, the chances of successful reform are substantially greater when the main national actors are involved in the planning and implementation of the financed projects (stakeholder engagement). Overall, the trend for more active integration of environmental aspects by the World Bank is unmistakable and progress in this direction should continue. Nevertheless it is still necessary to keep a critical eye on the World Bank's attention to environmental standards.

Notes on institutional reform

The World Bank has become the largest source of finance supporting environmental protection projects. The total portfolio of investments in environmental protection rose from US$2,000 million (1990) to US$11,500 million (1996) (Umana, 1997). For this reason, calls for a wholesale reform of the World Bank should be given a very balanced discussion and evaluation. The following points must be considered:
- It must be borne in mind that the significance of environmental aspects in the organization and strategy of the World Bank has continually grown. For projects in which major environmental impacts are feared, comprehensive environmental assessments are conducted. Additionally, support for environmental protection measures, increasingly also addressing global environmental problems, has become a fixed element of World Bank policy. Even if environmental strategy could still be integrated more consistently into World Bank activities, the overall progress made by the World Bank in recent years must be rated very positively. All the more so, given that its primary role is to support productive international investment pro-

jects to combat poverty. Pursuing this aim, the World Bank's contribution to (global) environmental protection might even be greater than if it devoted disproportionate attention to environmental concerns. Given that the World Bank fulfils these important functions, calls for a more extensive 'greening' of the World Bank are to be assessed critically. These demands may ultimately overburden the World Bank, which could jeopardize its primary purpose.

- The developing countries and many non-governmental organizations (NGOs) repeatedly criticize the dominant influence of the industrialized nations over the World Bank. This influence is undeniable, but it should not be forgotten that most of the World Bank's funding, especially for the IDA, is made available by the industrialized nations. The their wish for co-determination of the uses of funds (or granting of loans, or appointment of management personnel) is not only understandable, but could even be beneficial in respect of attracting additional funding (Section E 3).

In view of these parameters, proposals for institutional reform should only be directed at selected divisions of the World Bank Group. Above all, the changes already initiated by the World Bank itself should be advanced further. The reasons necessitating (partial) reform of the World Bank are:

- The World Bank Group's role in financing global environmental policy (Section E 3) is permeated by a pronounced cross-sectoral character. This means that in exercising its functions, the World Bank touches on many different fields of environmental policy. One example is the conflict which arises between the existing (supply-oriented) priorities of the World Bank in the area of energy supply and efforts to achieve an effective (demand-oriented) climate policy (WBGU, 1995b).
- The World Bank should endeavour to increase the transparency of its policy even still further. This would substantially improve its public acceptance.

In order to give adequate consideration to these two aspects, and to raise its efficiency and effectiveness in fulfilling its role, the Council recommends the following measures:

- Cooperation with major UN programmes (UNDP, UNEP) and major international environmental treaties should be extended (Chapter F). The benefits of increased cooperation would be, for instance, utilization of the expertise contained in the respective environmental conventions in order to set standards for environmental assessments, and making use of the advisory function of UNDP and UNEP in selecting projects to be financed.
- In order to raise the transparency and acceptance of World Bank activities, cooperation with NGOs should be further extended. The main idea here is to increase the exchange of information rather than to increase NGO involvement in bank decisions.
- The greater involvement of the private sector in planning and implementing projects promises in many cases to deliver effectiveness and efficiency gains. Hence public-private partnerships of this kind should be promoted.
- Structural adjustment programmes should be more thoroughly assessed for environmental impacts. The results of such studies should be used for operational and strategic changes in the planning and implementation of these programmes.

D 2.2
Interdependencies between the IMF and global environmental policy

Like the World Bank, the International Monetary Fund (IMF) is a target for criticism on the part of various international researchers and environmental groups. Just ahead of the annual IMF conference in 2000, worldwide public interest was attracted not only by the question of the future membership of the IMF Directorate, but also by a report from the International Financial Institution Advisory Commission (IFIAC; also known as the Meltzer Commission) for the US Congress which called for reform of the IBRD in the direction of a World Development Agency with an exclusive mission to assist with development in the least developed nations and provide global public goods, and in tandem, radical cuts in the IMF's duties, competences and funding (IFIAC, 2000). At the same time, demonstrations and protests during the IMF annual conference testified the dissatisfaction of the opponents of advancing globalization with the IMF's function and fulfilment of its duties. For the area relevant to this report, that of international environmental policy, criticism from these groups is concentrated directly on two aspects (French, 1995; Cornia et al., 1989; Oxfam Policy Department, 1995; Chossudovsky, 1998):

– The direct environmental impacts of national structural adjustment measures coupled to IMF support in the countries concerned, and
– one-sided concentration of IMF policy on maintaining or achieving a positive balance of payments without consideration of the consequences for establishing and adhering to international environmental treaties.

Over and above the direct global environmental consequences, the IMF stands as an important example

of the emergence and functionality of international cooperation in a segment which rates as one of the critical weak points of numerous environmental treaties: the financing of international tasks. Hence its experiences are worth considering when developing new financing mechanisms for global environment and development policy (Section E 3.2). Accordingly, the following discussions set out to give detailed answers to three questions in the cause-effect web interlinking the IMF and global environmental policy:

1. What role can and should the IMF adopt in the context of international environmental policy?
2. To what extent are the existing institutional structures suitable to fulfil these roles?
3. What recommendations for IMF reform can be derived from the international environmental policy perspective?

The departure point for answering these three questions is an analysis of the fundamental roles of the IMF (on the IMF's structure and function see Hoering, 1999; Khan, 1999; Siebert, 1998). The IMF was set up following the Bretton Woods Agreement to make funds available to secure the functioning of the stable exchange rate system, which was itself superseded almost three decades ago. The governments, as members of the IMF, pay a contribution in the form of Special Drawing Rights (SDR), which can be used for low-interest, sometimes only partially repayable loans and bonds to overcome short-term liquidity crises or to support structural financial reforms. The recent financial crises in Southeast Asia are an apt demonstration of the importance of this kind of international crisis intervention (Kho and Stulz, 1999; IMF, 1999). At the same time they also clearly indicate the limitations of leaving early detection and financial discipline to individual nations. The acknowledgement of these limitations was among the factors that unleashed controversies over the future profile of the IMF's tasks and corresponding institutional arrangements (IFIAC, 2000; Frenkel, 1999; Vasquez, 1999; Frenkel and Menkhoff, 2000).

Given the IMF's objective, its view of itself is expressly not that of a direct environmental policy actor. Regardless of this, any IMF intervention does have environmental policy consequences. These typically include the side effects of national structural adjustment programmes. The IMF insists on these, in combination with lending, to guarantee that balance of payments deficits which have arisen can be permanently reduced (Killick, 1995). Important components of the structural adjustment programmes are the reduction of subsidies and social services, and the promotion of exports. In this way, public expenditure should be reduced, competitiveness and attractiveness to international investors and capital inflows are raised, and the confidence of the international capital markets in the country's economic strength and its currency is reinforced. To understand these measures, it is important to keep the short-term and medium-term consequences apart. In the short-term, the reduction of social provision and subsidies heightens the pressure for adjustment in the national economies concerned (Abed, 1998). The consequences are evident signs of structural unemployment and increasing burdens on economically weaker groups within the population. For the environment, these short-term effects are linked with increased utilization pressure, due to

– the affected country's lack of financial means to comply with national and international commitments to environmental protection,
– the dependence of economically weaker groups on provision with natural resources,
– the increasing concentration of population groups in slums with negative consequences for human health as well as soil and water quality,
– the transfer of agricultural resource use to exportable crops and livestock, with production sometimes resorting to environmentally harmful practices and substances.

In the medium-term, on the other hand, financial and social reforms create the conditions to raise the efficiency of resource use and make economically weaker groups less dependent on short-term use of natural resources. Experiences following the Southeast Asian financial crisis show that it triggered urgently needed adjustments of economic structures, sealed-off markets and inefficient concentrations of enterprises (Kho and Stulz, 1999; Siebert, 1998; Frenkel 1999; IFIAC, 2000). Such an adjustment is accompanied by opportunities to build new education systems, to create decentralized local institutions and to reorganize production structures and product ranges. Enhancing international processes of competition fundamentally sharpens the pressure to make use of more up-to-date technologies, and thus raises incentives to reduce the resource-intensiveness of production practices and products. At the same time the compulsion to open up markets and to reduce public expenditure can weaken the attractiveness of political measures targeting shortsighted use of natural resources. Often, well-organized groups representing minority interests exert appropriate pressure, such as in the case of tropical forest use in Southeast Asia (Ariyoshi et al., 2000). The prerequisite for such reforms is the implementation of longer-term structural adjustments and the establishment of new institutional systems on the local level which are integrated into an international context.

The Council sees this initiation of long-term reform impulses as a decisive role of the IMF in the

context of international environmental policy. It cannot be the task of the IMF to define environmental policy standards itself and to integrate them into structural adjustment programmes, since neither the necessary capacities are available, nor is there any need for another international body to carry out such a task. Also the political prospects for obtaining IMF funding for environmental purposes are meagre (Jakobeit, 2000). However it is important to use the IMF to

- prevent short-term fluctuations in the international capital markets by means of an effective early warning system and incentives for structural adjustment, since such fluctuations raise the utilization pressure on natural resources,
- to support private financial and capital markets by means of international rules and standards (Frenkel and Menkhoff, 2000), also making it easier, for example, to attract private finance for international environmental protection projects and structures (Section E 3),
- to promote transparency of the impacts of national institutions through commitments to document economic, social and – where relevant – also ecological consequences, resulting in greater pressure from world public opinion (Siebert, 1998).

The Council recommends that the German government should more intensively pursue appropriate initiatives to strengthen the core competences of the IMF, with particular regard to short-term decision making. This also entails a clear delimitation of responsibilities from those of the World Bank, which the Meltzer Commission has advocated this publicly to great effect and it is already being discussed within the IMF as a strategic aim (IFIAC, 2000; Fischer, 2000; Langhammer, 2000a). Moreover, the Council urges examining the extent to which, within structural adjustment programmes, commitments arising from national and international environmental agreements can be spared from cuts in public spending. However it cannot be the IMF's aim to support projects in the sphere of global environment and development policy itself, although coordination with longer-term and structurally-focused activities of other organizations eases the acceptance and effectiveness of the structural adjustment programmes.

The future of the interplay between the IMF and global environmental policy involves more than policy content alone. Organizationally, the IMF comes under criticism for two reasons:

- Firstly, due to one-sided dominance of the capital donor countries over its decision making, and
- secondly, due to the limited effectiveness of IMF measures.

Dominance of decision-making power is based on the allocation of voting rights (Chossudovsky, 1998; French, 1995). The voting rights relate exclusively to the contributions paid in, which at the same time ensures that the capital donors have the certainty of being able to steer the spending of funds. Since lending is coupled to sometimes-drastic interventions into national sovereign rights over fiscal policy, the capital borrowers' sense the need to resist this 'modern form of colonialism'. However, it can be shown by analyses based on game theory, for example, that without such certainty on the part of capital donors, there is an increased incentive for borrowers to draw on the fund as a 'cheap' source of finance without inherent discipline (Section E 3). The capital donors would thereupon refuse to provide funds. Precisely from the environmental policy perspective, what emerges in this connection is the opportunity to develop 'packaged solutions', i.e. by linking international environmental treaty agreements with IMF funding allocation agreements. To achieve this purpose, there needs to be a clear separation of the role and organization of the IMF from international environmental agreements, so that the individual 'package elements' can properly be distinguished, and compliance made subject to separate and transparent control.

The emergence of the financial crisis in Southeast Asia and crises that have occurred in Mexico and Latin America in recent years have supported the conclusion that the IMF's main aim of stabilizing the world financial markets is not one that it can fulfil satisfactorily. A particularly problematic feature is the IMF's function as a 'lender of the last resort' which entails certain incentives (Siebert, 1998; Fischer, 1999). This defines the function of the IMF to intervene as a lender when, due to a liquidity crisis, no other capital lender can be found. This procedure causes problems, both removing incentives for government decision-makers to maintain fiscal discipline, and affecting the private banks' judgement of risks. The safety net of the IMF encourages private investors to enter into higher-risk lending in financially weak countries than is economically justifiable (IFIAC, 2000; Frenkel, 1999). The associated danger of growing financial crises in economically weak countries indirectly affects the availability of environmental resources, since grave economic crises tend to raise the utilization pressure. Hence the Council underscores the need for action, as recommended also by the Meltzer Commission, with regard to the formulation of and adherence to IMF criteria for intervention and lending. The Meltzer Commission's proposed criteria are so restrictive, however, that they would limit the activities of the IMF to a minimum. The Council thus argues for continuation

along the route embarked upon by the Financial Stability Forum in Basel towards a regulatory framework for the financial markets along with clear and timely notice of the IMF's course of action in cases of crisis, the development of early detection systems and, in the worst case, introduction of penalty payments for countries and actors where blame for causation of an economic crisis can be clearly apportioned (Siebert, 1998). In summary, the Council views a steadfast development of the IMF's stabilization function, the removal of false incentives, the overcoming of internal organizational coordination problems and better alignment with national and international environmental agreements as decisive contributions to improving the effectiveness of global environmental policy. The opportunities lie not so much in 'greening the IMF' as in 'enabling for green activities by the IMF'.

D 3.1
UNDP activities for environmental protection

The United Nations Development Programme (UNDP) is the central financing, coordinating and steering body for the UN's operative development policy functions. UNDP is represented by regional offices in 132 countries. Thematically the Programme emphasizes the areas of poverty reduction, gender issues, good governance and environmental protection.

Between 1994 and 1997, a total of 24 per cent of funding was dedicated to environmental projects, although the UNDP's contribution to sustainable development is very much wider ranging because expenditure on good governance or poverty reduction also supports this aim. Most projects are carried out by executing agencies (from within the UN and its subsidiary entities, or more recently also NGOs and private consultancy firms), with selection and coordination of projects arranged by UNDP's local staff. The Programme's policy is determined by an Executive Board comprising members from 36 countries.

In the area of environmental protection, UNDP carries out a range of projects. Thus since 1994 the *Sustainable Energy and Environment Division* (SEED) has been assisting developing countries in the implementation of programmes which integrate environmental protection and the use of natural resources to reduce poverty. SEED is also responsible for the further programmatic development of UNDP environmental strategies, and consists of a series of subsidiary programmes such as the Capacity 21 programme, which supports developing countries in integrating the principles and aims of Agenda 21 into national policy, or the *Energy and Atmosphere Programme*, which promotes sustainable energy policy in the developing countries. There are also projects on forestry, freshwater conservation and marine environmental protection.

UNDP is one of the implementing agencies of the GEF and one of the four bodies that administer the Multilateral Ozone Fund, which is engaged in implementing the aims of the Montreal Protocol and in supporting numerous developing countries in converting to non-ozone-depleting substances. UNDP also hosts the *Office to Combat Desertification and Drought* (UNSO, previously the UN Sahelian Office), which supports affected countries in implementing the aims of the Desertification Convention.

D 3.2
Moves for UNDP reform

In past years, UNDP has been criticized for its lack of success in fulfilling its allotted tasks adequately. Instead it tends to be seen as a weak development policy institution, partly due to its low and diminishing funding (1991: annual budget US$1,022 million, 1997: US$778 million). Nevertheless UNDP still ranks as one of the largest donors in the UN system. Financing operates by means of voluntary contributions, which makes for uncertainties in planning due to the considerable fluctuations from one year to another. Above all the donor countries complain that from their perspective the fulfilment of purpose is poor, the standards of performance are too low and structure of accountability is weak. This criticism from the donor countries is one of the reasons for the declining willingness to contribute (Section E 3). The end of the Cold War has also worked to the detriment of UNDP because since that era ended there has been less obvious interest in United Nations development cooperation. A significant structural flaw is the transfer of various tasks to UNDP without equipping the programme with appropriate enforcement instruments and reinforcing its political strength. Yet UNDP possesses important potentials for programme design and operative work, such as the coordination mechanism for round tables, a high degree of identification of programme countries with UNDP measures, and longstanding experience (Klingebiel, 1999). Governments in developing countries appreciate UNDP for attaching few conditions

to funding and giving relatively comprehensive political rights of co-determination.

Clear evidence of the drive for UNDP reform is seen in the major changes to the programme over the past ten years. During this time a significant part of the responsibility for implementation has been passed to the countries, so that UNDP has given up its own operative unity. Instead there is a self-contained UN Office for Project Services (UNOPS). Between 1992 and 1997 the administrative costs fell by 19 per cent, the number of staff by 15 per cent (and even as much as 31 per cent at headquarters). Out of a staff of around 5,300, over 80 per cent are employed in regional offices. Also the balance of the financing structure has been shifted away from its own resources (core sources) to new sources of funding (non-core sources). Finally, UNDP has fostered a new public image for itself with the publication since 1990, to worldwide acclaim, of the annual Human Development Report.

Lately the World Bank has begun to compete with UNDP in the area of technical cooperation (Rudischhauser, 1997). There seems to be a trend on the part of the USA, Japan and Germany to shift political priorities in favour of the financially better resourced World Bank Group, with the result that direct grants have been stopped in favour of increasing numbers of (to a greater or lesser extent subsidized) loans (Hüfner, 1997). Another problem is the stagnation of contributions and grants to UNDP. If this trend persists, UNDP's role as coordinator of all technical cooperation in the UN system will be jeopardized, especially as the World Bank's annual budget even now amounts to around ten times that of UNDP (1996). The developing countries in particular fear any further magnification of the imbalance between the United Nations ('one country, one vote' system) and the Bretton Woods institutions ('one dollar, one vote' system) (Agarwal et al. 1999). Thus the Council urges for a clear and well-considered division of responsibilities, and coordinated cooperation between UNDP – which should be better resourced – and the World Bank Group.

According to Klingebiel (1999), UNDP could take on a central role in the creation of favourable framework conditions in the developing countries, without which successful implementation of the aims of global environmental regimes is impossible. Firstly the remit of good governance, crisis prevention and peace consolidation could be extended. Here UNDP has a special legitimacy because from the General Declaration of Human Rights to the Covenant on Economic, Social and Cultural Rights, the most important agreements in this sphere have been reached by the United Nations. Secondly, by developing a systematic follow-through process, UNDP could contribute to the effective and efficient implementation of all the agreements reached at the 'world conferences' of the 1990s; in particular through targeted support and involvement of local institutions. Thirdly, according to Klingebiel (1999), by building suitable capacities in the developing countries, UNDP should help them to coordinate the greater part of their development cooperation themselves. Such proposals are along the right lines, in the Council's view, but to strengthen UNDP as a financing and coordination body for the operative activities of the United Nations, a more broadly drawn set of objectives is required which, in the spirit of Agenda 21, gives equal consideration to development and environment issues.

D 3.3
Strengthening UNDP as a financing and coordinating body

UNDP is steadily losing ground as a financing and coordinating body for the operative activities of the UN in favour of the very much better resourced World Bank Group. To bolster the confidence of donors in the Development Programme, the Council recommends more effective monitoring of the efficient use of UNDP resources (Section E 3). Furthermore UNDP should be reinforced in its responsibility for development issues within the UN system. In particular, the possible options should be examined for equipping UNDP with an exclusive mandate and with decision-making authority outside of its own programmes.

UNDP's acceptance is founded primarily on its competence in its field and its provision with resources (which has suffered greatly in recent years). The Council emphasizes that the funding of UNDP is far from adequate to ensure action commensurate with the global problems that are now imminent. A further reason why strengthening UNDP is highly desirable is that the programme enjoys the special confidence of the developing countries. This reserve of goodwill is especially important for projects promoting good governance, crisis prevention and peace consolidation.

Besides numerous development projects, UNDP also coordinates projects on the conservation of natural resources. The Council recommends investigation of the extent to which environment and development goals could be better combined within UNDP project work. One initiative along these lines is the Poverty and Environment Initiative of UNDP and the European Commission (the first Forum of Ministers on this took place in September 1999), which refuses to treat environmental protection and

poverty reduction as mutually exclusive and seeks possibilities for achieving both goals.

Reinforced in its cooperation and coordination functions, the United Nations Environment Programme (UNEP) (Section E 2) should have the option of exercising an environmental policy influence on UNDP, and could develop environmental standards for UNDP in the light of existing multilateral agreements. In future, the annual Human Development Report published by UNDP could also take environmental aspects into account, especially in the development of new indices. Here, in the Council's view, UNDP could also play a significant role in bringing about integrated reporting on global environment and development problems. The Council further emphasizes how important it is that knowledge gained in the operative activity of UNDP is also transmitted to UNEP, to ensure that the experience from these projects is fed back into the continued strategic development of the programme.

Without dependable financing combined with better efficiency controls, UNDP will be unable to achieve the outlined aims. To motivate donors, it is thus important not only to advance the proposed conceptual innovations and to strengthen the Programme's decision-making authority, but also to ensure efficient controls over the uses of funding. Ultimately it will be crucial to hold intensive dialogue between donors and programme countries regarding the continued pursuit of the reform process.

Global environmental policy: Assessment, organization and funding

E

E 1.1 Introduction

In this chapter, the Council concentrates upon the role of scientific policy advice in the assessment of global environmental changes, proposing, in particular, the establishment of an independent body that is capable of drawing the attention of the international community to particularly risk-laden developments. This discussion includes the Commission on Sustainable Development (CSD). In addition, the Council proposes the establishment of independent scientific panels modelled on the Intergovernmental Panel on Climate Change (IPCC). In its previous reports, the Council has already provided an in-depth discussion of the role of international science and has examined global monitoring and early warning systems (WBGU, 1997, 2000a).

E 1.2 An independent body for assessment and early warning

As a part of its vision for recasting the structures of global environment and development policy, the Council considers it essential to establish an independent body endowed with universally accepted ethical and intellectual authority, and charged with identifying and assessing the risks of global change. The Council recommends to the German government that it examines the options for establishing an 'Earth Commission' and that it submits a corresponding proposal to the United Nations (Fig. F 1.1). This commission, comprising 10–15 eminent individuals, would provide the long-term perspective needed to protect environmental resources and safeguard the rights and interests of future generations, and would provide impulses for research activities and political action. A particular function of the Earth Commission could be to place on the international agenda, in a manner that catches the world's attention, issues which would otherwise be neglected despite their vital importance.

The members of the Earth Commission, appointed by the UN General Assembly, should be leading figures of highest moral authority who can command the attention of a global audience, as the Brandt and Brundtland Commissions did. Such a commission might be viewed as a globalized form of the German Council for Sustainable Development (*Rat für Nachhaltige Entwicklung*). Where the need arises, the Earth Commission could be supported by inputs provided by scientific panels (Section E 1.3); however, the main task of the panels would be to advise the Conferences of the Parties to the Rio conventions.

The Earth Commission could receive a right to propose scientific issues to be treated by the panels. These environmental analyses would then be processed by the Earth Commission and evaluated in terms of whether a 'warning' needs to be issued to the global public and the United Nations about impending and potentially irreversible environmental changes. Neither the scientific panels nor the Earth Commission should engage in research themselves, but should initiate such research, review its outcomes in terms of policy relevance and inform political decision makers about emerging global change issues of particular concern.

For the early warning function to have sufficient weight and political mandate, the Earth Commission should have the right to be heard by the UN General Assembly or to launch initiatives to address problems or misguided developments relating to global change. It should deliver regular reports to the UN Secretary-General providing assessments of the global environmental situation. The CSD could provide a forum for debating these reports. In conjunction with the scientific panels, the Earth Commission would have four focal tasks:

- *Synopsis*: It should reap maximum benefit from the existing monitoring systems in order to characterize the state of the Earth System. Furthermore, additional monitoring activities should be established where needed.

- *Early recognition and early warning*: Based upon scientific data and findings, the Earth Commission should warn the public and particularly the United Nations of impending and potentially irreversible global environmental damage.
- *Identification of guard rails*: The Commission should identify 'guard rails' for international environmental policy in order to demarcate still acceptable transitional areas from unacceptable states.
- *Reporting*: The Commission should submit to the UN Secretary-General an annual report evaluating, on the basis of the latest scientific information, the main environmental problems and developments.

E 1.3 The role of scientific policy advice

In its previous reports, the Council has repeatedly stressed the importance of independent scientific policy advice in processes relating to problem identification and resolution (WBGU, 1997, 2000a, 2001). In view of the complexity of global problems, systematic dissemination of scientific findings and early recognition strategies to the political regulatory bodies is crucial. Scientific bodies operating within specific regimes frequently only address concrete tasks assigned to them by the respective Conferences of the Parties (COPs). To support such regime-specific bodies, a need remains in global environment and development policy for institutions that provide scientific advice in the manner of the Intergovernmental Panel on Climate Change (IPPC), making their recommendations accessible to the international community, the Parties and all stakeholders. For this, it is necessary to achieve improved coordination and concentration of existing scientific networks and to render them utilizable to international policy endeavours by setting up thematic panels. These panels should bring together the leading scientists from across the world.

As the Council has already set out in previous reports, knowledge is the key to coping with the challenges of global change, and has been utilized inadequately in the past (WBGU, 2000a). This has had various causes, ranging from inadequate integration of sectoral knowledge, over asymmetrical access to knowledge, through to ineffective knowledge dissemination structures. To bring together this knowledge more effectively, the Council has already recommended the establishment of various scientific panels (WBGU, 2000a, 2001). In the present report, the Council takes up these individual recommendations and develops them further to an integrated set of scientific panels within the context of an institutionalized Earth Assessment, one of the three pillars of an overarching Earth Alliance structure for strengthening international environmental policy (Chapter F).

E 1.3.1 The IPCC experience

Experience gained in negotiating processes within the international environment and development policy arena underscores a growing need for well-founded and independent scientific advice (Chapters B and C). Here it needs to be kept in mind that the impact of science upon politics depends crucially upon *how* these findings were generated and *who* presents them. This was one of the motives for the establishment of the IPCC by WMO and UNEP in 1988. In the meantime, the assessments delivered by the IPCC, which is not bound by the decisions of the Conference of the Parties, have become the widely recognized scientific basis of international climate policy. The IPCC's work rests upon a broad, international participation of scientists and a differentiated, multistage peer review procedure. However, the summaries for decision makers contained in IPCC reports are copy edited line for line by government representatives – while the main parts of the reports and the three working groups are not subject to such political influence (Agrawala, 1997). Furthermore – with the goal of making its work more relevant to the policy process – special-interest actors have been given opportunities to influence the process. Fears have been voiced that, at least in specific areas, this is jeopardizing the scientific character of the IPCC (Jung, 1999b). However, the experience of the Council does not currently support such fears.

Because developing countries lack sufficient research capacities, they are frequently underrepresented in the IPCC (Enquete Commission, 1990; Agrawala, 1997). Nonetheless, owing to financial support provided by the IPCC, the number of participants from developing countries has risen steadily since 1988. The Council takes the view that the aim cannot be to demand too-rigid fulfilment of regional representation quotas as this would compromise the scientific credibility of the IPCC. The aim should rather be to promote scientific capacities in developing countries in order to create a more balanced situation over the long term.

E 1.3.2
Supporting global environmental policy by scientific panels

The indeterminacy of the scientific fundamentals, terms and concepts used in international environmental policy negotiations has become increasingly clear in recent years and forms an impediment to elaborating or implementing the decisions taken by the Parties. With regard to the UNCED follow-up process, there is a need for action in the following spheres:

- There is a lack of coordinated contributions by the scientific community to the problems of global change. In some environmental spheres, knowledge on states, degradation dynamics and potential consequences is still very patchy or entirely absent (Chapter B). This applies, for instance, to the loss of biological diversity and the degradation of soils. Regular scientific stock-taking exercises are an essential prerequisite for concretizing treaty commitments, using, for instance, a base line catalogue of global indicators – which yet needs to be developed (Chapter C).
- There is a need for a body engaging in cross-cutting analysis of the key themes of global change and identifying 'safety margins' or 'guard rails' in order to inform the international community, in as timely a manner as possible, about hazardous developments in the environmental realm. Guard rails indicating the limits of absolute non-sustainability would provide a scientifically underpinned basis upon which to determine abatement or conservation goals within the various environmental regimes. In its report on global environmental risks, the Council proposed a Risk Assessment Panel, one function of which would be to initiate an international risk evaluation process (WBGU, 2000a).
- To transpose scientific findings into politically relevant options for action, there is frequently a lack of integration among the approaches and perspectives of the various disciplines.
- To inform the wider public, a need remains for a structure that channels and renders accessible the available 'risk knowledge'.

The present structure, in which only the Climate Change Convention has an independent scientific advisory body at its command, does not suffice to cope with the tasks outlined above. The biodiversity and desertification regimes do in fact have two bodies charged with providing scientific-technological advice: the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) within the biodiversity regime and the Committee on Science and Technology (CST) within the desertification regime. The function of these bodies is to stimulate and evaluate scientific reports at the specific request of the respective COPs. The results of these expert reports then need to be processed into draft resolutions for the COPs. In their capacity as subsidiary, instruction-bound bodies of the COPs, both the SBSTTA and the CST are closely linked to the programmes of work of their respective COPs. Under the Climate Change Convention, there is the Intergovernmental Panel on Climate Change (IPCC), whose reports are processed for the COP by the Subsidiary Body for Scientific and Technological Advice (SBSTA). The biodiversity and desertification conventions lack such an advisory structure – here the necessary independent scientific work cannot be conducted within the force field of political interests. In many instances, SBSTTA and CST meetings are attended by government representatives rather than independent scientists. These representatives engage in consultation processes from a more political perspective.

Building upon the IPCC experience, the Council recommends the establishment of comparable scientific bodies or panels to provide advice and support, for instance to international soil and biodiversity policy. In an *Intergovernmental Panel on Biological Diversity (IPBD)* (WBGU, 2001) or an *Intergovernmental Panel on Land and Soils (IPLS)*, eminent scientists could be brought together who could work on an ongoing and independent basis and provide scientific policy advice. The need for advice is extensive: Within the desertification regime, for instance, in order to provide more effective implementation of decisions, there is a need for a 'core set' of global indicators (for monitoring and reporting) and guard rails (for conservation and abatement targets). In this regard, there are already promising moves towards creating a database on soils, soil use and soil degradation over the next 10–15 years. Over the long term, however, a need remains for a structure that monitors and evaluates soil-related changes continuously (Section C 4.3).

It is similarly essential to focus international biosphere research within an expert scientific committee, as biosphere policy also suffers a lack of well-founded and independent scientific policy advice. The Council has already discussed this issue in detail elsewhere (WBGU, 2001). Furthermore, a *Risk Assessment Panel* could form a network node, systematically collating the various national-level risk characterization and evaluation efforts. This panel should be concerned not so much with analysing environmental problems that have already been identified, but rather with identifying, early on, new types of global change risk whose first outlines are

only just emerging. The Council has set out the tasks of this panel in detail elsewhere (WBGU, 2000a).

The contributions provided by these panels could give greater weight to the debate on international environmental protection. A further aspect is that the panels, set up as independent bodies as recommended, could provide the Parties and all stakeholders with scientific policy advice on current issues and problems in the political process and, moreover, highlight topics neglected in the policy arena. The scientific findings of these panels would also be utilized by the Earth Commission proposed by the Council. It would need to be considered whether the panels should be termed 'International' instead of 'Intergovernmental', in order to underscore their political independence.

However, it needs to be kept in mind that, by shifting scientific tasks to independent bodies, the existing subsidiary scientific bodies increasingly gain a preparatory role for the Conferences of the Parties. Such a development can already be observed today in the biodiversity and climate regimes, where the sessions of these subsidiary bodies (SBSTTA and, respectively, SBSTA and SBI) have now become 'mini-COPs' which prepare numerous COP decisions. Such a development is not currently under way within the desertification regime, because the sessions of the CST take place at the same time as the COP meetings. This effectively prevents the former from preparing the latter. The Council is of the opinion that further development of the existing scientific subsidiary bodies or committees in the direction outlined above is highly expedient, as this would make scientific inputs possible which could be processed in a manner utilizable for the Conferences of the Parties. The scientific subsidiary bodies or committees would thus have an important interface function between the scientific and policy arenas, as is already the case within the climate regime.

At the European Union (EU) level, too, there is a lack of coordinated scientific policy advice. It would therefore be useful to give the existing national-level environmental and sustainability councils the opportunity to provide consultative support, by means of joint reports, to EU environment and development policy. In the view of the Council, the run-up to WSSD would lend itself particularly to such an approach. In the negotiations within the UNCED follow-up process, the European Union has been speaking with one voice for long now. The time is therefore ripe to establish a structure permitting EU-wide cooperation among national-level scientific policy advice bodies or to set up a scientific council at EU level in which members of national-level advisory bodies are represented. The regular meetings of European environmental and sustainability councils, which have joined forces to form the group of European Environmental Advisory Councils (EEAC) and jointly finance a focal point, are a first step in this direction.

E 1.4
The role of the CSD

Within the Earth Assessment structure proposed by the Council, the Commission on Sustainable Development (CSD) would assume an important function in promoting interlinkage and dialogue in the deliberative process among the Earth Commission and governments, science, non-governmental organizations and the proposed International Environment Organization. In the view of the Council, such a repositioning could provide one of the future fields of work of the CSD, which will have fulfilled in the year 2001 its mandate as stipulated by UNCED to address the individual topics of AGENDA 21. As a functional commission of ECOSOC, the CSD was established without a fixed term. Consequently, the topics to be addressed will be decided anew at the WSSD. The Earth Commission could be given a right to propose the issues to be addressed by the CSD, thus raising the profile of topics which are particularly important from a scientific perspective but have not yet gained sufficient political attention. Moreover, the CSD could be the forum in which the reports of the Earth Commission are debated.

The CSD is particularly suited to this role, as it is the specific intergovernmental forum within the United Nations system in which cross-cutting sustainability issues are addressed. The CSD is the central forum for issues relating to environment *and* development. Besides this integrative role, the CSD has an important supportive function within international environment and development policy, as it initiates the consensus-building and standard-developing deliberative process within the international community of states that is crucial to the political decision-making process. This exceedingly important function needs to be retained in the future, and integrated within the system for global change risk assessment proposed by the Council. Science has been somewhat underrepresented in the CSD until now. The Council therefore urges that it be considered whether science can gain a more prominent role within the CSD process. One way of doing this could be by having representatives of the scientific panels report on latest findings at the two-day multi-stakeholder dialogues with which each CSD session begins.

E 1.5
Assessing global environmental problems: Recommendations for action

Overall, the assessment process should seek to integrate the Earth Commission, the scientific policy advice community and the CSD. In the view of the Council, such an interplay of ethical authority, cutting-edge scientific expertise and open debate within a UN institution is crucial to the enterprise of assessing the complex problems of global change in a manner that is both appropriate to the issues at hand and does justice to the precautionary principle. It is above all important that this assessment process has a dynamic structure and adapts continuously to changing conditions and findings. The Earth Commission should not only sound the environmental 'warning trumpet', but should also be able, if developments are favourable, to give the 'all clear'.

E 2 Reforming the organizational structure of global environmental policy

E 2.1 Introduction

While we have concentrated in Chapter C upon experience gained in specific environmental regimes, in Chapter D upon policy interplay and in Section E 1 upon scientific assessment processes, we now turn to the issue of the appropriate organizational architecture for global environmental policy. Section E 3 will then address the cross-cutting issue of funding. These elaborations are intended to provide an action-oriented contribution in the run-up to the WSSD due in 2002, where the institutional issue will be one of the focal themes.

As set out in the previous sections, the Council sees a number of advances in the present state of global environmental policy. Nonetheless, successful international negotiations are troublesome and time-consuming. Due to the structurally dominant principle of sovereignty, decision-making in international environmental negotiations continues essentially to be based upon the principle of consensus, although in some regimes the states have agreed upon majority decision-making for certain issues. As shown in Chapter C, majority decision-making has been introduced under, for instance, the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, and within the Global Environment Facility (WBGU, 1997). Nonetheless, these breakthroughs remained exceptions to the rule, and in other spheres of global environmental policy the principle of consensus has in fact experienced a renaissance. A consequence of the fundamental orientation to consensus, particularly when concluding treaties, is that often environmental policy 'laggards' can only be moved to participate by giving them concessions. In many instances, they even prevent effective measures completely (Sand, 1990). Similarly, deficits continue to prevail in broad areas of international environmental policy implementation and enforcement.

Consequently, in view of the frequently noted lack of coordination and efficacy of global environmental policy, repeated calls have been made in recent years for a comprehensive redesign of the international institutional and organizational architecture. No consensus on the necessary steps has yet been found in the scientific debate (Esty, 1994a, b, 1996; Runge, 1994; Biermann and Simonis, 2000). The most recent move in this direction comes from French Prime Minister Lionel Jospin and French Environment Minister Dominique Voynet, who announced in June 2000 their intention to use the French EU presidency to advance the debate on an international environmental organization. Former WTO Director-General Renato Ruggiero already spoke out in favour of a 'Global Environmental Organization' in 1999 as a counterbalance to the WTO, but without specifying this proposal. French President Jacques Chirac had already advocated the establishment of an international environmental organization a year before.

In the international arena, Germany, too, is viewed as a proponent of the establishment of a UN specialized agency for environmental issues following the official statement by then Chancellor Helmut Kohl in 1997 at the UN General Assembly special session on environment and development that "[...] global environmental protection and sustainable development need a clearly-audible voice at the United Nations. Therefore, in the short term, I think it is important that cooperation among the various environmental organisations be significantly improved. In the medium term this should lead to the creation of a global umbrella organization for environmental issues, with the United Nations Environment Programme as a major pillar" (Kohl, 1997). This was identical in essence to the Joint Declaration by Brazil, Germany, Singapore and South Africa issued in June 1997 at the same UN General Assembly special session. The design details of this 'global umbrella organization for environmental issues' proposed by Germany were not specified.

The new German administration which came into office in 1998 continues to back this initiative. For instance, the Social Democratic Party (SPD) environmental policy spokesperson declared on 25 January 1999: "We need […] a concentration of the unwieldy and fragmented international institutions

and programmes. UNEP, CSD and UNDP should be amalgamated in an organization for sustainable development. Close connections to the World Bank, the International Monetary Fund, the World Trade Organization and UNCTAD [UN Conference on Trade and Development] are desirable in order to prevent environmental dumping and to achieve overall a sustainable, environmentally sound development in accordance with AGENDA 21" (quoted after: epd-Entwicklungspolitik 5/99).

The Council has already spoken out in favour of the establishment of an International Environmental Organization in previous reports (WBGU, 1996, 2000a). The present report takes up this proposal once again and substantiates it comprehensively. First Section E 2.2 discusses what an organizational reform of global environmental policy should yield and should not yield. Section E 2.3 goes on to present a three-step model for redesigning the international organizational architecture. The Council does not recommend *a priori* that all steps should be implemented over the long term, nor that Step 3 should be the necessary ultimate goal. The Council rather advises the German government to aim initially to implement the first step, to examine its efficacy and only then to consider further steps if the previous step did not yield the desired outcome.

E 2.2
The functions of restructuring

COORDINATION NEEDS

What are the problems that have made the calls for the establishment of an International Environmental Organization so strident? First of all, the swift rise in the number of international environmental agreements over the past three decades has considerably increased the need to coordinate environmental policies. There is a real risk of duplication of efforts, overlap of competency and conflict among goals, not only among the various Conferences of the Parties, but also among the convention secretariats and the UN programmes and departments. Such problems arise both among various environmental agreements and between institutions located within and outside of the environmental sphere. For instance, international forest conservation rules are currently being debated by five different institutions: The International Tropical Timber Agreement, the Food and Agricultural Organization of the United Nations (FAO), the Climate Change Convention, the Biodiversity Convention and the Intergovernmental Forum on Forests.

In practically all fields of international environmental policy these problems are becoming increasingly apparent. For instance, there is little coordination between climate policy on the one hand and biodiversity and soil policy on the other. For each of these, independent secretariats have been set up which have effectively become small specialized organizations with their own agenda. Accounting for greenhouse gas sinks under the Kyoto Protocol to the Climate Change Convention could now create incentives in forest policy that run counter to the goals of biodiversity policy, because the Protocol will reward as a climate policy measure the logging of (species-rich) primary forests followed by reafforestation with (species-poor, but rapidly growing) plantations (WBGU, 1998b; for general discussions of these problems see Chambers, 1998; Oberthür, 1997; Oberthür and Ott, 1999; Young, 1997; Young et al., 1999).

A primary purpose of establishing the UN Environment Programme (UNEP) in 1972 was to coordinate the emergent field of international environmental policy. UNEP was initially a comparatively independent actor with clearly focussed tasks. The growing number of international environmental agreements subsequently led to considerable fragmentation of the system, as newly created convention secretariats were not or only loosely attached to UNEP, partly for political reasons. As a result, strong interests of individual entities developed, which has not on the whole promoted coordinated and efficient global environmental policy. In addition, various UN specialized agencies have developed environmental activities without UNEP, a relatively small organization, having been able to exert a normative and programme-determining influence. Moreover, the financing of the central environmental agreements of North-South relevance was partly institutionalized at the World Bank in the form of the Global Environment Facility (GEF), and partly entrusted to independent sectoral funds (Section E 3; Ehrmann, 1997; Biermann, 1997).

The problem of fragmentation has been well known for some time. Attempts to network individual organizations, programmes and offices have been under way since 1972. However, efforts to bridge the specific interests of individual departments, programmes and convention secretariats have foundered, so that the comparatively ineffective and inefficient fragmentation of the institutional and organizational architecture of international environmental policy has not subsided, but rather grown. The debate on institutional reform at the 1992 Rio conference only led to the formation of a further subsidiary commission of the Economic and Social Council of the United Nations (ECOSOC), the Commission on Sustainable Development (CSD) (Section B 4.3). Due to its specific institutional locus, which accords it little more than the right to forward recommendations to ECOSOC, the CSD has albeit

established itself in addition to UNEP, the convention secretariats and the UN specialized agencies as a forum for debate, but not for decisions.

Capacity building

Concerning the urgently required *capacity building* in developing countries, the international system again suffers under an ad-hoc approach that already fails to do justice to the requirements of transparency, effectiveness and participation of those affected – and the need for financial and technology transfer from North to South will continue to grow. For instance, in climate policy, as in ozone policy before, the industrialized countries have promised to reimburse the incremental costs incurred by developing countries if the latter commit themselves to quantified greenhouse gas emissions reduction objectives in the next decades. Much the same applies to the future costs of soil conservation and biodiversity conservation policy in the South. This will presumably soon be joined by transfer commitments for limiting the release of persistent organic pollutants. Moreover, future international emissions trading under the climate regime, for instance in the form of the Clean Development Mechanism (CDM) decided in Kyoto in 1997, will require substantial institutional underpinning.

Supporters of the establishment of a UN specialized agency for environmental issues argue that such an organization – modelled on, for instance, the World Health Organization – could make a greater contribution to raising awareness of the issues and could improve worldwide information as a decision-making basis. The latter point concerns both information on the Earth System and present environment and development issues on the one hand, and information on the status of implementation of international and national policies to control global change on the other. Of course there is no need to reinvent the wheel: All environmental agreements already commit their parties to regular reporting. Specialized agencies such as the World Meteorological Organization (WMO), the International Maritime Organization (IMO) or the WHO gather and disseminate valuable knowledge and promote further research; the CSD provides important contributions to the elaboration of indicators for sustainable development. UNEP, not least, is active in many of these fields.

Nonetheless, a need remains to coordinate and concentrate this knowledge in a comprehensive approach, and to process and channel it in a manner suited for decision-making (Section E 1). The contributions currently elaborated by the various international actors need a central locus in the international institutional system. UNEP could be this locus, but the resources and current competencies of this programme attached to the UN General Assembly do not suffice. Here one alternative might be to upgrade UNEP, transforming it into a treaty-based, institutionally independent International Environmental Organization underpinned with sufficient additional funding. A comparison of staff numbers illustrates how poorly UNEP is presently endowed: UNEP, an entity with worldwide activities, only commands over some 530 staff (2000), while the German Federal Environmental Agency (Umweltbundesamt, UBA) has 1,032 (1999) and the US Environmental Protection Agency (EPA) even commands over 18,807 staff members (1999).

Upgrading UNEP would also have the benefit of improved support for regime formation processes, for instance through initiating and preparing treaties. Here the ILO could provide a model, which has elaborated, following a defined procedure, a comprehensive body of 'ILO Conventions' which represent a form of global labour relations code. Compared to the ILO, regime formation in global environmental policy is far more disparate and suffers more from 'turf battles' among various UN specialized agencies, in which small UNEP has been unable to defend environmental interests adequately.

The case for and against a UN specialized agency for environmental issues

Now that Germany, too, has joined the debate on establishing a UN specialized agency for environmental issues, it needs to be stressed that this can be no panacea. Many of the problems plaguing the present small entities, notably UNEP and CSD, will not disappear from one day to the next. In a broader perspective, it further needs to be kept in mind that international organizations are rarely exemplars of efficiency. Institutional incrustation occurs all too easily in them, leading to inadequate adaptability and consequent bureaucratism. Thus some observers view the United Nations as a whole as an example of inefficiency. However, this does not necessarily speak in favour of maintaining the status quo either, for today the secretariats of international regimes are already often attached to global institutions and accordingly have to cope with bureaucratization tendencies. Each secretariat, each small environmental programme requires its own administrative apparatus, from payroll accounting to EDP services. The foundation of a new International Environmental Organization into which the convention secretariats and UNEP would merge would indeed create a new bureaucracy – but it would simultaneously render several smaller ones superfluous.

There is nonetheless a need to state clearly what a new International Environmental Organization

should not yield, or what must at all events be avoided. For one thing, it needs to be ensured that such an organization does not carry out projects itself. On-site project coordination should continue to be provided, according to the specific technical expertise required, by UNDP (Section D 3.3), the World Bank (Section D 2), FAO or UNIDO, whereby the new International Environmental Organization would operate exclusively as client and provider of substantive support. It would greatly exacerbate the inefficiency of the overall system if a further project-executing organization were created in addition to the existing project-focussed entities in the UN system.

Similarly, organizational restructuring should not lead to the creation of a new funding organization in addition to UNDP (Section D 3.3), the World Bank or the Global Environment Facility (Section B 4.5). However, a International Environmental Organization would need to be equipped with sufficient funding to pay its staff appropriately and carry out its substantive work – in some instances the present financial bottlenecks in the UN system have reached a scale detrimental to that system's effective operation.

Past debates have made it clear that reservations against the establishment of a International Environmental Organization prevail particularly in developing countries. The experience made with the German government initiative in 1997 shows that such political advances enter treacherous terrain if Germany is not backed by the consensus and support of its European partner countries. It is consequently recommendable to initially elaborate a common position on reforming the UN in the environmental sphere within the European Union, particularly as France evidently aims to lobby more strongly for an International Environmental Organization.

In a further step, it is essential to ensure that industrialized and developing countries support all initiatives in this area jointly. The Council therefore urges the German government to seek targeted coalitions with important developing countries in order to ensure acceptance of a political initiative from the outset. The Council accordingly welcomes the 1997 four-country initiative of the German government, taken together with Brazil, Singapore and South Africa, and recommends taking further political steps in this direction.

Furthermore, in order to enhance the acceptance by developing countries of proposals for reform, the Council recommends considering decision-making procedures in which North and South have an equal position – for instance modelled on the equal North-South representation in the decision-making procedures of the Montreal Protocol, the Ozone Fund or the GEF (Section B 4.5). This could ensure that the strategic and programming decisions of the new organization run counter to neither the interests of the developing countries nor those of the industrialized countries. Without the approval of a majority of the developing countries and without the consent of a majority of the industrialized countries, global environment and development policy is impossible. Decision-making procedures with equal North-South representation are effectively a 'third path' between the procedures of the UN General Assembly, which favour the South (one country, one vote), and those of the Bretton Woods institutions, which favour the North (one dollar, one vote), and may build the foundation for an International Environmental Organization (Biermann and Simonis, 2000).

E 2.3
Towards a new architecture

In the following, the Council develops three stages of organizational reform of the UN system as it relates to the environmental sector, building upon the status quo. Each step should be considered separately. The Council stresses that this model is by no means intended as a necessary sequence of steps leading inexorably to the last step. It is rather to be expected that the transition from one step to the next will already yield considerable improvements in global environmental policy. Only if this is not found to be the case should the transition to the next higher step be considered.

E 2.3.1
Step 1: Improving cooperation

The previous sections have discussed in detail the existing organizational structure and have highlighted its deficits. Against this backdrop, it appears necessary to the Council to take further steps towards improved cooperation among the various organizations and programmes. In Step 1, this cooperation would continue to be in the form of collaboration among equal partners. Nor would it touch upon the functions of the CSD, the GEF, the various convention secretariats and Conferences of the Parties, or the environmental policy departments and programmes of the individual specialized agencies. This corresponds to the basic principle of a 'segmentation strategy' of global environmental policy, in which the core competence for addressing individual environmental issues lies with the specialized conventions. This promotes unequivocal sectoral responsibilities.

Box E 2.3-1

The Töpfer Task Force

In 1998, UN Secretary-General Kofi Annan established the United Nations Task Force on Environment and Human Settlements in order to elaborate proposals for strengthening UNEP and Habitat (United Nations Centre on Human Settlements). Klaus Töpfer, UNEP Executive Director, was appointed chair. The motivation behind establishing the Task Force was the generally shared conviction that institutional fragmentation in numerous separate environmentally related processes has led to a loss of effectiveness. The brief of the Task Force was to review the structures of environmentally related activities within the UN, to evaluate their efficiency and effectiveness and to submit proposals for improving the environmental work of the UN at the global level and the role of UNEP as leading environmental organization. In addition, recommendations were to be made for strengthening the role of UNEP as the main source of environmentally related information for the CSD.

The Task Force comprised 21 eminent experts, met four times and submitted its report to the Secretary-General in 1998. It summarized its findings in 24 recommendations. Their implementation would serve to strengthen coordination among the various organizations, programmes and conventions, and enhance general political coherence in order to reinvigorate the work of the UN in the sphere of the environment and human settlements. The recommandations call for decisions and measures at both the intergovernmental and secretariat levels.

Establishment of an Environmental Management Group

The key proposal of the Task Force was to establish an Environmental Management Group headed by the UNEP Director, in order to better coordinate the exchange of information, new initiatives and the planning framework, and thus to ensure an efficient and effective use of resources. The purpose of this group is to create a forum for exchange among the analytical and normative activities of UNEP and the operative functions of UNDP.

Regular consultations between UNEP and the representatives of the conventions (presidents of Conferences of the Parties, heads of secretariats) are proposed in order to address cross-cutting issues. Consultation among the various programmes of the conventions and those of UNEP is to be improved and synergies exploited. The Secretary-General, governments and Conferences of the Parties are called upon to seek solutions to the inefficiency and exaggerated costs caused by the geographical dispersal of secretariats. The Task Force stresses the importance of stabilizing and strengthening Nairobi as a UN location. Issues that should be addressed include security, exploitation of synergies between UNEP and Habitat, developing a common financing strategy and, finally, merging administrations.

Early warning function

In the opinion of the Task Force, UNEP and Habitat should adopt information and early warning functions. They should be placed in a position to provide governments with timely information about negative developments that require preventive or relief measures on the part of the international community. This calls for a strengthening of their information provider function in order to facilitate an improved exchange of information for best practice in dealings with the global environment by the international community. Consequently, the Earthwatch system should be reviewed and further developed to an effective, scientifically based system. In the same vein, indicators for sustainable development should be developed and data and information exchange capacities expanded. The Task Force states expressly that these should include information provided by non-governmental organizations.

The Task Force further stresses the necessity of using the GEF efficiently. To this end, collaboration between UNEP, UNDP and the World Bank should be intensified.

The Task Force also provided a series of suggestions for strengthening the involvement in the work of the UN of private industry, non-governmental organizations (particularly those in the South) and other civil society groups.

To enhance coordination and coherence among intergovernmental institutions in the environmental sphere, the Task Force proposes, among other things, a global environmental forum at minister level that should meet annually in connection with the sessions of the UNEP Governing Council and should review the environmental agenda of the UN and its implementation. The meetings should take place at different locations, should tackle regional issues and should attract media attention through debates of topical interest. With the aim of improving consultation with the CSD and with the Conferences of the Parties, this forum should also elaborate contributions to the CSD sessions. The first global forum of environment ministers took place in May 2000 in Malmö.

In this phase, a key element in the opinion of the Council is to first establish a high-level Environmental Management Group. This would be drawn from the executive personnel of the environmentally relevant UN specialized agencies and programmes, as recommended by the Töpfer Task Force (Box E 2.3-1). Within this group, environmental concerns could be promoted by upgrading UNEP accordingly. This upgrading could be provided by strengthening UNEP financially and administratively, in order for it to be able to carry out its tasks more effectively in the fields of scientific coordination, public awareness-raising, technology transfer and advisory services for state and non-state actors in developing countries.

If appropriate, UNEP could also be strengthened by upgrading it to the status of an agency within the United Nations system. Such an elevated status would not compromise the rights of the convention secretariats, Conferences of the Parties or the other UN specialized agencies. It would rather mean, besides improved financial and staffing resources, above all an upgrading of environmental concerns within the 'family' of UN specialized agencies.

There are two models for such institutional upgrading: First that of the World Health Organization, i.e. a UN specialized agency with its own budget and own membership, or, second, that of the United Nations Conference on Trade and Development

(UNCTAD), a UN programme established by the UN General Assembly to promote cooperation in international trade policy.

The group of UN specialized agencies is the outcome of functional specialization within the UN system, with the United Nations Organization (UNO) at the centre, surrounded by a group of independent UN specialized agencies for special policy fields, such as for food and agriculture (FAO, since 1945), education, science and culture (UNESCO, since 1945), health (WHO, 1946), aviation (ICAO, 1944) or meteorology (WMO, 1947). Some of the specialized agencies are much older than the UNO itself, such as the Universal Postal Union (UPU), going back to the year 1874. Most, however, were established almost simultaneously with the UNO because national governments feared at the time that the vast range of tasks would overburden the UNO. All UN specialized agencies are linked intimately with the UN, in particular with ECOSOC.

In 1945, environmental problems were not yet an issue, so that the term 'environment' is not mentioned once in the UN Charter. It was not until 1972 that a UN environment programme was established within the UNO, without legal personality and without its own budget; its founding document stipulates it should have only a small secretariat. This UNEP is not comparable with the UN specialized agencies for the other policy fields. If, now, the International Environmental Organization were to be established as a further UN specialized agency, this would build upon a founding treaty that would need to be ratified by a certain number of states in order to enter into force. Such an organization could have its own budget, possibly replenished by member state contributions, and could also administer in trust the funds of innovative financial institutions (Section E 3).

A UN specialized agency for environmental issues could adopt certain standards binding upon all members, where appropriate with majority decisions. Furthermore, the general assembly of the International Environmental Organization could negotiate and adopt treaties which would then be opened for signature within the organization. ILO, for instance, demands of its member states that, within one year after adoption of an ILO convention, they forward this to the appropriate governmental institutions for deliberation and ratification. This goes far beyond the powers of the present UNEP Governing Council. On the other hand, a new organization would not necessarily lead immediately to the dissolution of UNEP, particularly if not all UN members wish to join the new organization. Insofar, during a transitional period and possibly for longer, a new UN specialized agency could exacerbate rather than alleviate the problem of duplication of efforts and inefficiency. Over the long term, however, following the establishment and implementation of an International Environmental Organization, the existing UN environmental programme should expire.

The UNCTAD model, i.e. a subsidiary body within the UN, currently appears the most realistic solution. UNCTAD was established in 1964 by a resolution of the UN General Assembly. Its status as a semi-autonomous specialized entity within the UN has remained largely unique. To a certain degree, UNCTAD has a higher status than UNEP at present. Nonetheless, upgrading UNEP to a semi-autonomous entity subsidiary to the UN does not appear a sufficiently ambitious step.

The act of creating a Type I International Environmental Organization, be it on the WHO/ILO model or on the UNCTAD model, would not in itself affect the status of the various environmental conventions. It is however probable that a stronger environmental policy actor within the UN system would ultimately lead to a certain shift in the balance of power among the organizations, notably to a transfer of competencies to the new organization at the cost of FAO, UNESCO and UNIDO.

Approval by the developing countries would be enhanced if this Type I International Environmental Organization implies a strengthening of the UNEP functions that are central to developing country interests, such as information procurement and dissemination, and technology transfer. It further needs to be ensured with a view to developing country approval that the Type I International Environmental Organization does not remain restricted to inherently global environmental problems such as climate change or ozone layer depletion; it must also cover the management of environmental problems whose global impact rests on cumulative effects, such as soil and land degradation, biodiversity loss, forest decimation or freshwater scarcity. In developing countries, such environmental problems currently endanger far more human lives than the inherently global environmental problems (WBGU, 2000a). The Type I International Environmental Organization should therefore concentrate on the conservation of freshwater resources, soils, biodiversity and forests, on the safe management of chemicals and on air pollution control (also indoors). Inherently global environmental problems, such as ozone depletion or climate change, must also be addressed by this organization, but should not be the central issues. One reason for this is that – at least in the eyes of the developing countries – the principal responsibility for these inherently global issues continues to rest with the industrialized countries and therefore other organizations such as the OECD could carry out the corresponding tasks.

Such a International Environmental Organization need not have any 'sharp teeth', but could quite well be successful by means of 'soft' enforcement mechanisms. For instance, the organization should be empowered to gather information on the state of the environment and of environmental policy in the individual countries and to evaluate and publish this in a suitable form. This could in particular make comparisons with the international commitments into which the states in question have entered. As Levy (1993) has shown for the example of the European air pollution control regime, purely comparative information on different states can trigger important political initiatives in countries where environmental awareness is low.

E 2.3.2
Step 2: Coordinating umbrella organization with independent committees

If improved cooperation among international organizations and programmes, possibly including the establishment of a new organization modelled on the WHO or on UNCTAD, should not suffice to remedy the deficits identified, strengthening environmental protection through improved *coordination* of actors would need to be considered. Such coordination would to a certain extent necessitate a limited introduction of hierarchies within the organizational architecture. Should such a step become necessary over the medium term, the model of the World Trade Organization (WTO) suggests itself. Here the secretariat of the General Agreement on Tariffs and Trade (GATT) was upgraded to an independent international organization; at the same time, various multilateral and plurilateral trade agreements were brought under the umbrella of the framework treaty establishing the WTO. As a result, all trade agreements have the same secretariat, namely the WTO, which prevents inefficient fragmentation among numerous administrative units. Furthermore, all trade agreements are subject to the same dispute settlement mechanism. Nonetheless, a certain degree of decentralism in the decision-making system is retained because the specific decisions for the key trade agreements are taken at special conferences attached as 'committees' to the WTO Ministerial Conference. In analogy, it might be possible over the medium term to integrate the various Conferences of the Parties in the environmental arena under the umbrella of a common framework treaty establishing an International Environmental Organization and then to let them continue to operate, as in the WTO system, as special committees of the ministerial conference with a high degree of autonomy. The establishment of such a Type II organization will surely only be accepted by developing and industrialized countries alike if both sides have effective veto rights over the further development of the organization. Here adoption of the decision-making procedure of the Montreal Protocol, with its equal North-South representation, makes particular sense.

For developing countries, the establishment of a Type II International Environmental Organization would have the particular advantage of geographic centralization of negotiations. Until now, very many of the smaller developing countries are overburdened in terms of human resources by the great number of international negotiating committees, Conferences of the Parties, sub-committees and expert panels meeting worldwide. They are scarcely able to keep track of the scientific, political and economic implications of the complex issues under negotiation, for instance global emissions trading under the climate change regime, or safe international management of genetically modified organisms. As a consequence, many developing countries orient themselves politically to the major actors of the South. Even the leading G-77 countries, such as India or China, often do not command over a sufficient number of experts to keep up with the 'global negotiating caravan'. Thus, for instance, Indian interests have often been represented at international negotiations by local embassy staff, so that India's ambassador in Finland had to play a substantial role in negotiations on a global ban on the diverse ozone-depleting substances (Rajan, 1997). It is therefore often considered an advantage of an International Environmental Organization that environmental policy negotiations could be organized centrally at the seat of this organization. This would put almost all developing countries in a position to build a professional team of expert environmental diplomats at this organizational seat. The same applies to representatives of environmental associations and other non-governmental organizations from the South, who are scarcely able to afford the present negotiating system of shifting conferences moving through almost all capital cities of the world. They would be able to establish a permanent representation in a single 'global environmental capital'. Industrialized countries, too, could save considerable travel and staff costs through such centralization.

A need for clarification would remain in Step 2 with regard to the development aspects of the global project of sustainable development. Globally, environmental protection cannot be viewed in isolation from the other policy arenas. Political agreements and programmes, for instance on tropical forest conservation or on regulating the consumption of fossil fuels, inevitably affect core areas of economic and

development policy. A Type II International Environmental Organization needs to take this into account. In the view of the Council, it should not promote development as such, such as the UN Development Programme (UNDP) or the World Bank strive to do (Sections D 2 and D 3). However, the new organization should strive to ensure in its policies that poverty alleviation and economic development in the South are not jeopardized and that global environmental policy meets the criterion of globally equitable burden-sharing. It is therefore important to enshrine these aspects in the statutes of the organization – possibly in analogy to the 1992 Rio Declaration on Environment and Development. Biermann and Simonis (2000) make the further proposal of expressing this focus in the title of the new organization, too, terming it the 'World Environment and Development Organization' (WEDO).

Some envisage a far greater degree of integration, arguing for a merger of UNEP and UNDP (thus, for instance, the German Social Democratic Party's environmental policy spokesperson in a declaration on 25 January 1999). Considering the UNDP core budget of some US$700 million, this would be a 'juggernaut marriage' in the family of international institutions. Industrialized countries have long resisted an international organization for development issues, so that it appears scarcely possible to implement the upgrading of UNDP and UNEP to a 'World Organization for Sustainable Development'. On the other hand, the UNDP-UNEP synthesis might find favour among some industrialized countries if this could reduce the overall development policy budget of the UN through merger-related savings. The former UNDP head Gustave Speth has spoken out fundamentally in favour of an International Environmental Organization, but against its merger with his own institution (Speth, 1998). Similar resistance is to be expected from his successor; given the weight of UNDP, this is not to be underestimated. A main problem is the project character of UNDP's work, which UNEP does not have and would not be expedient for the International Environmental Organization under debate here; a further problem is the considerable difference in size between UNEP and UNDP. Both aspects could be highly detrimental to the envisaged policy-stimulating and cooperation-enhancing effects of an International Environmental Organization – these new effects could be submerged by UNDP's operative activities.

E 2.3.3
Step 3: Centralization and concentration within one organization?

It is too early to judge whether steps 1 or 2 will suffice to respond adequately to the mounting global environment and development crisis. Nonetheless, with a view to longer-term developments, the Council wishes to provide indications for possible further institutionalization steps as a response to any failure of steps 1 and 2.

Step 3 would involve fundamental restructuring of the institutional architecture of global environmental policy, notably by establishing a new, superordinate organization. One purpose of this would be to centralize and hierarchize international environmental policy more strongly. A second would be to accelerate decision-making processes by overcoming the principle of consensus or setting up smaller decision-making bodies with representative membership, such as an 'Environmental Security Council', by which minorities would lose their power of blockade. Building on such hierarchization, compliance with international environmental standards could be ensured by means of coercive measures, but also through intensified financial and technical assistance. The present great array of decentralized institutions developing in isolation from each other, whose interrelationships have as yet scarcely been designed in any deliberate manner, could thus be channelled to solve coordination problems more readily. Daniel Esty's proposal to establish a 'Global Environmental Organization' (1994b), for instance, amounts to such centralization and hierarchization.

Such proposals give preference to the aspect of global 'government' over horizontal, non-hierarchical patterns of organization – 'governance'. In most schools of thought there has been general agreement that this is unrealistic or undesirable. This view is shared both by neorealism, which considers all forms of institutionalizing the international system unrealistic and improbable (Waltz, 1959, 1979), and neoliberal institutionalism, which stresses the prospects of building international governance upon a foundation of interconnected issue-specific regimes and not through organizations that restrict sovereignty (Haas et al., 1993; Victor et al., 1998; Young, 1997; Zürn, 1997).

Over the medium term, forms of hierarchization that restrict sovereignty will doubtlessly encounter considerable resistance, in North and South alike. This applies, for instance, to proposals for the establishment of an Environmental Security Council (Palmer, 1992) or an International Environmental Court with binding adjudication (Zaelke and

Cameron, 1990; Fues, 1997). The first of these two would certainly need an amendment to the UN Charter, which requires ratification by two-thirds of UN members and by China, France, Russia, the United Kingdom and the United States. Far-reaching restrictions of national sovereignty appear out of the question at present with such a quorum.

Furthermore, rigorous enforcement mechanisms of an International Environmental Organization would ultimately only be practicable against those states that already see themselves threatened today by 'ecoimperialism': The developing countries (Agarwal and Narain, 1991; Agarwal et al., 1999). Particularly in relations with these states, an International Environmental Organization equipped with 'sharp teeth' may therefore in fact be counterproductive (Biermann and Simonis, 2000): In order not to expose themselves to the environmental dictates of rich industrialized countries, they may either stay away from the organization, or demand weaker standards in international environmental law and refuse stricter ones.

A centralization in which several issue areas are drawn together would offer special opportunities to make package deals across the boundaries of previously separate sectors. However, when the scope of negotiations is expanded in this fashion there is the danger of increased negotiating blockades, as too many technical aspects may be mingled (Sebenius, 1983). Furthermore, centralization harbours the risk of hampering institutional innovations that would otherwise emerge in niche areas and subsequently become the norm. In a centralized structure, even innovations in peripheral areas will always tend to have very much broader implications because the directly regulated area is interlinked institutionally with many others. For instance, it is quite conceivable that the possibility of majority decisions provided for by the Montreal Protocol would not have been enforceable in a centralized structure because many actors would have feared the precedent that this would have set.

Institutional centralization in the shape of a world organization restricting national sovereignty has a clear potential to solve the problems associated with coordination among different environmental organizations. However, the necessary coordination services could in principle also be provided within the context of existing structures and a more modest organizational solution, such as establishing an International Environmental Organization with a limited mandate that does not restrict national sovereignty (Type I or II).

E 2.4
Recommendations for action and research concerning the organization of global environmental policy

The institutional and organizational architecture of international environmental policy currently has a distinctly decentralized structure: In most issue-specific institutions a variety of institutional elements are combined. This has hampered, given the prevailing principle of consensus, both the adoption of binding decisions for environmental protection and the effective implementation of decisions taken. Moreover, the system of international institutions in the environmental sphere (and beyond) is struggling increasingly with coordination deficits.

To remedy this situation is now the challenge for efforts to reform the institutional structure of international environmental policy. Proposals range from establishing an all-powerful world organization responsible for all environmental issues, through to simply introducing new procedural elements within the context of certain environmental agreements (incremental change) (Oberthür, 1999b). In the opinion of the Council a hierarchical restructuring of international environmental policy is currently out of the question as it will not be compatible with the principle of sovereignty that conditions structures in international relations.

Overall, however, the Council takes the view that it would be a promising path to upgrade UNEP to an International Environmental Organization in such a way that this does not restrict national sovereignty. This would provide an additional element of a horizontally organized global governance structure in international environmental policy. In the typology set out above, the Council has termed this 'Step I'. It appears essential to have an organizational locus for a decentralized international sustainability strategy, in a form that does justice to the interests of most states. Just as the environmental protection policy arena was strengthened institutionally in the nation-states in the 1970s and 1980s through the establishment of independent environment ministries, so now should the global environmental policy arena be strengthened by an independent specialized organization. This is important to minimize the tendencies of individual programmes and organizations to pursue their own agendas, and in order to limit duplication, overlap and inconsistency.

The main functions of the new organization would be to bring international environmental policies back together, to build capacity in developing countries through the transfer of knowledge and technology, to contribute to improved implementation and to cre-

ate a setting for negotiating new institutions that is more conducive to cooperation. It can at present scarcely be assessed whether further moves – steps 2 and 3 – may become necessary over the medium term. The Council urges adherence to the principle of subsidiarity; initially Step 1 should be the aim, before, proceeding from a painstaking analysis of effectiveness, further steps are considered. It is only through such an approach that the confidence of the developing world can be gained for a reform of the UN system in the environmental sphere.

The debate on the establishment of an International Environmental Organization should not obscure the fact that the global environmental crisis is more than a problem of environmental protection – it is a global environment and development crisis that calls for efforts and new global policy approaches in the sphere of 'traditional' development cooperation too. Revocation of the German government's drastic cuts in official development assistance funding would be a key contribution to promoting effective and globally acceptable environmental policies.

E 3 Raising and allocating funds for global environmental policy

E 3.1 The significance of funding

Solving the problem of how global environmental protection is to be financed plays a crucial role in virtually all stages of global environmental policy (Chapter C). While national environmental policy is implemented principally through sovereign jurisdiction, global environmental policy is characterized by the principle of consensus, in other words, the implementation of global environmental policy depends to a large extent on agreement being reached by all countries. Because many measures to protect global environmental resources are more efficient in developing countries (e.g., lower costs associated with improving energy efficiency to avoid greenhouse gas emissions), or indeed are only possible in developing countries (e.g., conservation of the tropical rainforest), getting developing countries to agree to international conventions on the environment is frequently dependent on wealthier industrial nations assuming at least some of the costs of implementing these conventions. The developing countries are thus gaining increasing negotiating power, and this manifests itself especially in the say that they have regarding the use of funds (Biermann, 1998b).

AGENDA 21 takes this as a starting point when analysing the design of global environmental policy. According to that programme of action, the financing of global environmental protection is to proceed in accordance with the principle of 'common but differentiated responsibilities'. In the conventions for the protection of the ozone layer, the climate and biological diversity, the industrialized countries committed themselves to take on the 'agreed full incremental costs' incurred by developing countries in implementing the conventions. The concept of 'agreed full incremental costs' is a rather loose term that requires interpretation, and one on which the views of parties to the conventions are opposed. In AGENDA 21 the annual funding required for implementation of the conventions is estimated at US$600 thousand million for the 1993–2000 period, of which the international community is expected to raise US$125 thousand million. The Council has already indicated in an earlier report that at that time, based on Germany's contribution of 8.93 per cent to the United Nations for 1993, the amount expected from Germany would be in the region of US$11.16 thousand million. In terms of Germany's gross national product for 1993 – the first year of the AGENDA 21 planning period – this would have been equivalent to 0.59 per cent of Germany's gross national product (GNP). Such a commitment would have come very close to the internationally agreed target, reiterated at the international conferences in the UNCED follow-up process, of earmarking a 0.7 per cent share of GNP for development cooperation. As economic cooperation with developing countries encompasses more than the 'pure costs of Rio follow-up', the commitment would effectively go far beyond the stated 0.7 per cent (WBGU, 1998a). It is against this background that one should view the recommendation of the Council, once again reaffirmed here, to increase the target in the long term to one per cent of GNP. First of all, however, we should focus our attention once again on the goal of spending 0.7 per cent of GNP on global environment and development policy. Despite the difficult budget situation, the German government should seek – at least in the medium term – to implement this goal.

This demand must appear all the more ambitious given that public spending on development cooperation in Germany has dwindled continuously over recent years. In most of the other industrialized countries too – especially in those countries that make the largest financial contributions to development cooperation in absolute terms – the willingness to provide more funds out of public budgets has diminished substantially (Table E 3.1-1).

The foregoing remarks show clearly that any examination of the question of financing global environmental policy must take into account the two following background conditions:

- The funding requirement for global environmental protection seems to be enormous. This has been shown clearly both in the various reports of

Table E 3.1-1
Official Development Assistance (ODA) transfers of OECD countries in 1993 and 1998 (debt repayments deducted; sorted in the order of absolute volumes of development assistance transfers in 1998).
Source: World Bank (2000c)

	ODA [millions of US-$]		ODA [% GNP]		mean annual change [%]
	1993	1998	1993	1998	1992-93 to 1997-98
Japan	11,259	10,640	0.27	0.28	-0.8
USA	10,123	8,786	0.15	0.10	-8.3
France	7,915	5,742	0.63	0.40	-5.7
Germany	6,954	5,581	0.35	0.26	-4.7
UK	2,920	3,864	0.31	0.27	0.6
Netherlands	2,525	3,042	0.82	0.80	2.3
Italy	3,043	2,278	0.31	0.20	-12.7
Denmark	1,340	1,704	1.03	0.99	3.8
Canada	2,400	1,691	0.45	0.29	-3.9
Sweden	1,769	1,573	0.99	0.72	-3.7
Spain	1,304	1,376	0.28	0.24	0.3
Norway	1,014	1,321	1.01	0.91	2.7
Australia	953	960	0.35	0.27	-0.3
Switzerland	793	898	0.33	0.32	-2.1
Belgium	810	883	0.39	0.35	-0.8
Austria	544	456	0.30	0.22	-2.6
Finland	355	396	0.45	0.32	-5.6
Portugal	235	259	0.28	0.24	-1.2
Ireland	81	199	0.20	0.30	19.8
New Zealand	98	130	0.25	0.27	3.9
Luxembourg	50	112	0.35	0.65	18.2
Total	56,486	51,888	0.30	0.24	-3.6

the Council (WBGU, 1994–2001) and in the remarks made in Chapter B concerning the six major global environmental problems.

- Because of the consolidation path being pursued by the majority of donor countries, due to the decreasing level of priority being given to global environmental protection against the background of national economic problems (e.g., unemployment), but also due to diminishing confidence that funds are being used efficiently, the amount of funding being made available by the industrialized countries is declining constantly.

Within the UN system these fundamental problems related to financing have been the subject of discussion for some time under the heading 'global partnership for development'. In 1997 the UN General Assembly passed a resolution to stage a high-level intergovernmental event in the year 2001 on the subject of financing for development. Key themes at this conference will be international development cooperation, including debt relief, but also aspects of the international monetary, financial and trade system that could help to support economic development. The Council welcomes the efforts of the UN to tackle this important subject in the context of a high-level international conference. Accordingly, this section is devoted to examining key questions pertaining to the financing of global environment and development policy.

The Council has demonstrated the considerable need for action that exists in terms of global environmental policy. There is significant scope for action for an environmental policy without money. This kind of policy focuses above all on measures aimed at formulating global regimes, improving the organization of existing institutions, harmonizing policies or eliminating shortcomings regarding enforcement. Such steps are important, but they are not enough. Thus the question of how to raise funds is indeed vitally important. Regrettably, this question is often answered only very superficially and money is requested for all sorts of purposes. Sometimes one cannot avoid the impression that obtaining funding is the be-all and end-all in itself.

More recent discussion surrounding the reform of international organizations shows that demands of this sort for more money are being viewed with increasing scepticism. In particular more recent public choice analyses of politics and bureaucracy have drawn attention to the fact that national, and especially international, authorities and institutions have a tendency to expand and to be inefficient and are characterized by a high degree of irreversibility (Roppel, 1979; Jackson, 1982; Frey and Kirchgässner, 1994; Kolan, 1996; Richter and Furubotn, 1996; Kuhlmann, 1998). Important insights have been gained by examining bureaucracy in terms of principal-agent relationships. Such a relationship is present where a person or a body (such as a community of

states) – the so-called principal – within the framework of a contractual agreement instructs an agent – administrative authority – to perform a service that benefits the principal. There is always a risk that the agent will use the scope for action assigned to it to further its own interests. The easier it is for the authority (agent) to elude regular (democratic) monitoring the greater the risk becomes. Such authorities can also achieve considerable autonomy as regards particular apportionments of funds. This is the case when the funds are raised by means of dedicated levies whose basis of assessment expands (such as movements of traffic or mass flows). Then authorities or bureaucracies can develop 'idiosyncrasies', which are particularly prevalent in international bureaucracies (Kuhlmann, 1998). Administrative officials here are much better able to pursue their own personal interests than within national bureaucracies. This explains why requests for more money are met with increasing caution and ways are sought to improve efficiency or find other, more sophisticated solutions.

Parallel to serious efforts first of all to achieve the 0.7 per cent target, innovative financing mechanisms must also be developed. Where one is dealing with public funds (Section E 3.2), solutions must first be found that do not consist – whether openly or disguised – of a new form of taxation, but rather take the shape of, for instance, charges for actual use of environmental resources. Other new proposals are constantly being put forward for introducing so-called 'innovative financing mechanisms' in order to enable steady funding for global environmental policy and at the same time to create a degree of independence from the willingness of the industrialized countries to provide funds. Section E 3.2 provides an overview of such sources of finance. In its own recommendations and in the research that it commissions, the Council focuses on developing systems that provide incentives with beneficial environmental impacts. Section E 3.3 discusses the advantages that can be achieved through greater involvement of the private sector in financing global environmental protection and identifies the possibilities that exist for obtaining additional financial resources as a result of involving private sector players. The subject of Section E 3.4 is how efficiently financial resources are spent. The level of efficiency with which funding institutions allocate public funds is an important topic of analysis because efficiency improvements can increase what can be achieved with a given volume of resources. This in turn can increase willingness to provide additional funds. The discussion concludes with recommendations for action and research in the field of financing global environmental policy (Section E 3.5).

E 3.2
Innovative approaches to financing

E 3.2.1
Introduction

Section E 3.1 underscored that considerable financial resources are required to deal with the global environmental crisis. This need will increase as the existing problems grow in significance (Chapter B), but also as new areas for action emerge. Despite efforts to use the money already flowing into the system more efficiently (Section E 3.4), in the coming decades the international community will not be able to circumvent having to develop new, innovative approaches aimed at raising money to reorient the path of global development towards greater sustainability and viability.

It its report entitled 'Our Common Future', the Brundtland Commission put forward proposals for innovative, 'automatic' sources of finance. In the following section the Council assesses some of the proposals for financing global environmental protection and adds some ideas of its own. Many people may find the proposals discussed here far-reaching. Indeed it is true that international politics, which still has to work within the parameters of a system of decentralized state agencies, will need a great deal of staying power in order to make these proposals concrete and implement them. The Council nevertheless considers it to be its duty to march on with elaborating the ideas and to provide policy-makers with initial concepts and stimuli for developing innovative financing tools.

Direct allocation of funds out of national tax revenues is the predominant mechanism for financing global environmental policy (Section E 3.2.2). In discussing these issues and making its recommendations, the concept of user charges has a key role for the Council. Section E 3.2.3 therefore discusses proposals for levying user charges for using global common goods. The following section goes on to present and assess the possibility of introducing compensation for abstaining from resource use (Section E 3.2.4), and insurance and compensation options for regional damage resulting from global environmental change (Section E 3.2.5). The section concludes with an analysis of some additional, much debated proposals for levy schemes (Section E 3.2.6). It is important to emphasize with regard to the whole of the following discussion that considerable further research and debate are needed. The Council therefore recommends that the German government

should continue to foster and promote scientific exchange and political debate on these issues.

E 3.2.2 Direct contributions of funds from national tax revenues

The status quo as regards financing international environment and development policy has been described in depth in the academic literature and has also been evaluated in the Council's earlier reports. From these it is clear that as a rule global environmental policy is financed by means of direct allocations of funds from national tax revenues, which means that governments meet the costs of their own environmental policy primarily directly from their own budgets. This is basically true of both industrialized and developing countries. In addition, most developing countries also receive financial support for their environmental policy from the international community, either in the form of bilateral assistance or through multilateral donors such as the World Bank or the UN Development Programme (Sections D 2 and D 3.3).

Protection of the climate, the ozone layer and biological diversity are three special cases; here the industrialized countries and (with regard to ozone policy) some emerging economies have committed themselves to take on the 'agreed full incremental costs' of the developing countries in these areas of policy. This means that the costs incurred by developing countries for planning and implementing environmental protection measures in these areas will be reimbursed by the international community, less any costs related to other, purely national interests of benefit to the developing countries (for example, less the income from tourism in nature conservation areas). Defining 'incremental costs' in a specific environmental project is no simple matter, however, and is often the subject of protracted political negotiations. Moreover, by setting out in a contract provisions for the implementation of contribution-based financing of 'incremental costs' that are difficult to define there is a risk of encouraging 'increases in costs', and thereby creating inefficiency, which is not the intention of the donor.

In institutional terms, in these three areas of global environmental concern funds are transferred through the Multilateral Fund for the Implementation of the Montreal Protocol (Biermann, 1997) and the Global Environment Facility (GEF) of the World Bank. The Bank operates the GEF in conjunction with UNEP and UNDP. The GEF finances environmental protection projects to protect international water resources, the ozone layer (where eastern European countries and Russia are concerned) and the soil in arid regions (insofar as there is a connection with climate and biodiversity) (Ehrmann, 1997; Fairman and Ross, 1996). In all these cases funding comes directly from the government budgets of the industrialized countries which have committed themselves to this programme, either in accordance with a specially adapted UN contributions scheme (in other words, depending primarily on the financial capacity of each country), or on the basis of voluntary contributions (as is mainly the case with the GEF).

Direct financing of this nature via the state budget has a whole range of important advantages. It ensures, for example, that such funding remains a regular subject of parliamentary debate and does not become rigidified in an inefficient manner. Constant review of the funding mechanism by the national parliaments of the OECD countries also has the effect of making the money-distributing authority constantly seek reaffirmation of these parliaments' support. This undoubtedly has considerable influence on how efficiently financial resources are allocated.

On the other hand, however, there are also obvious disadvantages: donor countries that are particularly strong in financial terms gain significant influence as regards the allocation of funds and the general policy of the money-distributing authority, which may be reflected not only in staffing policy but also in certain fundamental decisions. The United Nations itself for example suffers from the failure of some of its largest member countries to adhere to their contribution commitments and as a result is dependent on these countries in a very particular way. This in turn is hardly beneficial for the organization's constitution and especially for its internal voting mechanisms. A further problem arising from the more or less voluntary financing of global environmental policy is that it creates incentives for donor states to engage in freerider behaviour, perhaps withholding or cutting back on their contributions at times when there are budget bottlenecks, relying on the contributions of other states being sufficient to finance global tasks. The theory of collective action (Olson, 1965) shows that this behaviour, which is rational on an individual basis, can lead to a policy outcome that is collectively suboptimal in a decentralized system. Yet another disadvantage related to raising financial resources via national budgets and taxes is that it has no impact whatsoever in terms of changing behaviour towards making more efficient and resource-conserving use of the natural environment.

Direct financing of global tasks via transfers from state budgets nevertheless remains the preferred method at the present time and its advantages – especially the regular checks by national parliaments and the pressure on the money-distributing body to legit-

imize its actions – should not be underrated. The Council therefore recommends adhering in principle to this method. In parallel, however – for particular global environmental policy tasks where such a procedure is appropriate – progress must be made in developing and introducing new types of financing mechanism. It must be stressed again, however, that considerable research and testing still needs to be undertaken in this regard. The proposals presented below likewise require such in-depth analysis.

E 3.2.3 Levying charges on the use of the global commons

E 3.2.3.1 The basic idea of user charges

The Council has repeatedly emphasized the positive contribution to environmental protection that transferring property rights relating to environmental resources – in conjunction with liability – can have (WBGU, 2000a). In some cases, however, this option is not feasible at all or only to a limited extent. This applies especially to the oceans and the Earth's atmosphere – the global commons. These are what are known as open-access resources, and they are constantly exposed to the danger of overexploitation unless common rules of 'good practice' are established for their management. Assigning property rights over these for environmental purposes is generally ruled out simply because of diffusion processes. These resources must be managed by the international community in a kind of trusteeship. There is a need to clarify the implications of these global commons in terms of property rights.

In the case of goods where property rights are clearly defined, the situation is straightforward. Here, as a rule, a user charge must be paid for using the resource. If the owners are thinking in the long term, this has advantages from the environmental point of view. Above all it arouses the owner's interest in maintaining the viability of the resources he owns. This leads the owner to engage in protection and remediation activities with a view to maintaining or restoring the viability of a given resource and also simultaneously makes users aware of the scarcity of a good or resource. It is most important that the link between the charges and the use of the environmental resource should be direct and clear and that they raise awareness of the harmful impact resulting from using the resource. If the harmful effects diminish or the viability of the resource is secured by other means, then the charges must also be reduced. The point therefore is not to raise revenue in a 'purposeless' way or defined merely in terms of general environmental concerns, but rather that the charges should serve a clear purpose and provide specific incentives.

In the view of the Council it would make sense to explore to what extent user charges could be used as a tool in the case of the oceans and the Earth's atmosphere, including the geostationary orbit. Here we are dealing with open-access resources which, despite protective regulations, are being damaged increasingly. Substances (such as greenhouse gases) are being emitted into the Earth's atmosphere, the Earth's orbit is being used for satellites or space stations, or as a dumping ground, fish stocks are being overfished and the water and air are being contaminated by shipping and air traffic. In this connection the Council would also point to recent developments in the field of infrastructure financing. In these cases too we are dealing with resources – e.g., roads – that are utilized by the community as a whole. Here there is an increasing tendency to exclude the maintenance and expansion of capital goods that are important from the point of view of sustainability from the day-to-day political agenda and instead provide them with funding that is linked to interesting sources of revenue and incentives, and to more long-term thinking. A typical example of this is the German federally-run trunk road network. An increasing number of academics recommend going down the road of legal autonomy – for example in the form of a federal motorway company – with the new owners levying user charges at the same time. User charges could vary according to intensity of use and environmental impact, and also according to time and place. The intention of such proposals is to provide a stronger focus on utilization and on the longer term.

Technically it is possible to cover all movements of traffic and apportion the costs of use (road pricing). In this way a connection can be made between inducing behavioural change and financing. By directly linking user charges to specific purposes – in other words, maintaining the viability of these community resources – the problems of monitoring are also reduced, since instead of an international authority that might have a rather diffuse operating remit, an institution is created whose tasks are clearly defined and which can be monitored by means of regular reporting. Such an institution can also be made subject to competitive controls, for example through regionalization. There is no reason why the idea of levying user charges cannot be applied to global common resources too.

The Council would like to emphasize strongly here that such charges are not merely one of many variants in the upwardly spiralling number of proposals for new forms of environmental levy. Rather it

is about a concept that contains elements of assigning 'property rights', but which centres on the principle of equivalence as regards setting the charges. By assigning property rights, open-access resources become common property resources. Overexploitation and degradation (pollution), which also occur frequently in the case of the latter, are to be prevented. At the same time the beneficiaries become the bearers of the costs, and the efficiency of resource allocation can thereby be increased greatly. The revenues thus obtained should be used primarily to maintain or perhaps even improve the viability and productivity of resources belonging to the global community – 'global common resources'. Revenues must not be used for cross-subsidizing other tasks and must not be diverted into the general budget. The charges must highlight instances of scarcity and should serve to maintain the functional capacity of a specific global environmental resource. It must be possible to reduce the charges again where this task has been fulfilled. Below we shall discuss some proposals aiming in this direction concerning air space, the oceans and the Earth's orbit.

E 3.2.3.2 Use of air space

Although under international law air space comes under the sovereign jurisdiction of the country in question, it can certainly also be regarded as a common resource in terms of impact and for considerations that are to some extent political. Above the high sea – which covers a large share of the Earth's surface – air space is not subject to national sovereignty. To this extent it is justifiable to speak of this medium primarily as a global common resource. As global warming shows, the global community is jointly affected at least by specific impacts upon the Earth's atmosphere. Air space and the Earth's atmosphere are openly available to be used for waste disposal or as a medium for transportation purposes, and their increasing scarcity raises questions concerning how to manage this scarce resource efficiently and how to finance the necessary measures to reduce emissions.

A starting point for efficient management of these scarce resources is to define rights of use with regard to the Earth's atmosphere. The Earth's atmosphere may be understood as a global common resource that must be managed in trusteeship. Such a trusteeship may sell rights of use to interested parties. The best-known example of this is the hotly debated granting of emissions rights in climate policy. Here, emissions rights are acquired for private use and are treated like property titles. In principle these rights, the overall scope of which has been laid down politically beforehand, could be acquired through auction. In such an event, given the large number of interested users, the trusteeship could expect to take in a high volume of revenue. Moreover, from an economic point of view an auction of this kind also provides a guarantee that the distribution of available utilization rights is determined exclusively by efficiency criteria, since only the highest bidders would receive the rights. The Council would therefore welcome an auction mechanism of this sort in principle.

However, since one has to work on the basis of widespread existing use, such a course would cause huge adjustment problems for existing users. In addition, in view of the economic disparities that exist, it would trigger serious distribution effects worldwide. The Council therefore considers auctioning rights of use to the Earth's atmosphere to be politically infeasible. Instead, it is assumed that each country must be granted a certain amount of emissions disposal rights in a first round, and each country is then free either to sell its superfluous emissions rights or to buy up extra emissions rights that it needs. This procedure has the ecological advantage that the desired quantitative reductions are achieved immediately and the scarcity of space for emissions disposal in the Earth's atmosphere immediately acquires a price tag. The use of the atmosphere as a sink for greenhouse gas emissions, which has so far been virtually 'free of charge', is thus included more comprehensively in the cost calculation of individual economic units, triggering the desired adjustment responses (including innovation effects). In addition, in view of the differences that exist worldwide in terms of the way producers of greenhouse gas emissions are organized and in terms of the potential for reducing emissions, considerable financial resources may be expected to flow into capital-poor regions that generally have low per capita emissions.

Consequently, the key political problem with emissions rights trading of this sort – alongside the technical questions of verification and implementation, which are relevant for other instruments too – is the initial allocation of emissions rights. If allocation were based on a country's emissions per head of population, then all developing countries would remain sellers in this market in the long term, with the result that there would be a significant north-south transfer of funds. If, on the other hand, emissions rights were allocated on the basis of existing emissions ('grandfathering'), industrialized countries would be able to profit from their already considerable emissions level. Allocation of rights purely on the basis of the per capita criterion is probably not feasible in most industrialized countries on account of the major financial and economic implications that it would likely entail. Such a method of allocation

would furthermore have major consequences for world trade and would create resistance to climate policy.

It should be borne in mind that no additional funds flow into the system of international organizations in the event of a decision not to auction utilization rights when they are initially allocated. Financial flows in this case are transferred exclusively between the generators of greenhouse gas emissions engaging in this trade and are stimulated by the economic profitability of measures to reduce emissions. Forgoing additional funds has no deleterious effect on the way the trade in emissions rights operates, as all that is required is a 'clearing house' to implement and supervise the transactions, and these are tasks that in principle could be carried out by a private institution in the banking or stock market system. The funds required for this are negligible, judging from the experience of the USA with certification schemes as part of their clean air policy (Hansjürgens, 1998). In such a system, a Conference of the Parties (COP) would define and allocate emissions rights in the first instance.

It is also possible in principle to achieve the desired reduction in emissions via taxation. Here the hope is that rising prices will act as an incentive. Experience has shown, however, that this route is fraught with considerable problems. Faced with uncertain and constantly changing price elasticities, the reductions are difficult to predict; integration into existing tax systems presents problems; in the short term interest in the fiscal effects prevails and individual governments tend to allow exceptions that are ecologically counterproductive. In line with the position it has taken previously, the Council therefore advocates the introduction of a system of tradeable emissions rights. Research has already advanced so far in this area that it would be appropriate to launch a pilot phase.

Disagreement reigns among academics and politicians as to what extent it is appropriate or possible to levy a user charge for access to the Earth's atmosphere as a transportation route. Although air traffic at present contributes only around three to four per cent to global warming, the huge growth potential of this sector could mean a quadrupling of this percentage by the year 2050. Moreover, the emissions are four times more harmful at an altitude of 10,000m than on the ground. Yet another problem is that emissions caused by international air traffic do not at present figure in countries' emissions inventory reports. For all these reasons, consideration should certainly be given to imposing a charge for the use of the atmosphere and air space.

According to current data from the International Air Transport Association (IATA), whose members account for around 90 per cent of all passenger flights and 95 per cent of all cargo flights, approximately 20 thousand million kilometres were flown in 1998. A global utilization charge of DM0.10 per kilometre flown would therefore raise revenues of around DM2 thousand million. Similar calculations may be found in the *Agenda for Peace* by the former UN Secretary-General Boutros-Ghali.

This already demonstrates clearly, however, that in many cases attention focuses on taxation proposals concerned primarily with revenue-raising and less with bringing about a change in behaviour. The Council therefore emphasizes that charges for the use of air space must fulfil three conditions in order to avoid the situation where an international organization orients itself exclusively towards maximizing the funds at its disposal:

- The basis of assessment must be oriented strictly towards the global environmental consequences of air traffic and a direct link must be established with prevention and reduction of this environmental damage.
- The levying and use of such a charge must be coordinated internationally in order to limit evasion strategies.
- Attention must be paid to ensuring that it is politically feasible to implement such a charge in view of the social and economic importance of air traffic.

These requirements would be best fulfilled under a system of tradeable emissions rights. It is thus conceivable that airlines, depending on the specific emissions of their aircraft and the number of kilometres covered, might have to purchase emissions rights or bargain for these rights among themselves on the basis of an initial allocation system.

Another proposal goes down the road of a special, internationally agreed levy on kerosene consumption, which presupposes that the existing subsidization of aviation fuel would first of all be abolished. Against the background of the urgent need for action on the environment, raising funds in this way seems especially attractive, especially as it is possible to limit the effect on flight prices. A user charge based on aviation fuel and thus on the level of CO_2 emissions would not necessarily result in higher air fares as the share of fuel in an airline's operating costs is only 10–25 per cent. Accelerated technology development in the field of fuel-saving aircraft engines might also be expected, but not necessarily a reduction in the amount of kilometres flown. The international success of the Airbus industry was founded precisely on lower-consumption aircraft, so considerable competitive importance is attached to this segment of technological development. However, here too, care must be taken to prevent the increase in the

cost of fuel taking on a momentum of its own. The basis of assessment for such a tool would have to be related to the dynamics of CO_2 emissions of air traffic. At the same time the whole system would need to be integrated into an international arrangement for flexible implementation of the global goal of climate protection. The special levy should be collected for this specific purpose and used (for purchasing emissions rights and financing measures to reduce emissions) in the individual countries in order to prevent an international organization from using such a levy as a (constantly increasing) source of income.

International coordination of this sort has so far run aground chiefly due to resistance from individual countries to a user charge related to fuel consumption. Within IATA this resistance comes first and foremost from developing countries, which are afraid of losing their revenues from tourism and point to their relatively old aircraft, which would be 'penalized' disproportionately due to their higher kerosene consumption. But the USA, Japan, Canada and other industrialized countries too (although not Norway and Switzerland) spoke out in 1997 at the 'Rio+5' UN General Assembly Special Session against the worldwide introduction of user charges for air traffic that had been proposed by the EU.

The Council also strongly advises Germany against trying to 'go it alone' on this issue because, given Germany's central location and the resulting additional financial burden, it is likely that this would lead to flights being diverted to airports in neighbouring countries (Section C 3.6). The limits of action taken at national level are confirmed by the experiences of Norway. In January 1999 Norway introduced a kerosene tax of 26 per cent that was close to neutral in revenue terms for international and national flights, in order to curb increasing air traffic emissions. As a countermove, the existing environmental levy for all airline passengers was reduced. British Airways thereupon refused to pay the new tax, referring to existing bilateral and multilateral treaties that permit airlines worldwide to procure kerosene duty and tax-free. Other airlines too announced their intention to take legal action. In March 1999 the kerosene tax was abolished with retrospective effect, the money levied up to that date was repaid – with interest – to the airlines, and the levy payable for all passengers was raised again. Only domestic flights were excluded from this reversal. This example shows that, although it is possible for a country to act on its own, efforts to introduce user charges must be intensified simultaneously at both European and international level. An agreement at European level is thus more promising in terms of avoiding international deflections of traffic while at the same time testing the economic and environmental feasibility of a user charge that is linked to a verifiable basis of assessment.

The Council therefore recommends to the German government as a first step to review existing tax preferences granted to air traffic at national level. In the medium term the German government should lend its support to an EU-wide levy of user charges for use of the air space, with these consisting ultimately of nothing other than the purchase of emissions rights, and it should push for such levies to be introduced within the framework of the United Nations. The Council considers linking this closely to trade in emissions rights to be an indispensable condition for safeguarding against political incentives to introduce an (especially lucrative) environmental levy.

E 3.2.3.3 Use of the oceans

The oceans of the world are a common resource par excellence, even if the recent regime of Exclusive Economic Zones has in some ways led to property rights to resources being allocated or appropriated since the 1970s. There is still a need for action. The following forms of utilization require regulation (Section B 2.6):

- Use of resources on or in the seabed,
- use of fish stocks,
- use of the sea for transportation and for installations (such as drilling rigs),
- use of the sea for waste disposal.

In all these cases there is a problem of financing. This is particularly relevant with regard to combating the pollution problem that is largely the result of river-borne substances entering the oceans of the world. This problem can only be combated by building purification plants in the catchment areas of major rivers and by modifying production processes and product systems. In places where industrial nations are responsible for river effluent one can assume that the riparian states have the necessary technical know-how and are also in a position to finance solutions to the problems themselves. The situation in developing countries, on the other hand, is quite different. There, both technology and financial transfers are needed. In these cases the first question that arises is how to raise the necessary funds for financing measures to reduce effluent in the developing countries. At the same time, there is the question of how funds can be used most efficiently in the countries concerned.

With regard to *financing* such measures the Council advocates reviewing which uses of the marine environment might best contribute to underscoring

the increasing scarcity of marine resources through the introduction of user charges. This particularly concerns deep-sea mining, whose importance is considered minimal at present, but will increase in the future (Section B 2.3). Deep-sea mining is carried out mainly in the high sea, which is not covered by national property rights (Box E 3.2-1). In the context of the negotiations on the United Nations Convention on the Law of the Sea (UNCLOS), the possibility of mobilizing funds for international objectives from user charges for deep-sea mining had come under consideration since the 1970s (Wolf, 1991), and it was thought of also as a means of raising funds for the UN. UNCLOS, which came into force in 1994, created a new institution for supervising deep-sea mining, the International Seabed Authority. However, little came of initial hopes of a new source of funding for the UN. The International Seabed Authority coordinates the activities of private consortia of firms and levies only very small utilization charges. As there is currently very little activity taking place in this field due to the relative, and in some cases the absolute, decline in price of many mineral resources and unresolved technical problems relating to deep-sea mining, hopes of tapping into new, additional financial resources from this sphere have been dashed for the time being. A major problem as regards these considerations is that they were planned as a tax or duty for financing the UN. Thus the principle of focusing on the benefits and costs of maintaining a global environmental resource, as emphasized by the Council, is relegated to the background.

If ownership of the seabed existed, then it would be conceivable to buy and sell, or lease it subject to public welfare considerations. An institution that is responsible for managing the seas – and therefore also its mineral resources – in trusteeship could lease out areas subject to environmental considerations. In view of the lack of appropriate property rights to date, it would be quite legitimate here – contrary to utilization of the Earth's atmosphere – to charge a rent and thereby secure an income for the trustee body. To ensure that the rent charged is appropriate it would make sense to establish a regulatory body responsible for authorizing the pricing proposals of the Seabed Authority while at the same time taking into account environmental issues. The income could be used to provide financial support for measures that reduce effluent (discharge of substances into rivers) by developing countries, other marine protection measures and support for marine research. It is crucial to ensure that there is a clear connection at all times between the amount of the charge and the protection of the oceans and marine resources, and that regular reports are produced giving cost-to-performance analysis.

A worsening problem of scarcity may be seen in the field of fishing (Section B 2.3). At issue here is a specific use of the sea that affects a renewable resource. Given the already overstrained regeneration capacity of fish stocks in many places, and in view of continuing population pressure and intensification of food production based on marine products, pressure on the use of this resource may be expected to increase further in future. In addition, subsidization of the fishing industry is widespread, which prevents fishing fleets from adjusting.

In order to counteract this danger of overexploitation and destruction, the Council suggests defining rights of use with regard to fish stocks. These rights of use – defined for individual fish species and adapted to suit the conditions of different ecosystems – would be auctioned annually, with the highest bidder winning. In this way the scarcity of fish stocks would also be manifest in the prices. The price increase likely to result from this would have the effect of reducing demand. A market for rights of use would also demonstrate that the current subsidization of national fishing industries is a form of intervention that distorts competition; this ultimately affects trade and should be banned by the WTO as discriminatory. Defining rights of use and conducting the auction requires the setting up of an institution operating as a trusteeship with specific responsibility for conserving fish stocks. It should operate separately from the other marine protection bodies. The Council recommends that the German government should lobby via the EU for the implementation of such a scheme.

The revenues could be used for measures to support the process of structural adjustment of national fishing capacities to the new price and quantity regimes, to establish the systems of control required to monitor compliance with the fishing rights acquired, and to fund research into accelerating the restoration of endangered stocks. In order to assist developing countries with the process of adjustment it is also conceivable that the trust organization might itself purchase stocks (fishing rights) using the income it receives and, subject to special conditions, pass these on to selected countries. Efforts must however be made to ensure that total allowable catches are not exceeded and that the dynamics of the auction prices are not manipulated. Revenues must remain earmarked for their designated purpose and may not be used to provide financial support to other institutions. Options involving taxation are ruled out as they allow too much scope for manipulation, and lack of information concerning price elasticities means that the intended conservation effect can only be achieved to a limited degree or with considerable

Box E 3.2-1

Use of the genetic resources of the high seas

Access to genetic resources is regulated internationally in the Convention on Biological Diversity. Under the Convention genetic resources do not constitute a global common resource, but are basically subject to state sovereignty, which also extends to the 12-nautical-mile zone. Scientific marine research in the 200-nautical-mile zone (also called the Exclusive Economic Zone) is regulated internationally by the Convention on the Law of the Sea. In practice the coastal state has sovereign rights to conduct research and exploit the natural resources in this zone, and this includes access to genetic resources. Countries' national legislation, however, is generally limited to terrestrial ecosystems and does not often deal with the legal peculiarities relating to access to coastal waters.

Genetic resources accordingly only take on the character of a global common resource outside the 200-nautical-mile zone. Here a distinction should be made between the water column and the seabed. The regulations pertaining to the water column are principally concerned with preventing overexploitation and pollution. They thus have no relevance in terms of access to genetic resources as this regularly does not involve pollution of the environment, nor does it involve any form of consumption, and therefore cannot result in overexploitation. The rules relating to exploitation of the seabed beyond the boundaries of national jurisdiction apply only to mineral resources that could be of significance for deep-sea mining. Living resources do not belong in this category and neither, therefore, does their use as genetic resources.

The genetic resources of the high seas are thus a 'global common resource' that is not covered by any legal regulation. They are therefore freely accessible and may be appropriated by anyone. This gap in the regulatory system is an inadvertent omission, however, as the potential value of marine genetic resources was not yet apparent in the 1970s. In principle, therefore, there is nothing that stands in the way of levying a user charge for access to the genetic resources of the high seas. The argument used in the case of the other global common resources is also valid here: Anyone deriving benefit from the use of these resources, in this case in the form of intellectual property rights, should contribute to conservation of the resources, or the ecosystem. According to its preamble, the Convention on the Law of the Sea is intended to contribute to a just and equitable international economic order that takes into account above all the particular interests and needs of developing countries. In addition, it stipulates that marine scientific research should be carried out for the "benefit of mankind as a whole" (Article 143[1]), although it does not go any further in defining this. Article 5 of the Convention on Biological Diversity also specifically stipulates that there should be cooperation among the Contracting Parties "in respect of areas beyond national jurisdiction".

A set of rules for access to marine genetic resources could therefore be agreed by the United Nations as an amendment to the Convention on the Law of the Sea or as a protocol under the Biodiversity Convention. Amending the Convention on the Law of the Sea would have the advantage that an institution already exists in the shape of the International Seabed Authority, which has responsibility for organizing the use of resources and levying user charges. The Biodiversity Convention, on the other hand, has greater specialized powers as it regulates access to genetic resources within the areas of national jurisdiction and a recognized legal framework for this already exists.

The Council warns against having excessively high expectations in this regard, however. Utilization of marine genetic resources requires a vast amount of technology and know-how, and this is currently available only in a few industrialized countries and multinational companies. There are also considerable problems involved in terms of proving the origin of the resources, among other things. The effort required for tapping the genetic resources on land or in coastal regions is considerably smaller and at the same time the biological diversity of these areas is immeasurably greater. The deep sea is nevertheless a habitat of extreme living conditions and the ways in which its organisms have adapted, their biochemistry and their genetic attributes are unusual and rare (extremophile organisms, e.g., in 'black smokers' or in marine ice). Thus, for example, enzymes that have adapted to the extreme temperatures, pressures or chemical conditions typical of the ocean depths can be of great significance for research and industry. A lucky strike in this sphere – such as a patent with broad industrial applications – can certainly be of considerable economic value. Whether the specific search for extremophile marine organisms leads to commercial success is by no means certain. For this reason, the economic significance of this market is still speculative in nature and is ultimately impossible to gauge, especially given that extremophile organisms can of course also be found in more easily accessible places (e.g., thermal volcanic springs).

The potential revenues from user charges, which at the present time are purely visionary in character, must be weighed up against the administrative and financial costs associated with negotiating an international legal instrument for marine genetic resources and the incalculable problems of monitoring its implementation. This field should not, however, be consigned to oblivion as the framework conditions in science and technology are wont to change rapidly. Problems that still seem impossible to solve today may be manageable tomorrow, so that the above process of weighing up advantages and disadvantages might well produce a different conclusion. For this reason, the timely creation of an internationally recognized legal status for these resources, laying down provisions relating to the conservation, sustainable use and sharing of this common inheritance of mankind for the benefit of the global environment could be a great advantage in the event – at present purely speculative – of a 'genetic gold rush'. To continue with the present unregulated state of affairs would mean in practice that the utilization of these resources would be the exclusive preserve of the industrialized countries endowed with financial and technological resources, and this would not be in keeping with the spirit of either the Biodiversity Convention or the Convention on the Law of the Sea. 'Curative' regulation of this area after the event, when concrete economic interests have already made themselves manifest, would certainly be considerably more difficult than 'preventive' regulation. The Council therefore recommends investigating the various options regarding legal regulation of access to the genetic resources of the high seas and, based on this, taking the initiative in the international arena. Scientific knowledge about marine genetic resources and how to assess their value is currently inadequate, so the Council at the same time advises intensifying research efforts in this sphere.

Sources: Glowka, 1995; CBD, 1996; Henne, 1998; ten Kate and Laird, 2000

delay. The political resistance that is to be expected from countries with large 'distant water fleets' (Japan, Russia, Spain) should not be underestimated in terms of the obstacle it will present to levying any form of user charge.

The sea not only separates, it also connects. Human history shows that the sea above all facilitates inter-state trade and thereby benefits the economic development of coastal states and ports. This maritime transport, however, is largely free of charge, at least as regards use of the transport route. As a rule, the use of other transport or transmission routes (roads, electricity lines) is tied to a toll charge, and attention is increasingly being given to the idea of levying a user charge based on the section of a route travelled (e.g., road pricing) as a solution to the problems of maintenance, reconstruction, expansion and congestion. However, it is rarely suggested that this idea be applied to the use of the oceans as a transport route. As there is a connection between utilization and pollution (Section B 2.3), the Council considers the idea of charges that reflect the demands on and pollution of the seas to be an idea worth pursuing. However, the link between utilization and pollution or remediation must be maintained at all times. The revenue from such charges should not be used for purposes that are unrelated to pollution.

Technically it would be relatively straightforward to implement a user charge of this sort because satellite technology nowadays makes it possible to identify vehicles or vessels and record the distances covered by them. The charge could be levied in a decentralized way via port dues. It would also be possible to differentiate on the basis of the potential risk posed by individual ships or stationary installations or their potential to cause pollution. At the same time this would create incentives to limit the use of antiquated engines and particularly hazardous heavy oils. Overall, this would mean that funds would come from rental charges relating to seabed lease, from the annual auction of rights of use relating to fish stocks, and from a toll charge for marine transport based on route and risk. In terms of institutional arrangements, the revenues from the auction of rights of use relating to fish stocks should be levied separately via a trust administration, and this income should be used with an eye to fostering structural change in the fisheries sector and monitoring compliance with rights of use in order to keep the scheme focused on its primary purpose.

In contrast, the rest of the revenue should be put to a specific *use* related to improving marine water quality, namely to finance measures to reduce land-based discharge of effluent into the sea in those countries that are not in a position to do so either economically or institutionally. In view of the fact that deep-sea mining is not very economically attractive at present, this principally concerns the proposed user charges for maritime transport. The charges are to be paid strictly as an earmarked special levy and collected in a fund to which a time limit is attached. This fund could be administered by the World Bank. The time limit relates exclusively to implementation of effluent-reducing projects in economically weak countries. In order to prevent freerider effects in developing countries, which might reduce their own investment to eliminate land-based emissions in the expectation of receiving financial support, here too – as is the case with protection of the climate, the ozone layer and biodiversity – support should be restricted to the 'agreed full incremental costs' incurred through the common goal of marine protection. In view of the fact that investment in remediation in the countries eligible for subsidization can take place annually at best and in view of the large number of ship movements annually, we can assume that the average amount of distance-related charges will be small. This means that the economic burden on this branch of the transport sector will be kept within limits. As regards the use of the funds, the Council considers it vital that

- a time-limit should be fixed from the outset on the levying of user charges for maritime transport and on the financing of effluent-reducing measures,
- the user charges should be used solely for the specific purpose of supporting the effluent-reducing measures,
- the administration of the fund should be institutionally separate from the levying of the charges and that the funds should be used efficiently in accordance with the conditions set out in Section E 3.4.

Protection of the seabed and marine water quality are to be understood as joint tasks that could be undertaken by a trust-type body. In contrast, decisions relating to calculating the charges and terminating the redistribution of funds from user charges to effluent-reducing projects should be made exclusively by the community of nations in order to ensure democratic monitoring of the process.

E 3.2.3.4 Use of the geostationary orbit

In recent times there has been great interest in the use of the geostationary orbit. Its use is increasing rapidly and the number of satellites is growing, but the debris dumped there is also becoming all too obvious. From an economic point of view, therefore, a scarcity phenomenon is becoming apparent. Consequently, it comes as no surprise that this should

trigger a debate on user charges for stationing telecommunications satellites in the geostationary orbit, which constitutes a common access space under international law. The Council takes the view that there is a need for global action emerging here which could certainly be tackled by means of raising a utilization charge.

The Earth's orbit is used primarily as a path or location, or as a parking place, for satellites and space stations. It is increasingly also becoming a dumping ground where the debris of rockets, satellites or space stations mills about, and into which other substances are also discharged. Initial signs of congestion are becoming apparent, and the dumping of 'scrap' of all sorts is proving especially troublesome. If the Earth's orbit were in private ownership the (fictitious) owner would demand (increasing) user charges for the uses outlined above, and these charges would show clearly the increasing scarcity of this resource and the costs of combating the problem of orbital debris. As these economic signals are lacking, there is a danger of overexploitation.

We must either agree rules for appropriate communal use, as is often the case with the classic common resources, or we must consider the idea of user charges. With the first of these two suggestions there is the problem that setting rules like these that are accepted by the community of nations will be difficult and very time-consuming. The concept of user charges, on the other hand, allows the individual players more scope for action, and makes it possible to adjust the charges more quickly to any new problems that emerge. In this case an orbit authority would have to be established under the auspices of the United Nations, and this authority would set the charges – under the supervision of a regulatory body. Critical values such as maximum permissible levels of ambient pollution or defining the maximum 'orbital parking space' would have to be prescribed by the United Nations (Section E 1). The income could be used to finance these institutions, for the removal of orbital debris or for orbital research. In any case, it is essential to prevent a process of automatically increasing revenues from developing and prevent the revenues from being diverted to other uses. The Council therefore urges that the charge-setting process should be reviewed continuously by the individual countries.

Thinking of ways to raise money is not something new. The discussion surrounding the launch tax envisaged by the European company Arianespace in 1996 is a typical example. At that time it was assumed that by the year 2003 around 20–25 sizeable civilian observation and telecommunications satellites would be transported into space each year (The Economist, 1 June 1996). Given costs per launch ranging between US$50 million for a Chinese spacecraft and US$150 million for Ariane 5, a launch tax of one per cent would have yielded annual revenues of around US$20 million. Vague references were also made to improvements in environmental performance brought about by such a scheme. What precisely was meant by this, however, was open to interpretation. Was the intention to reduce the number of launches, or to use the money to remove space debris? There is much to suggest that the proposal was aimed primarily at creating a fiscal charge with the main objective of raising revenue, although the revenue thus obtained would have been much too meagre to tackle even the most important issues.

This shows clearly the problems there are with this proposal. Although technically it would be relatively easy to implement this levy, questions remain unanswered, such as how to raise a substantial volume of funds, but most especially what is the connection between the levy and actual use of space. There were and are no adequate research data on possible pollution of the stratosphere resulting from spacecraft emissions. Added to this is the fact that some satellites are used specifically for observing the Earth and gathering environmental information. In these cases a tax of this sort would be counterproductive in terms of modifying behaviour. Moreover, political compliance on the part of the countries operating spacecraft launching systems is not guaranteed, as space transportation technology is considered to be an 'industry of the future' that is of great economic, technological and security importance.

These reservations could be mitigated by establishing a clear link between the user charges and specific levels of ambient pollution or the available space for waste disposal in the Earth's orbit. In these cases a system of tradeable certificates could be set up, which would have three important advantages. First, it would have a clearer impact on behaviour due to its strong connection to scarcity of space in the Earth's orbit. Second, auctioning utilization rights would be likely to raise considerable funds. Such an auction is unlikely to be feasible, however, without the acceptance of those countries that operate spacecraft launching systems. Third, by deciding not to place such a financial burden on these countries, while at the same time ensuring efficient distribution of the existing space in the Earth's orbit, political resistance could be reduced. The Council is therefore in favour of investigating the possibilities of setting up such a system in the medium term.

E 3.2.4
Compensation for abstaining from using a resource

In contrast to the oceans, the Earth's orbit and air space, in terms of ownership rights, most land and freshwater resources are in the hands of private actors or countries. Owners are able to use these resources freely for a variety of purposes, and as a rule they have several options open to them. The problem for environmental policy resides in the fact that ecological functions are not valued highly enough, and those who benefit from protective measures and those who pay for them are far apart both in time and in place.

In order to conserve biological diversity it is often necessary to abstain from using certain areas of the Earth's surface, and this is an issue to which the Council has devoted considerable attention (WBGU, 2001). What is problematic here, however, is that some of the countries harbouring a particularly large share of biodiversity of worldwide conservation interest face disadvantages as a result of effective global environmental policy. Moreover, the most biodiversity-rich countries are often also the poorest and are therefore unable to contribute to conserving biological diversity without support. The Biodiversity Convention attempts to deal with this problem by guaranteeing to developing countries that the 'agreed full incremental costs' of any measures implemented to conserve biological diversity will be covered, in other words the costs remaining after deduction of the overall utility for the country itself. The Council already mentioned the problems and risks associated with this agreement earlier in the present report. The idea behind this cost-sharing approach is nevertheless economically justifiable if it is understood as international compensation for the loss of prospective profit from the use of these resources, which is in the interests of the global community.

This idea may be extended further, taking up the principle underlying pollution certificates. In the latter case a specific right of use is bought, and a non-utilization commitment may be purchased in much the same way. The problem concerning conservation of renewable resources is that because of the long time needed for regeneration, e.g., of a forest stand, owners are often unable to 'reap the fruits' of it and as a result use existing stocks more intensively than they can replenish. The costs and the benefits of maintaining stocks of a resource diverge in time. The conflict becomes even more serious where the costs and the benefits of conserving a resource diverge in terms of place too. Here the obvious thing would be for those who benefit in terms of time and place to pay the owner of the resource compensation for not using the resource (today). They purchase commitment certificates, with which the owners commit themselves not to use the resource. Basically this is a form of non-utilization payment with corresponding incentive effects.

The funds could be raised in either the private sector or the public sector. Here, however, further research is needed. There is a need to clarify, for example, how compliance with commitments can be ensured, to what extent extortion can be prevented in connection with commitment payments, in which areas commitment certificate 'swaps' might be possible, and to what extent fragmentation can be prevented. What is important in any case is that the person or institution 'bearing the cost' – which we will define here as a person or institution not exercising an ownership right – receives the payments. Only in this way can a genuine incentive effect be achieved. If the payments, or the 'incremental costs' mentioned above, are paid to governments, there is a danger that they will be used to pay for other matters of concern.

In the long term, consideration should be given to extending this concept to create a worldwide system of commitments not to use particular resources (such as rainforests) signed by countries or regional stakeholders and with corresponding financial compensation provided by the international community.

E 3.2.5
Options for insurance and compensation for regional damage resulting from global environmental change

Many environmental problems are a legacy of the past. They came about at a time when the legal provisions still permitted inappropriate emissions or uses of resources, or there was a lack of information about the risks associated with particular emissions or uses. Furthermore, it is not always possible to identify or eliminate all environmental problems in time, and in the global context too it is to be feared that some environmental changes can no longer be halted, only mitigated or slowed by decisive action. The onset of climate change is the best-known example illustrating that in future there will be costs relating not only to prevention but also adaptation. At the national level this issue is generally approached, with an eye to future risks, using the instrument of liability (accompanied by the insurance schemes that liability regularly entails). Such a form of regulation not only allows compensation for damage, it also gives rise to preventive effects and innovation. In order to avoid

paying high premiums, substitution processes are initiated and production may even be halted.

If an effective liability system is in place, then the players have an incentive to limit the risk of environmental damage as far as possible. As a rule this is both efficient and highly effective, due to the fact that the players know more about the hazards in a given situation. Insurance premiums that are graduated according to risk induce a corresponding behavioural change in decentralized actors. In addition, these insurance schemes package together knowledge about potential risks, preventive measures and strategies for adapting to unavoidable environmental changes (WBGU, 2000a).

But how does one deal with problems that are genuine legacies? It is often impossible to identify those who are to blame for these inherited burdens or hold them to account legally. At the international level, moreover, there are no clearly defined legal regulations to date pertaining to liability. If we follow the classical principles of environmental policy, the polluter pays principle would have to be replaced here by the principle of public responsibility, or the latter principle applied in subsidiary fashion. In certain respects an international solidarity principle would come into its own here. The costs of remediation and adaptation (such as resettling people at risk due to sea-level rise) would need to be financed out of a fund replenished by state contributions. As it is mainly the industrial nations that have benefited, in terms of prosperity, from misguided use of natural resources in the past, payments into the fund could be based on prosperity indicators, on international trade volume, or on the specific volume of trade with the countries concerned. In some cases the responsibility of specific branches of industry should also be investigated. However, here too the funds must remain dedicated to a specified purpose.

In the medium term it might also be worth examining the possibility of setting up a general fund for damage. The idea behind this is that we will probably never manage to avoid the adaptation costs that global activities entail. In theory it might therefore be possible to envisage some form of global obligatory insurance for residual damage compensation in the event of globally induced environmental problems. Consideration should be given to setting up a solidarity-based model analogous to that of the German social insurance system. An integral part of such a model is a commitment on the part of all members of the collective (in the present instance the community of nations) to pay contributions into a fund that will be used to cover the costs of certain types of damage – for example as a result of climate change and measures needed to adapt to it (e.g., dyke building or clean-up operations). There are a number of indicators that could be used to graduate the level of contributions – emissions, productive capacity of the economy, etc. In contrast to an exclusively pay-as-you-go system of financing, which is the approach most European social insurance systems are based on, in view of the uncertainty and incalculability of the risks relating to climate change impacts it would be conceivable for the fund to be placed under private-sector risk management, with funds invested in long-term real and human capital investments that foster climate protection. Modern reinsurance strategies using hedging portfolios could also be employed here (Hommel, 1998).

In this context catastrophe bonds, or cat bonds, are an instrument that is of special interest. Damage resulting from natural disasters has increased considerably in recent decades. The Kobe earthquake in 1995, for example, caused damage amounting to US$100 thousand million to the economy as a whole. Only around two to three per cent of the damage was covered by insurance. Damage on this scale can no longer really be covered by traditional insurance and reinsurance business. The capital resources of the global insurance market are estimated at US$500 thousand million. The capitalization of the international financial markets, meanwhile, amounts to approximately US$40 million million. The basic idea of catastrophe bonds is to distribute the risks associated with natural disasters beyond the classical insurance sphere, over the financial markets and the participants in those markets (Adler, 1999; Kunreuther and Linnerooth-Bayer, 1999).

Catastrophe bonds are issued on the capital markets by insurance and reinsurance companies or by governments and they relate to a precisely defined environmental occurrence. For example, the catastrophe bond of the Swiss insurance company Winterthur covers damage arising in the event that more than 6,000 insured motor vehicles are damaged by hail, storm and tempest. Buyers of catastrophe bonds receive interest above the market rate. In return they have to forgo interest, and in some cases capital too, in the event of damage occurring. In this way they are taking on a part of the overall risk. Thus, by bringing an inflow of new risk capital, catastrophe bonds have a positive effect on the liquidity of the insurance sector, which in turn expands capacity to provide cover. There have already been academic studies looking at adopting this tool for reducing risk related to floods. As well as its effects on liquidity, it is also possible to use catastrophe bonds, if they are designed appropriately, in conjunction with other decentralized incentive-creating instruments to finance, for example, preventive and adaptation measures (Kunreuther and Linnerooth-Bayer, 1999).

The Council sees this as an important area for future research and recommends that the German government explore ways of developing similar models for the prevention and short-term control of risks associated with other disasters (e.g., the flood disaster in Mozambique).

E 3.2.6
Other financing mechanisms

In the international debate on this issue a whole range of other proposals are also under discussion. The Council can mention some of these only briefly here, such as the proposal to tax data transfers via the Internet (the 'bit tax'), to allow the UN to take out loans or to assign new special payment rights via the IMF for purposes relating to environment and development policy in developing countries (Jakobeit, 1999; see also Section E 2). Other proposals, however, merit more in-depth analysis.

E 3.2.6.1
Foreign currency turnover tax ('Tobin tax')

A great deal of space in the debate is given over to the proposal for taxing currency transactions that has become known as the 'Tobin tax', after the US Nobel-Prize Laureate economist James Tobin (Tobin, 1974, 1978). For advocates of this tax it represents a way of making speculative, cross-border capital transactions less attractive, of enhancing national capacity to act in the economic policy sphere, and a way of mobilizing additional financial instruments to balance out the global North-South divergence and for funding global environmental tasks (Ul Haq et al., 1996; Michalos, 1997; Felix, 1995, 1996; Kulessa, 1996; Menkhoff and Michaelis, 1995; Spahn, 1996; Stotsky, 1996; Tanzi, 1997; Jakobeit, 1997; Bündnis 90/Die Grünen, 1998; Huffschmid, 1999).

Due to the explosion in the volume of currency transactions in recent years – it now stands at around US$1.5 million million per day of trading worldwide (as of April 1998) – according to cautious estimates even a minimal tax of a mere 0.1 per cent would yield more than US$170 thousand million per year for national and/or global purposes. As the Tobin tax would be levied nationally, it would be left to national parliaments to decide what share of this revenue should be earmarked for international goals. Attaining the 0.7 per cent target would no longer be a utopia for the industrialized countries.

If it were only a question of its function as a financing mechanism, then the verdict on the Tobin tax would be positive. The revenues that could be expected from it would suffice – assuming that there was the necessary political will in the industrialized countries – to cover the new and additional funding requirements of AGENDA 21. However, this tax has scarcely any ecological behaviour-modifying function and little chance of being politically feasible, and there is still controversy as to whether it would be technically possible to implement it. Consequently, over the next few years discussion concerning introduction of the Tobin tax is likely to continue, but there is little likelihood of it being realized.

Politically the tax cannot be implemented if there is resistance from major industrialized countries, because if it were introduced in some countries only, then currency transactions would shift to stock exchanges where no Tobin tax was levied (free riders). The USA especially rejects any new form of taxation of this sort as an inadmissible regulatory intervention in the free play of market forces. Even the advocates of the tax admit that there is no chance of it succeeding unless the world's eight most important stock exchanges are involved. And yet the technical feasibility of the tax would still be questionable even if the Tobin tax were levied at the eight major stock exchanges. In the international financial markets in recent years the pace of innovation has been extremely rapid, and has also benefited from the new global information and communications possibilities. Stock market trading can now take place 24 hours a day, worldwide, on the Internet. Capital market transactions that became more expensive as a result of the Tobin tax would move to financial oases or offshore financial markets. Even if a new tax were levied globally on particular types of currency trading transactions (and the type of transaction would have to be laid down precisely in law in all countries), the financial sector has shown in recent years that it would be capable of developing new instruments very quickly that would not come under the Tobin tax but that would nevertheless take on the hedging and speculative functions of currency trading. The legislators would presumably have difficulty in keeping up with such a pace of innovation.

In addition, the Tobin tax offers no direct link to specific, environmentally harmful actions; rather, with its across-the-board taxation of all currency transactions, it places the emphasis on maximizing budgetary revenue. For the reasons given above, the Council opposes this course of action in the area of financing. Moreover, the Council considers that narrowing the debate to such financial instruments jeopardizes the objective of reaching agreements based on international consensus.

E 3.2.6.2
Environmental lotteries

Since environmental lotteries have already been introduced both regionally and nationally (Netherlands), there might be an opportunity for the German government, in addition to other financing mechanisms, to launch a political initiative for the introduction of a European environmental lottery. The focus here would not be on the lottery's fundraising function. Rather, such an environmental lottery could help to raise public awareness of environmental issues in developing countries.

Experiences with environmental lotteries in Lower Saxony, Schleswig-Holstein and Hamburg ('bingo lottery') prove that additional, dedicated financial resources can be mobilized in this way at least for environmental problems that are specific to the region. In the national context (in Germany, ARGE-Lotterie-Arbeitsgemeinschaft Neue Bundeslotterie für Umwelt und Entwicklung – working group for a new federal lottery for the environment and development) or in the European context (Eurovision, or modelled on the Dutch 'Nationale Postcode Loterij') additional funds could be raised by a lottery of this kind held in conjunction with a television programme geared specifically towards informing the public about serious environmental problems in developing countries. As an innovative medium for political education, and one that is geared towards a mass audience, there is undoubtedly scope here for ministerial or federal government initiatives. Even though it is difficult to estimate the revenue from such lotteries (especially given that the new lottery would have to compete with numerous established regional lotteries), the principal effect would probably be to increase awareness of and interest in these issues. This, meanwhile, would provide links for work at local and municipal level to implement AGENDA 21 if these local initiatives worked in stable cooperation partnerships with municipalities in developing countries. Establishing competing lotteries with different environmental and development projects and private and local partners would also open the way for institutional competition to develop, which would mean that the success of a lottery could also be an indicator of the project's likelihood of success (Section E 3.4).

However, the problem remains that the funds raised for tackling global environmental problems will be meagre, the environmental incentive effects are very general in nature and, most importantly, the ever-crucial link to a specific purpose is omitted. Ultimately it does little more than open up a source of finance for environmental goals that are defined in very general terms.

E 3.3
Involving private players in financing

In principle it makes sense to involve private-sector players. There is much to suggest that these organizations are more efficient, as can be seen in the comments made in Section E 3.4 regarding efficient use of financial resources. Privatization holds the potential for the following advantages:

- Greater capacity for *processing knowledge* as a result of being more decentralized, with the added effect that a transfer of know-how of relevance to small areas is facilitated (WBGU, 1997),
- greater *diversity* of globally relevant solutions to problems, as competing approaches can be tested in the competitive environment first and assessed in terms of what they contribute to solving the problem,
- improved *control* over how funds are used through competitive structures and increased interest on the part of those concerned,
- positive *motivating effects*, as the anonymity and limited direct control of government funding programmes can be reduced.

By galvanizing private initiatives the Council sees a chance to use the process of globalization and the efficiency effects it has brought with it for the benefit of the global environment. New technical possibilities provided by modern information and communications technologies, and also the fusion of global markets, open up new ways to move beyond government action and include 'civil society' as a relevant player in global environmental policy worldwide. There are two principal ways in which this can happen. First, through the creation of property rights and liability rights, private players can become more integrated into global environmental policy both as payers of user charges and as implementers of worldwide environmental protection and development tasks. Approaches relating to this were discussed in detail in Section E 3.2. Second, it is also a question of mobilizing private players' existing readiness to pay and to act even where no unilateral or multilateral agreements are in place. In this connection the Council is particularly opposed to two popular misconceptions that are often used as arguments against strengthening private initiatives:

- There is neither the willingness nor the financial resources,
- it is infeasible in the face of a process of globalization that is leading to erosion of social and ecological standards.

The Council has already devoted special attention to private initiatives in its earlier report on biodiversity, where it emphasized the importance of private foun-

dations for fundraising (WBGU, 2001). Private initiatives such as these involve a kind of 'governance without government' (Rosenau and Czempiel, 1992). This approach can be supported by means of a contractual environment that fosters cooperation and by concern building. In its earlier reports the Council also made reference to a motivational approach (WBGU, 2000a).

This motivational approach is based on the observation that for many issues of concern to global environmental policy there is definitely a willingness to pay on the part of individuals, and that this can be mobilized and put to use. It should, however, be pointed out that with this approach we do not mean a policy of selective setting of economic incentives – such as by establishing state funding bodies from which subsidies, guarantees or grants of some kind are made. Rather, it is geared towards creating the basic conditions for establishing a variety of solutions on a private basis, including 'spontaneous' ones. What we want is a wide variety of institutions that is not merely the expression of deliberate state intervention in pursuit of an internationally agreed model of global environmental policy, but rather the product of individual, local or regional ideas concerning environmental protection.

Ultimately we are talking about a kind of club or patronage scheme that would be able to mobilize private players' inherent willingness to pay for environmental concerns. Similar activities are to be found in the sphere of development cooperation (such as Misereor or Bread for the World). They are important, as money is often combined here with personal commitment and it can generally be guaranteed that resources will be spent frugally. Moreover, they also serve to raise awareness, as they arouse interest in global environmental protection in the donor countries.

A special incentive is created for private initiatives of this sort if financing of environment and development policy measures can come from private consumers' willingness to pay. Guidance with regard to assessing products can be provided in the form of labelling and auditing information. Consumers then use their consumption decisions to vote on alternative institutional systems of environmental protection in the different countries. Environmental protection is part and parcel of competition between institutional systems in different countries (Streit, 1995; Karl, 1998; Becker-Soest, 1998). Thus it is totally conceivable that a competitive 'race to the top' could, under certain conditions, contribute to solving global environmental problems. The basic idea underlying this line of argument is the fact that for producers compliance with protection requirements or certain (not necessarily politically set) standards in environmental protection are not just a cost factor, but may also be seen from an offensive point of view as extra utility (Section E 2.2). This extra utility can be marketed profitably and is therefore capable of developing environmentally innovative processes. These standards compete as product or location attributes with other products or locations that have different standards. Competition thus takes place not only between products but also between standards. This by no means has to be laid down by government, but can evolve 'spontaneously' in the manner of many of the ISO standards. When they make a purchase, therefore, consumers or location seekers are at the same time making a decision about accepting certain standards (Wegner, 1998; on the potential of labelling strategies for environmental protection, see also IWÖ and IFÖK, 1998; Karl and Orwat, 1999). Producers who fail to submit to these standards run the risk of being sanctioned by worldwide competition and of incurring economic losses. Furthermore, if the risk of being exposed to problematic pressure to adjust as a result of decisions by a global regulatory body is then removed, then there is an increased incentive constantly to bring new standards into play at global level as new competitive elements, or for an ecological dynamics of the free market to evolve (Knill, 1998). Thus the question is not primarily one of using regulatory measures to prevent poor countries from dragging down prosperous and environmentally aware countries, but quite the opposite: mechanisms should be brought into play to encourage other countries to adjust to the more rigorous standards (Vogel, 1997).

In its previous report, the Council indicated the reforms that would be needed in order to foster this process of galvanizing private players (WBGU, 2001). Included among these measures are reforms – over and above the reform passed in Germany this year – of the law pertaining to foundations, public relations work to promote environmental labelling and auditing systems, critical appraisal of the competitive impact of established labels and the impact on demand exerted by large trading companies, and information and public awareness-raising work to support the development of international networks of companies and agreements for private-sector capacity building and knowledge transfer.

Experience shows, however, that private commitment of this sort often merely functions as an impetus or only has a complementary role. Given the scale of the problems to be tackled, a much greater inflow of funds is needed and these funds need to be used in a more focussed way. This inevitably means that more abundant sources of funding need to be found, as was discussed in Section E 3.2 above.

E 3.4
Efficient spending of funds

E 3.4.1
The issues

The international system for financing global environmental protection is characterized by a multitude of institutions and organizations (Table E 3.4-1). In terms of their primary function, the individual institutions have different relationships to global environmental policy. The Global Environment Facility (GEF) provides funds exclusively for global environmental protection. In the case of the UNDP and the World Bank the connection with global environmental issues is much more indirect, since the focus is primarily on financing development projects and programmes and only a portion of the funds goes directly to environmental protection. On the other hand, expenditure that serves to reduce poverty also makes an important contribution to global environmental protection. In the case of multifunctional funding organizations of this sort, the exact amount of funding allocated to global environmental protection can only be determined by analysing the individual projects and programmes. Such analysis, however, is highly resource-consuming. For this reason, only estimates are given here. It is even more difficult to establish the volume of funding provided by private foundations for global environmental issues. For the sake of comparison only, therefore, Table E 3.4-1 presents the volume of donations of the Turner Fund (United Nations Foundation, UNF), which provides funds for the areas of 'Environment', 'Women and Population', and 'Children's Health', and that of a national environmental fund in Colombia ('Corporacion Ecofondo'). Taken all together, these funding institutions represent the spectrum of institutions that must be examined in order to gauge how efficiently funds are spent.

In AGENDA 21 the principles of 'Universality, Democracy and Transparency' were formulated for the institutional design of global environmental policy. From the point of view of efficiency, transferring these principles in a uniform way to matters relating to financing global environmental policy is not to be recommended. As the experience of many UN bodies demonstrates, the universal participation of all countries makes decision-making difficult. For reasons of efficiency it is advantageous in many cases to strive for smaller decision-making bodies (Ehrmann, 1997). Furthermore, it is desirable to place the management of funding allocation in professional hands to avoid unnecessary and inefficient battles over how money is spent. At the same time, however, due consideration must be given to the justified demands of

Table E 3.4-1
Overview of international funding institutions of relevance to global environmental policy. n.d. = no data.
Source: WBGU

	Personal staff [number / reference year]		Budget [mio. US-$ year^{-1} / reference year]		Funds administered [mio. US-$ year^{-1} / reference year]	
INSTITUTIONS WITH A FUNDING FUNCTION						
World Bank	11,310	'00	719	'99	29,000	'99
GEF	65	'00	22.2	'00	500-700	'99
UNDP	5,300	'98	58.6	'00	2,000	'98
FAO	3,500	'00	367	'00	615	'00
UNESCO	1,076	'96	272.2	'00	405	'00
Ozone Fund	8	'00	3.9	'00	147	'00
UNCTAD	394	'00	50	'00	24	'00
UNEP	529	'00	4.7	'00	96.1	'00
INSTITUTIONS WITHOUT A FUNDING FUNCTION						
IMO	300	'00	29.5	'00		
WMO	246	'00	39.4	'00		
CSD	approx. 40	'00	n. d.			
CBD	47	'99	8.3	'99		
CITES	27	'00	5.15	'00		
UNCCD	39	'00	8.6	'00		
UNFCCC	79	'00	11.04	'00		
BY WAY OF COMPARISON						
Turner Fund (United Nations Foundation)					1,000 [1)]	
Corporación Ecofondo (national environment and development fund, Columbia)					58.5	

[1)] For various global policy objectives (environment, women and population, children's health).

developing countries to have a say in the raising and allocation of funds.

In developing a system for financing global environmental policy there is thus a fundamental conflict between equity and efficiency goals. This conflict cannot be eliminated entirely by means of institutional reforms. Compromises must always be sought that take adequate account of both goals. Examination of the conflict between distributional equity and efficiency certainly has a firm place in the academic literature (e.g., Okun, 1975; Zimmermann, 1996). On the other hand, however, systematic application of theories of justice (Rawls, 1975) to global environmental policy in conjunction with an examination of efficiency effects is largely lacking to date (one exception, for example, is Helm and Simonis, 2000). However, it is beyond the scope of the present report to discuss these extremely complex problems in detail. Our intention is to highlight the significant shortage of research in this area. For this reason we single out two aspects here that are crucial for developing a system for financing global environmental policy that takes into account both equity and efficiency-related objectives:

1. What sort of voting and decision-making processes operate within international funding institutions, and what effects do these have in terms of efficiency and distribution? This will be discussed using the GEF as an example (Section E 3.4.2).
2. What is the institutional form that distributes a thousand million DM best in terms of contributing to achieving a goal (relating to a global environmental problem)? Put in a different way: how, if it were solely a case of ensuring efficient allocation, should the German government distribute the available funds among the various institutions involved in financing global environmental protection? In connection with this, a system of determinants is presented that provides pointers for developing an efficient system of financing that is also equitable in distributive terms (Section E 3.4.3).

E 3.4.2
The role of voting and decision-making procedures in the case of the GEF

In terms of designing an efficient and distributively just system for financing global environmental policy it is particularly instructive to examine the development of the GEF, which was founded in 1991 and may be considered to be the key funding institution for global environmental protection (WBGU, 1995a). Ever since it was founded, the GEF has been the subject of many disputes between industrialized and developing countries. The central issues in these conflicts have been the design of the organization's voting rules and decision-making processes. Because the GEF operates under the joint auspices of the World Bank, UNEP and UNDP, a major reason for this conflict is inherent in the institutional design of the GEF itself. Should its decisions be made in accordance with the rules of UN organizations ('one country, one vote') or should they follow the procedures of the World Bank Group, in which a country's vote is weighted according to its financial contribution ('one dollar, one vote')?

The advantages of both procedures are plain: whereas the decision-making rules of the UN organizations guarantee member states equal standing, and distributive considerations play a more significant role, in the World Bank Group's decision-making procedures it is the influence of the wealthy industrial nations that predominates. Because of the dominating influence of the donor countries, one can assume a high degree of efficiency in the case of the World Bank Group. Demands on the part of developing countries for greater consideration to be given to distributive goals, which in many cases could mean a loss of efficiency, are fended off or weakened by the voting majority of the industrialized countries.

Naturally, such a brief characterization of the two different decision-making processes is simplistic. Not all UN decisions are automatically inefficient and not all World Bank decisions are distributively unjust. Rather, we are talking here about tendencies. The effects of the two decision-making processes may be expected broadly to take this form.

In the course of the founding and restructuring phases of the GEF, this fundamental conflict was largely resolved by means of an innovative solution. The voting mechanism of the GEF is based on a 'double weighted majority' system. Basically, decisions in the Council of the GEF must be based on consensus. In the event that all efforts to reach a consensus have been exhausted, each member of the Council has the right to demand a formal vote. However, the subsequent voting takes place in two stages: in the first round each member has one vote ('one country, one vote'), and in the second round the vote is weighted according to financial contribution ('one dollar, one vote'). A decision is reached if 60 per cent of the countries vote in favour and this majority at the same time represents 60 per cent of the contributions to the GEF fund. Industrialized countries and developing countries are thus not able to outvote each other (WBGU, 1996; Ehrmann, 1997). In the UN institutions, in contrast, as was mentioned above, decisions are made on the basis of a majority of member states, so that donor countries can easily be outvoted. For this reason, if the GEF had not been set up outside

the narrower confines of the UN system, financial resources would probably not have flowed to the extent they have.

Similar, flexible voting rules were also introduced in the context of decisions relating to the allocation of funds from the Multilateral Ozone Fund. The Ozone Fund has been given the task of compensating developing countries for the incremental costs of converting their industries to substances and processes that are non-damaging to the ozone layer in accordance with the provisions of the Montreal Protocol. A group composed of an equal number of donor and recipient countries is responsible for the management of this fund. Outvoting of one group of countries by another is not possible because, in the event of failure to reach consensus, a decision is arrived at by two-thirds majority, which must also comprise the majority of representatives of both groups of countries (Gehring 1990; Biermann, 1997).

The voting mechanisms of both the GEF and the Multilateral Ozone Fund are the product of a pragmatic compromise. Experience to date suggests that these are successful institutional innovations in the sphere of global environmental policy that could act as models for other international environmental agreements. Their success is demonstrated not least by the fact that actual voting – in the case of the GEF at any rate – is the exception and that the existence of this voting procedure in itself fosters the desired consensus.

In the case of some of the conventions it has so far not been possible to approve a full set of operational rules because of conflicts relating to voting rules on decisions concerning financial matters. For example, in the case of the United Nations Convention to Combat Desertification (UNCCD) (Rule 47) and the Convention on Biological Diversity (CBD) (Rule 40) voting rules concerning financial matters have not been settled to date. Whereas developing countries argue for a two-thirds majority rule, the OECD countries demand unanimous decisions on financial matters. In order to end this dispute, which has already lasted several years, as soon as possible, the Council recommends introducing decision-making procedures based on the voting rules of the GEF and the Ozone Fund.

The GEF, as the most important funding institution in global environmental policy, is rated positively. The reasons for this evaluation are on the one hand its proximity to the World Bank, which makes it probable that funds will be allocated in a professional manner, and on the other its innovative decision-making procedure. It is not recommended, however, that all the funds earmarked for global environmental protection in the German federal budget should be handed over to the GEF. A number of reasons can be given for this. Especially important is the fact that the concentration of large sums of money in one place always tends to arouse a desire for more money, even though these additional funds may not be necessary to fulfil the task in hand. The principal danger here is that large institutions are particularly susceptible to becoming excessively bureaucratic. Moreover, where competition among different institutions for public funds is reduced, efforts to use resources efficiently may also be expected to slacken. Preference should therefore be given, for example, to NGOs in developing countries because they have the advantage of being close to the problems due to their familiarity with the particular local conditions. Such a network of NGOs could be funded for example via Germany's development cooperation institutions (BMZ, GTZ, KfW), or alternatively via a newly created national trust fund for the environment and development (Section E 3.4.5).

Against this background it is vital to give careful consideration to how the available volume of funds can be divided up so as to ensure the maximum possible contribution to the goal of global environmental protection. The system of determinants presented below is intended to provide starting points both for dividing up the funds and for possible institutional changes with regard to the international system of financing.

E 3.4.3 A system of determinants for assessing how efficiently funds are spent

E 3.4.3.1 The importance of analysing efficiency in the allocation of public funds

If an organization is highly efficient in the way it spends funds, this means that it makes a large contribution to achieving the goal of global environmental protection with the resources available to it. What we are concerned with here is not so much planning individual environmental protection projects in the most efficient way possible. Rather, the focus is on the funding institutions, and the analysis examines the extent to which an institution is able to select from among the projects requiring funding those proposals that will contribute the most to achieving the desired goals. This is the primary goal of any funding institution, and in order to achieve it the funds required for the project selection process must themselves be spent as efficiently as possible. For a start this means that the budget of an organization must allow the minimum possible for financing adminis-

trative costs and the maximum possible for projects funding. If an institution is successful in achieving a high degree of efficiency, then this will have two main effects:

1. The contribution it makes to the goal of global environmental protection is greater. This will happen by definition as a result of greater efficiency, which implies that a goal is achieved at the lowest possible cost. The additional funds available as a result of the increased efficiency can then be spent on other projects. By being able to finance these additional projects, the overall contribution to global environmental protection is increased.
2. Alongside this direct connection, greater efficiency in the use of funds also has an important indirect effect on the donor countries. The knowledge that the funds allocated will be used efficiently can significantly increase the inclination of these countries to provide more funds. In view of the fact that the industrialized countries' inclination to provide funds for global environment and development policy is on the wane, this aspect becomes all the more important.

The further idea of effectiveness is also closely bound up with efficiency. An institution is effective if it achieves the environmental goal set for it. Cost-related considerations are not taken into account when measuring effectiveness in the stricter sense. In the following reflections the focus is on efficiency as regards the use of funds, even though reference is occasionally made to effectiveness. Systematic examination of how efficiently funds are spent by international funding institutions is virtually completely missing in the literature. As the question being raised is new, it is not possible to make assertions that are backed by empirical evidence. Rather, the goal is to set out a rough preliminary pattern of determinants that can serve as a basis from which we can derive hypotheses concerning how efficiently funding bodies spend financial resources in the field of global environmental protection. Empirical examination would have to be the subject of future research (Zimmermann and Pahl, 2000).

E 3.4.3.2 The individual determinants

The basic idea underlying a system of determinants to assess how efficiently international funding institutions spend funds is that the efficiency of a given funding institution is influenced by a great number of very different factors. Under the term 'efficiency', two approaches are examined in parallel:

- The narrow concept of efficiency, as used for example in cost-benefit analysis, where the established costs are set against the measured or estimated benefits (advantages, contribution to achieving a goal, etc.), is only used to a limited extent as a basis here. This approach is very limited because although costs are usually relatively easy to ascertain, measuring the magnitude of benefits on the utility or performance side is bound by tight constraints.
- The second approach is procedural in nature. We want to identify an organization that is designed in such a way – with incentives, clear performance targets, scope for decision-making, etc. – that efficient results may be expected. This approach is the focus of the discussion below.

The possible determinants that might be expected to affect efficiency as outlined above are very numerous. They are condensed here into a limited number. Some of these may be applied to all types of financial institution and should therefore be examined first. These are particularly suited to comparing funding institutions with one another.

Another group is specific to a particular area of responsibility and the problems that need to be resolved within it; consequently, global environmental problems are focused upon here. Lastly, the kinds of measures that institutions plan and take decisions on also appear to influence efficiency.

The determinants that we have formulated are explained here in brief. In doing so the argumentation is not taken to the point of carrying out efficiency tests. Rather, examples are subsequently given of hypotheses concerning how these determinants relate to efficiency (Section E 3.4.4). Further reflections aimed especially at extending this list and further subdividing the determinants presented, as well as empirical examination, would be a subject for future research. The years of experience gained in the field of efficiency and effectiveness analysis relating to development assistance payments could be particularly useful in terms of analysing financial support payments for global environmental policy (Fairman and Ross, 1996).

Attributes of financial institutions as determinants

Determinant One: Public versus private institutions. In global environmental policy a distinction can be made between public and private institutions as players. Large public organizations such as those within the UN system are often said to be relatively inefficient. National trust funds for environment and development can provide a counterbalance to this (Section E 3.4.5). These trust funds provide support especially to private groups, NGOs, etc. – mostly operating at local level – that often operate more

efficiently and effectively than projects initiated by government organizations.

Determinant Two: Multifunctional versus monofunctional institutions. Funding institutions may be designed specifically to deal with a single environmental problem (e.g., the Multilateral Ozone Fund), or they may be responsible for several environmental issues (GEF). Concentrating on a narrowly defined environmental problem (e.g., ozone depletion in the stratosphere; see also Determinant Six) permits a fund that is related to a specific convention rapidly to build up a body of knowledge relating to the environmental problem concerned. One of the special features of multifunctional funding institutions such as the GEF, meanwhile, is their good overview of the spectrum of global environmental problems and this enables them to make internal linkages that cut across the boundaries between different conventions (see also Determinant Six). A funding institution for climate problems has to spend more interdisciplinary knowledge and policy than an ozone fund. An institution that is inappropriately designed for the environmental issue in question, for example if it is inadequately connected to the relevant environmental conventions, is highly detrimental to efficiency.

It is usually not possible to draw any direct conclusion as regards efficiency from either of these two determinants, which relate to the type of funding institution. Rather, each institution must be examined on a case-by-case basis for specific examples of funding allocation. In any case, cross-checking must be carried out with the determinants described below.

Determinant Three: Internal organization. With regard to internal organization, we can draw a distinction between a professional approach to responsibilities, which fulfils the requirements of the 'clients' and develops an ethos geared towards accomplishing tasks correctly on the one hand, and a bureaucratic organization characterized by lengthy and awkward decision-making processes on the other (Mayntz, 1997). Older institutions, ceteris paribus, are often more bureaucratic and may therefore have to undergo reorganization. Reference points for testing the efficiency of funding institutions may be obtained by examining the internal structures of the organization. For example one can examine whether there are internal review procedures to check whether tasks are carried out efficiently. The existence of an internal review mechanism should greatly increase the likelihood of the sort of procedural efficiency under discussion here. Furthermore the type of budgeting procedure exerts considerable influence on how efficiently funds are used. The UN organizations have already largely replaced 'object-of-expenditure budgeting' with 'programme budgeting'. However, a results-oriented budgeting process, focussing attention more on achieving results and setting performance indicators for this purpose, would provide better internal and external efficiency controls (see also Determinant Four). Efforts to introduce such 'results-based budgeting', which is also an important element of the reform plans of UN General Secretary Kofi Annan, should therefore be pursued for reasons of efficiency (Mizutani et al., 2000).

Determinant Four: External regulation of institutions. This determinant covers many individual considerations that can affect efficient use of resources. Of particular importance is institutionalized monitoring of efficiency. Provision should be made either for internal auditing (see also Determinant Three) or this should be carried out externally. Internal auditing should be carried out along the lines of the rigorous internal reviews that are carried out in private enterprises. For external auditing an organization could be established along the lines of the Office of Inspector General in the USA, which would inspect the funding bodies concerned. Furthermore, the nature of the voting process (e.g., unanimity rule, or double weighted majority decision-making such as in the GEF and the Multilateral Ozone Fund; Section E 3.4.3) and the terms of reference for allocating funds are also important. As regards the terms of reference, another important question is whether these are laid down in the convention or are largely open to interpretation on the part of the funding bodies. The extent to which the funds available to an institution are dedicated to specific purposes should also be checked, or whether the distribution of funding is largely at the discretion of the institution. Both types have advantages and disadvantages that have to be ascertained on a case-by-case basis.

Determinant Five: Possibilities for influencing governance structures in the recipient country. It is a well-know fact in the field of development cooperation that, due to poor governance structures in the recipient country (e.g., corruption, or construction of prestige objects), a great deal of funding has made only a meagre contribution or none at all to achieving its intended objectives (World Bank, 1998). Institutions such as the IMF and the World Bank have a good rating with regard to this determinant, because they can exert an influence on the creation of a good institutional infrastructure. Recent studies have shown, however, that being able to influence governance structures successfully depends on the institutional setting in each case (Seymour and Dubash, 2000). For this reason assessment should be made on a case-by-case basis. In many instances decentralized approaches with direct involvement of local agents

offer an alternative to the World Bank and the IMF in order to build appropriate governance structures and, as an important prerequisite for institutional reforms, strengthening the interest of the local population in (global) environmental protection (Keohane, 1996).

Attributes of global environmental problems as determinants

Determinant Six: Whether a global environmental problem cuts across issues. By cutting across issues we mean whether a global environmental problem impinges only on a single, narrowly defined area of the environment or whether it affects several areas. The first applies for example to the problem of stratospheric ozone depletion or protection of the sea from tanker accidents. The problems of global warming and biodiversity conservation on the other hand affect several areas of the environment simultaneously; in a special report (WBGU, 1998b), the Council has discussed in detail the problems associated with crediting carbon sinks in climate policy and how they relate to biodiversity conservation.

Determinant Seven: Numbers of people affected by prevention measures. For global environmental problems, the groups of actors that are affected and that benefit are by definition global. However, a distinction can be made between global environmental problems where prevention activities affect only a small group of actors, and those where the circle affected by prevention measures is very broad indeed. A soil protection policy, for example, has a decisive effect on land-use options and thus has a significant impact on the local population, while the circle of people affected by protection measures relating to the stratospheric ozone layer, in other words, CFC-producing companies, is considerably narrower. Here too, appropriate design of the institution is a prerequisite for fulfilling tasks efficiently. The projects financed by the GEF for example are sometimes criticized in this regard for failing to cooperate adequately with the institutions and stakeholder groups on site, in other words with those affected by the environmental policy measure (Horta, 1998).

Type of environmental protection measure

Determinant Eight: Type of environmental protection measure. The eighth determinant, finally, is the type of measure that is envisaged or required, as this plays an important role in determining which institution is better suited than others to carrying out the job in hand efficiently. There is a significant difference, for example, whether it is a question of financing concrete projects, developing a long-term environmental protection strategy (e.g., altering the energy mix of a national economy) or disseminating information.

E 3.4.4 Hypotheses and recommendations relating to the determinants

Due to the large number of determinants listed and all the possible combinations of influences resulting from this, it is not within the scope of this report to assess the individual determinants exhaustively. These represent a first attempt to make some conjectures regarding how efficiently funding institutions spend funds and to draw up hypotheses that can be tested empirically. It is only possible to give some examples here of politically significant conclusions that can be drawn from such a broad concept.

An important reference point for assessing the efficiency of a funding institution is its internal organization (Determinant Three). The existence of internal review mechanisms and the budgeting process strongly influence the efficiency of an institution's activities. In addition, transparency with regard to the use of funds should also be mentioned here. A lack of transparency regarding the use of funds by the secretariats of the individual conventions is a problem that is increasingly a cause of displeasure on the part of the donor countries. The secretaries-general of the CBD and the UNCCD have been asked repeatedly to provide the Parties with more detailed and precise information on how funds are allocated, instead of submitting an overall balance-sheet that consists of only a few pages or is difficult to understand. The Council therefore believes that the reform efforts of the UN should include improving the financial reporting system of the secretariats. These reforms could be supported by the Office of Internal Oversight Services (OIOS) set up in 1995, which assists the UN Secretary-General in carrying out internal inspections.

When considering the determinant relating to the multifunctionality of an institution (Determinant Two) one may initially assume that an institution that has been assigned many tasks will display a low level of efficiency. There are many different environmental protection measures to be financed. The knowledge required for this may be developed through relevant specialist departments, but this can result in very large institutions. Such large institutions are often considered to be less efficient than smaller institutions due to their tendency to become bureaucratic (Determinant One). The opposite of such multifunctional institutions are convention-specific funds such as the Multilateral Ozone Fund (Determinant Two). In the case of funds relating to a specific convention one may assume that the focus on a precisely defined environmental problem permits a large body of expertise to be developed more rapidly and more

effectively (determinants Two and Six). The proximity of such a convention-specific fund to the problem should prove to be highly advantageous in terms of achieving the greatest possible efficiency.

Nevertheless, it would be wrong to give preference to convention-specific solutions on principle. On the one hand, all of the determinants must be taken into account, while on the other, most importantly, reference must be made to the environmental problem in question. This will be illustrated in a few points, using the example of the GEF:

1. The work of the GEF as a multifunctional institution is certainly to be judged efficient overall. A crucial reason for this is its linkage to the World Bank, which has at its disposal a well-honed evaluation and monitoring system (determinants Three and Four). The professionalism that this gives it is in turn an important precondition for the donor countries to provide funds, as their influence means that they have a say regarding the spending of funds, at least to a certain extent (Sharma, 1996).
2. In addition, the GEF also provides the right setting for developing strategies for global environmental problems which require international cooperation (Determinant Eight), such as climate change. This is also true of biodiversity conservation. Many measures in biodiversity policy must, however, be developed and implemented on site in cooperation with the sections of the population affected. Accordingly, smaller, locally operating institutions, including NGOs, should be given greater involvement in planning – and in financing, which is the focus of our attention here.
3. The GEF is responsible especially for climate protection and biodiversity. These global environmental problems cover a wide cross-section of fields and the circle of those affected by preventive action is very broad (determinants Six and Seven). It is therefore necessary to have a general overview of the linkages among the underlying environmental problems. This points in favour of giving the GEF responsibility for funding matters relating to both conventions.

Despite its very positive assessment, the GEF should not be the only institution for distributing funds. Some studies for example (Keohane, 1996) show that so far neither the GEF, nor indeed the Multilateral Ozone Fund, have entirely managed to arouse interest in (global) environmental protection at local level (Determinant Five).

Experience in development policy in this regard shows that innovative forms of service provision, such as participation by the local population and decentralization of decision-making, can greatly increase the efficiency of development assistance payments (OECD/DAC, 1997; Umana, 1997; World Bank, 1998). Such approaches should be adopted more frequently in financing global environmental policy. National trust funds for environment and development, among others, could serve this purpose. In the next chapter these funds are presented briefly and we examine – also using the system of determinants presented above – to what extent these funds might be suitable to take on the role of a second important pillar in the financing of (global) environmental protection alongside the GEF.

E 3.4.5
Efficiency analysis of non-commercial national trust funds for environment and development

National trust funds for environment and development emerged from the debt-for-nature swaps that took place in the early 1990s (Resor and Spergel, 1992; Sand, 1994; Rubin et al., 1994; Danish, 1995a, 1996; CSD, 1996; Meyer, 1997). These trust funds are administered in the developing country concerned and take on the function of an on-site source of funding. They provide funding for organizations or individuals planning to carry out environmental or development projects. One of their special characteristics is the integration of the structures of civil society in the developing countries in question into the decision-making mechanisms of the fund.

To date this innovative financial tool is being used in more than 30 countries. Just under US$1,000 million have flowed into these funds. Trust funds for environment and development came about not least because the experience gathered in development cooperation over the past five decades suggested that it was not necessarily a good idea to continue using the tools hitherto used. If financial resources can be usurped and diverted to other purposes (e.g., to buy arms) by the political power elites in the countries of the South where democracy has not yet been adequately consolidated or where dictatorial regimes are still in power, then new, additional funds would not only fail to solve the fundamental problems, but indeed exacerbate them further.

As the first fixed-interest securities issued in the framework of debt-for-nature swaps with national governments were approaching their final maturity date in the late 1980s and early 1990s, the question arose as to what would be the most sensible thing to do with the nominal capital of these securities. Instead of going to a single NGO, which could easily find itself overwhelmed by the sudden windfall, the solution that presented itself was to create a new national institution or foundation that would manage the funds independently of the government and

involve the broadest possible range of stakeholders from civil society. It would also allow the donors to be involved in the process of decision-making regarding allocation of the funds. As far as international environmental NGOs were concerned the most important thing was the goal of achieving independent, long-term, secure funding for nature conservation measures in order to minimize the problems of meeting on-going costs that had been experienced in past projects. Precisely in the field of projects relating to biodiversity conservation, the constant need for funds often exceeds the limited duration of project cycles in traditional development cooperation.

In addition, these trust funds contributed to strengthening the structures of civil society in the recipient country if the rights of disposition over the new financial resources were designed appropriately (Determinant Five). The trust funds in many cases proved to be much less susceptible to corruption and thus spent the funds more efficiently and in a more targeted way than the state bodies in the recipient countries in traditional project work. In order to guarantee that the national environmental trust funds were representative, the environmental NGOs advocated that if possible all representative local and national environmental NGOs, national governments and representatives of the donor countries' governments and international NGOs should have a seat and a vote in the trust's decision-making bodies.

Meanwhile the World Bank, UNDP and the governments of the USA, Switzerland, Canada, Norway and The Netherlands all lend their support to the setting up of national trust funds for environment and development by providing technical assistance or ongoing funds from the public budget (Wahl, 1997).

Depending on the chosen legal form of the funds, which go by the name of 'Trust Funds' under Anglo-Saxon law or 'Stiftungen' (foundations) under German law, the money from donors or from national environmental taxes and levies goes into a central investment fund, where it can either remain tied in the long term, with projects being financed out of the current income (revolving fund), or it can be invested immediately or over a period of time for particular measures relating to environmental protection (depleting fund). Trust funds for conserving species diversity are generally managed as revolving funds where the endowments are invested on the international capital market by professional managers in accordance with criteria prescribed in advance. The objective is to make current income available for project work that is planned on a long-term basis. The high opportunity costs associated with a revolving fund might cause some surprise at first sight. Since there are numerous examples of absorption capacity for new project funding being too low in other areas too, however, this legal structure for the funds certainly carries conviction. Wherever more damage than progress in terms of consolidation and development is caused by a heavy influx of funds, a revolving fund is probably the most appropriate solution. This flexibility, which is geared to the on-site conditions, is without doubt one of the strongest points of this tool.

Existing national trust funds for environment and development are not uniform in design. A vast range of legal forms, ways of raising and allocating funds, decision-making structures, ways of assigning tasks and ways of working can be identified. At the same time, however, there are three key points that they all have in common (Danish, 1996). First, funds are pooled together from a large number of national and international sources of finance, both public and private. Second, in their decision-making bodies as a rule a broad swathe of stakeholders from civil society in the recipient country are represented and third, they have the distinguishing feature of also being able to allocate very small-scale grants to many local recipients.

There have so far been no comprehensive comparative studies of the work of national trust funds for environment and development to date. It is nonetheless possible to evaluate the potential of these funds. They often display a higher level of economic efficiency because they cut down on transaction costs and avoid the opportunistic structures that are often to be found where environment-related North-South transfers are concerned (Meyer, 1997). In addition, trust funds for environment can be tailored to suit the environmental problem concerned, thereby enhancing their effectiveness in terms of environmental policy (determinants Six and Seven). Such funds allow forms of 'good governance' to be learned and can strengthen the structures of civil society (Determinant Five; Jakobeit, 2000). As a result of the capacity building that goes hand in hand with this, the efficiency with which funds are spent is likely be enhanced in the long term.

Funds and NGOs are not miracle cures, however. They too must be assessed in the light of the determinants presented above. For example the transparency of an environmental trust fund's decision-making structures and its integration into an external monitoring system must be examined (determinants Three and Four; Meyer, 1997). It should not be overlooked that, as non-profit organizations, such trust funds are not subject to either of the two major control mechanisms of the 'market' (with bankruptcy as a sanction) or the 'state' (with being voted out of office as a sanction), and that they therefore need particularly good internal and external control mechanisms, not least in order to remain innovative (Zimmermann, 1999).

Studies have shown, moreover, that dependency on a single source of finance can reduce the efficiency of a fund considerably (Edwards and Hulme, 1996). One must also examine to what extent participation rights for local NGOs affect traditional bilateral development cooperation, which is based on cooperation between governments. Greater flexibility, less bureaucratization, fostering smaller projects at local level and participation of civil society stakeholders are nevertheless significant advantages that environment trust funds offer. A further positive point that should be emphasized is that the fund's capital can be made up of money from a wide variety of sources. For example, the fund's capital can comprise internationally agreed contributions from member countries, as in the case of the GEF, direct bilateral development cooperation, debt-for-nature swaps, private endowments (Section E 3.3) or the revenue from specific environmental property rights (WBGU, 2001).

Because of the advantages outlined here, the Council recommends assessing the efficiency and effectiveness of national trust funds for environment and development on the basis of the system of determinants presented above. In the event of the assessment being positive, one option that presents itself would be to allocate at least part of the money that would be freed up as a result of a comprehensive initiative to release the poorest developing countries from their debt, as was discussed at the world economic summit in Cologne in June 1999, to selected trust funds for environment and development. In the case of a partial waiver of debt repayments, for example, this could take the form of paying the remaining debt commitment into such a fund. This would have the advantage that on the one hand debt repayment could take place in the currency of the country concerned and, on the other, that the impact that can be achieved in terms of environmental policy is greater than in the case of an unconditional remission of debt.

E 3.5 Conclusion

The creation of an efficient and effective system for financing global environment and development policy is one of the most vital and at the same time one of the most difficult tasks in reforming the international institutional framework. In this chapter the Council presented and discussed a large number of proposals for institutional reform on the revenue side and the expenditure side. If one looks in isolation at the recommendations of the Council for financing global environmental policy, many of the proposals appear utopian at first sight. It is therefore imperative that the recommendations should be viewed in the context of a comprehensive reform of the institutional framework of global environmental policy. The institutional and organizational shortcomings of the existing structures raise doubts for example as to whether, even if funding were increased to one per cent of GNP, the desired increase in the effectiveness of global environmental policy could be achieved. It could certainly be achieved if the institutional structures were optimized. In Chapter F the Council develops a comprehensive vision for reorganizing the institutional and organizational structure of global environmental policy in the form of an Earth Alliance. Incorporated into the presentation of the Council's vision concerning structures, the crucial recommendations for action with regard to financing are reiterated in Section F 4.3.

Earth Alliance: Approaches and a vision for restructuring

F

Contributing to the World Summit on Sustainable Develepment F 1

Shortly before the World Summit on Sustainable Develepment the Council submits its proposals for restructuring the institutional architecture of global environmental policy. These proposals concentrate on concrete action. The analysis of the most urgent global environmental problems has shown that, despite the great number of some 900 bi- or multilateral environmental agreements, a considerable need for action remains (Chapter B). At the heart of the recommendations is the structural vision of the Council for global environmental policy, taking the shape of an Earth Alliance. This does not appear feasible over the short term; nonetheless, it is recommended to use this structural vision over the long term as a guiding model for the reform of global environmental policy. First steps towards this vision should be taken and subjected to continuous review of their efficiency and effectiveness.

The Council's vision of an Earth Alliance to reform the architecture of international environmental institutions and organizations (Fig. F 1-1) builds on existing structures and develops them further as needed. The Earth Alliance comprises three cross-cutting areas interlinked in terms of information, communication, coordination and finances. First, to enhance the assessment of environmental problems, the Council proposes the establishment of an independent entity with the task of issuing (early) warnings of development trajectories that harbour particularly high risks. This entity should be kept small (10-15 members plus secretariat), should have a right of proposal vis-à-vis the scientific advisory bodies of the Conferences of the Parties – some of which are yet to be established – and should be entitled to address the public as needed (Earth Assessment). This recommendation is explained in detail in Section E 1.

Second, the Council recommends changes in the organizational hub of international environmental policy (Earth Organization). This centres on the stepwise establishment of an International Environmental Organization – a prime issue of debate in the run-up to WSSD. This would involve the coordination and cooperation function of a strengthened UNEP, with closer networking among the secretariats of the international environmental conventions and their (in some instances yet to be established) scientific advisory bodies. The possible structure of this organization is discussed in detail in Section E 2.

In addition to legal certainty and good governance, sufficient financial resources are necessary to counter growing global challenges successfully. However, the reluctance of the industrialized countries to provide adequate funding – which has become increasingly entrenched over the years – poses an obstacle to the raising of sufficient funds to protect global environmental resources. For instance, over the period from 1990 to 1998, the official development assistance transfers of Germany have dropped from 0.42 to 0.26 per cent of gross national product. This trend needs to be reversed. In addition, the Council recommends that innovative avenues for funding global environmental policy be pursued increasingly. The third and last part of this chapter therefore makes recommendations for funding the policies previously outlined. Such new prospects for Earth Funding are discussed in depth in Section E 3.

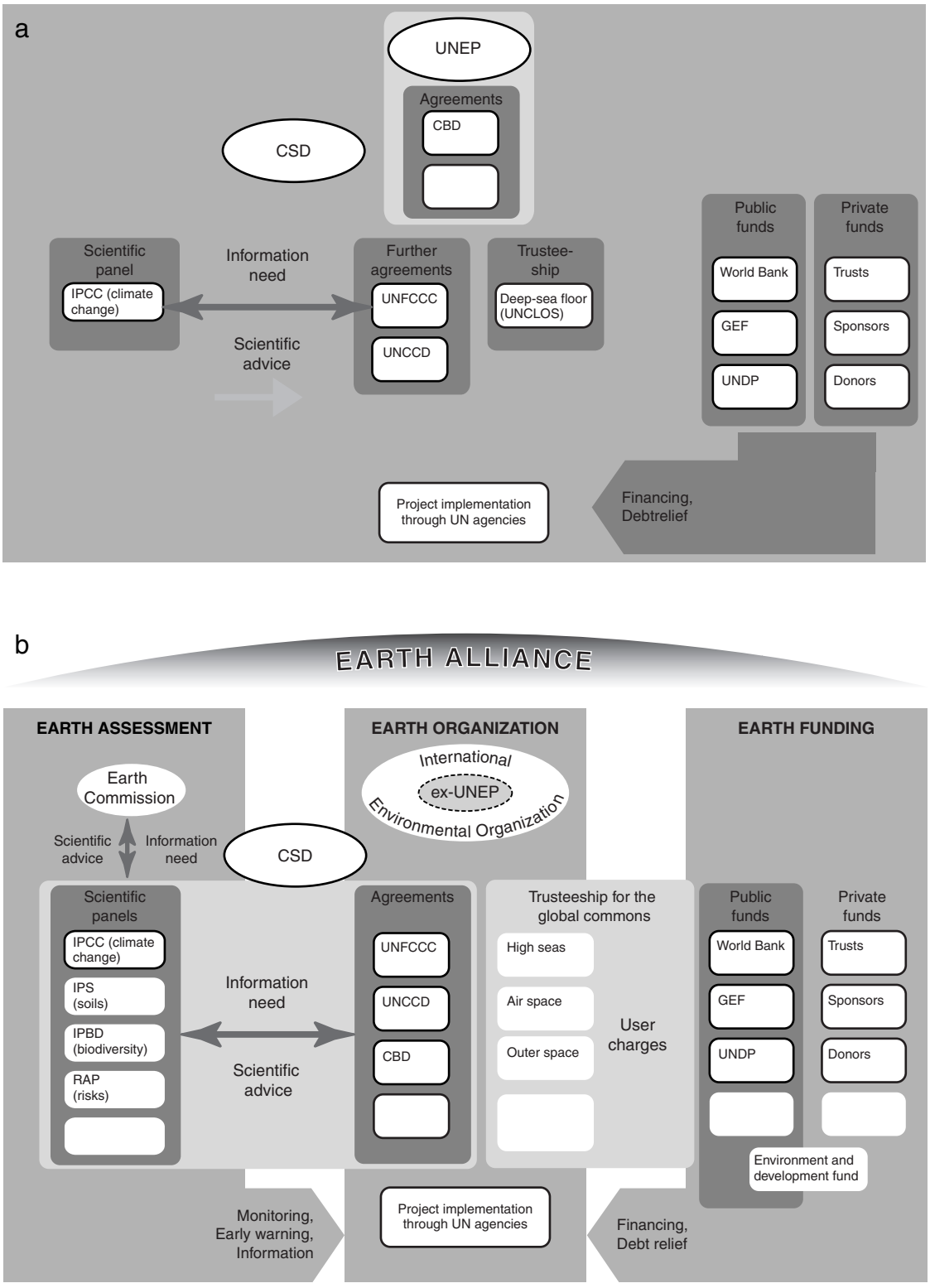

Figure F 1-1
Reform of the United Nations in the field of environment: (a) today's status and (b) vision of a reform.
Source: WBGU

Earth Assessment: Ethical authority and scientific competence to assess environmental issues

F 2

F 2.1
Establishing an Earth Commission

As a part of its vision for recasting the structures of global environment and development policy, the Council considers it essential to establish an independent body endowed with universally accepted ethical and intellectual authority, and charged with identifying and assessing the risks of global change. The Council recommends to the German government that it examines the options for establishing an 'Earth Commission' and that it submits a corresponding proposal to the United Nations. This commission would provide the long-term perspective needed to protect environmental resources and safeguard the rights and interests of future generations, and would provide impulses for research activities and political action. A particular function of the Earth Commission could be to place on the international agenda, in a manner that catches the world's attention, issues which would otherwise be neglected despite their vital importance.

The members of the Earth Commission, appointed by the UN General Assembly, should number 10 to 15, and be leading figures of highest moral authority who can command the attention of a global audience, as the Brandt and Brundtland Commissions did. Such a commission might be viewed as a globalized form of the German Council for Sustainable Development (*Rat für Nachhaltige Entwicklung*). Where the need arises, the Earth Commission could be supported by inputs provided by scientific panels (Section E 1.3). The Earth Commission could receive a right to propose scientific issues to be treated by the panels. These environmental analyses would then be processed by the Earth Commission and evaluated in terms of whether a 'warning' needs to be issued to the global public and the United Nations about impending and potentially irreversible environmental changes.

For the early warning function to have sufficient weight and political mandate, the Earth Commission should have the right to be heard by the UN General Assembly or to launch initiatives to address problems or misguided developments relating to global change. It should deliver regular reports to the UN Secretary-General providing assessments of the global environmental situation.

F 2.2
Strengthening scientific policy advice

In conjunction with the scientific panels, the Earth Commission would have four focal tasks:

- *Synopsis*: It should reap maximum benefit from the existing monitoring systems in order to characterize the state of the Earth System. Furthermore, additional monitoring activities should be established where needed.
- *Early recognition and early warning*: Based upon scientific data and findings, the Earth Commission should warn the public and particularly the United Nations of impending and potentially irreversible global environmental damage.
- *Identification of guard rails*: The Commission should identify 'guard rails' for international environmental policy in order to demarcate still acceptable transitional areas from unacceptable states.
- *Reporting*: The Commission should submit to the UN Secretary-General an annual report evaluating, on the basis of the latest scientific information, the main environmental problems and developments.

With regard to the UNCED and future WSSD follow-up process, there is a need for action in the following spheres:

- There is a lack of coordinated contributions by the scientific community to the problems of global change. In some environmental spheres (e.g. biodiversity and soils), knowledge on states, degradation dynamics and potential consequences is still very patchy or entirely absent (Chapter B).
- There is a need for a body engaging in cross-cutting analysis of the key themes of global change and identifying 'safety margins' or 'guard rails' in

order to inform the international community, in as timely a manner as possible, about hazardous developments in the environmental realm. Guard rails indicating the limits of absolute non-sustainability would provide a scientifically underpinned basis upon which to determine abatement or conservation goals within the various environmental regimes.

- To transpose scientific findings into politically relevant options for action, there is frequently a lack of integration among the approaches and perspectives of the various disciplines.
- To inform the wider public, a need remains for a structure that channels and renders accessible the available 'risk knowledge'.

The present structure, in which only the Climate Change Convention has an independent scientific advisory body at its command, does not suffice to cope with the tasks outlined above. Building upon the IPCC experience, the Council recommends the establishment of comparable scientific bodies or panels to provide advice and support, for instance to international soil and biodiversity policy. In an *Intergovernmental Panel on Biological Diversity (IPBD)* (WBGU, 2001) or an *Intergovernmental Panel on Land and Soils (IPLS)*, eminent scientists could be brought together who could work on an ongoing and independent basis and provide scientific policy advice. Furthermore, a *Risk Assessment Panel* could form a network node, systematically collating the various national-level risk characterization and evaluation efforts and identifying global risks. This panel should be concerned not so much with analysing environmental problems that have already been identified, but rather with identifying, early on, new types of global change risk whose first outlines are only just emerging (WBGU, 2000a). The contributions provided by these panels would provide the Parties and all stakeholders with scientific policy advice on current issues and problems in the political process. The scientific findings of these panels would also be utilized by the Earth Commission proposed by the Council.

At the European Union (EU) level, too, there is a lack of coordinated scientific policy advice. It would therefore be useful to give the existing national-level environmental and sustainability councils the opportunity to provide consultative support, by means of joint reports, to EU environment and development policy. In the view of the Council, the run-up to WSSD would lend itself particularly to such an approach. In the negotiations within the UNCED follow-up process, the European Union has been speaking with one voice for long now. The time is therefore ripe to establish a structure permitting EU-wide cooperation among national-level scientific policy advice bodies or to set up a scientific council at EU level in which members of national-level advisory bodies are represented.

F 2.3
The CSD as the forum for debate

Within the Earth Assessment structure, the Commission on Sustainable Development (CSD) would assume an important function in promoting interlinkage and dialogue in the deliberative process among the Earth Commission and governments, UN agencies, the scientific community and non-governmental organizations. In the view of the Council, such a repositioning could provide one of the future fields of work of the CSD. The Earth Commission could have a right to propose the issues to be addressed by the CSD, thus raising the profile of topics which are particularly precarious from a scientific perspective but have not yet gained sufficient political attention. Moreover, the CSD could be the forum in which the reports of the Earth Commission are debated. The CSD is particularly suited to this role, as it is the specific intergovernmental forum within the United Nations system in which cross-cutting sustainability issues are addressed. The CSD is the central forum for issues relating to environment *and* development. Besides this integrative role, the CSD has an important supportive function within international environment and development policy, as it initiates the consensus-building and standard-developing deliberative process within the international community of states that is crucial to the political decision-making process. This exceedingly important function needs to be retained in the future, and integrated within the system for global change risk assessment proposed by the Council.

F 3.1
Towards an International Environmental Organization

F 3.1.1
Introduction

As a result of the frequently stated lack of coordination and efficacy in global environmental policy, calls for comprehensive reconfiguration of the international institutional and organizational structure have become increasingly strident in recent years. This debate received a new impetus from the proposal of the heads of government of Brazil, Germany, Singapore and South Africa in 1997 to establish an international environmental organization to be developed as a UN entity from UNEP. In 2000, France's Prime Minister Lionel Jospin and Environment Minister Dominique Voynet also spoke out in favour of such a proposal. The 1st international forum of environment ministers in Malmö reiterated the need for organizational reform.

The issue will therefore doubtlessly play a key role at the WSSD in 2002 (Section E 2). A look at staff members underscores the urgency not only of reform, but also of strengthening UNEP: UNEP has only 530 employees to carry out its global mandate. The German Federal Environmental Agency (Umweltbundesamt, UBA) has almost twice as many (1999: 1,032) and the US Environmental Protection Agency (EPA) even 35 times more (1999: 18,807). In the view of the Council, the need for action is plain.

However, it is essential to take a number of points into consideration when embarking upon a restructuring of global environmental institutions:

- The concerns of the developing world must be taken into account. Past debates have shown that these countries in particular have reservations against the establishment of an International Environmental Organization. It needs to be ensured that all initiatives in this area are supported multilaterally, in a concerted effort of industrialized and developing countries. The Council therefore urges the German government to engage in targeted efforts to form coalitions with key developing countries in order to ensure acceptance of a political initiative right from the start.
- In order to enhance the acceptance of reform proposals in the developing world, decision-making procedures need to be considered that give North and South equal representation. This could be modelled on the systems of developed-developing world parity in decision-making established by the Montreal Protocol, the Ozone Fund or the GEF (Chapter C). It could thus be ensured that strategic and programming decisions do justice to all interests as far as possible.
- The reform should not lead to the establishment of a new authority with a *mandate to implement projects on its own*. Operational work in the field should continue to be carried out by UNDP (Section D 3.3), the World Bank (Section D 2), FAO, UNIDO and similar actors.
- Organizational restructuring should not create any further financing organization in addition to UNDP, the World Bank or the GEF.

These are fundamental aspects that need to be considered in the debate on reforming the international system of organizations in global environmental policy in the run-up to WSSD. For this, the 1997 initiative of the German government and the 1999 declaration by the environmental policy spokesperson of the Social Democratic Party group in the German parliament provide a good basis.

F 3.1.2
Three steps for reform

Building upon the previous analysis, the Council recommends three steps for organizational reform of the UN system (Section E 2). Each step needs to be examined separately. This model is not intended as a necessary sequence of steps that must strive inexorably towards the final outcome. It is rather to be

expected that the transition from one step to the next already yields considerable improvements in global environmental policy. Only if this is not found to be the case should the transition to the next higher step be considered.

Step 1: Improving cooperation

The first step involves improved cooperation among the various organizations and programmes, which would continue to cooperate as equal partners. In this process, the several functions of the CSD, the GEF, the various convention secretariats and Conferences of the Parties and the environmental policy departments and programmes of the individual specialized agencies would not be touched. If appropriate, improved cooperation could be brought about by upgrading UNEP to the status of an international organization within the UN system. At this stage, such upgrading would imply, besides the associated financial and human resource strengthening, above all an upgrading of environmental issues in general within the 'family' of UN specialized agencies. Such upgrading of UNEP to an International Environmental Organization could be modelled on the World Health Organization – that is, on a UN specialized agency with its own budget and membership – or on the UN Conference on Trade and Development (UNCTAD), an internal UN entity set up by the UN General Assembly to promote cooperation in international trade policy.

A UN specialized agency for environmental issues could be empowered to adopt certain standards by majority decision which would then be binding upon all members. The general assembly of such an International Environmental Organization could furthermore negotiate and adopt treaties which would then be opened for signature within its headquarters. This would go far beyond the present powers of the UNEP Governing Council.

Step 2: Setting up an umbrella organization with independent committees

If improved cooperation among international organizations and programmes, as set out above, should not suffice to remedy the deficits identified, strengthening environmental protection through improved coordination of actors would need to be aimed at. Such coordination would necessitate a limited introduction of hierarchies within the organizational architecture. Should such a step become necessary over the medium term, the model of the World Trade Organization (WTO) suggests itself. Here the secretariat of the General Agreement on Tariffs and Trade (GATT) was upgraded to an independent international organization; at the same time, numerous multilateral and plurilateral trade agreements were brought under the umbrella of the framework treaty establishing the WTO. As a result, all trade agreements have the same secretariat, namely the WTO, which prevents inefficient fragmentation among numerous administrative units. Furthermore, all trade agreements are subject to the same dispute settlement mechanism. Nonetheless, a certain degree of decentralism in the decision-making system is retained because the specific decisions for the key trade agreements are taken at special conferences attached as 'committees' to the WTO Ministerial Conference. In analogy, it might be possible over the medium term to integrate the various Conferences of the Parties in the environmental arena under the umbrella of a common framework treaty establishing an International Environmental Organization and then to let them continue to operate, as in the WTO system, as special committees of the ministerial conference with a high degree of autonomy. The establishment of such an organization will surely only be accepted by developing and industrialized countries alike if both sides have effective rights to determine the further development of the organization. Here adoption of the decision-making procedure of the Montreal Protocol, with its equal North-South representation, would be expedient.

Step 3: Centralization and subordination to a single organization?

It is too early to judge whether steps 1 or 2 will suffice to respond adequately to the mounting global environment and development crisis. Nonetheless, with a view to longer-term developments, the Council wishes to provide indications for further institutionalization steps as a response to any failure of steps 1 and 2. The proposals made in the debate all seek to centralize and hierarchize international environmental policy more strongly. Decision-making processes are to be accelerated by overcoming the principle of consensus or setting up smaller decision-making bodies with representative membership, such as an 'Environmental Security Council', by which minorities would lose their power of blockade. Building on such hierarchization, compliance with international environmental standards could be ensured by means of coercive measures, but possibly also through intensified financial and technical assistance.

Over the medium term, forms of hierarchization that restrict sovereignty will doubtlessly encounter considerable resistance, in North and South alike. This applies, for instance, to proposals for the establishment of an Environmental Security Council or an International Environmental Court with binding adjudication. Moreover, the first of these two proposals would need an amendment to the UN Charter, which requires ratification by two-thirds of UN

members and by China, France, Russia, the United Kingdom and the United States. Far-reaching restrictions of national sovereignty appear out of the question at present with such a quorum.

Beyond these steps, the Council recommends for the restructuring of the Earth Organization the long-term creation of trusteeship authorities for the global commons – atmosphere, oceans, geostationary orbit and Antarctic (Section E 3) – and strengthening existing project-implementing organizations such as UNDP (Section D 3.3).

F 3.1.3
Concrete implementation of structural reform

Overall, the Council takes the view that it would be a promising path to upgrade UNEP to an International Environmental Organization in such a way that this does not restrict national sovereignty. This would provide an additional element of a horizontally organized global governance structure. It appears essential to have an organizational locus for a decentralized international sustainability strategy, in a form that does justice to the interests of most states. Just as the environmental protection policy arena was strengthened institutionally in the nation-states in the 1970s and 1980s through the establishment of independent environment ministries, so now should the global environmental policy arena be strengthened by an entity within the UN or, alternatively, an independent specialized agency. This is important to minimize the tendencies of individual programmes and organizations to pursue their own agendas, and in order to limit duplication, overlap and inconsistency. The main functions of the new organization would be to bring international environmental policies back together, to build capacity in developing countries through the transfer of knowledge and technology, to contribute to improved implementation of international agreements and to create a setting for negotiating new institutions that is more conducive to cooperation. The latter function is particularly important given the current loss of confidence among developing countries in the willingness of industrialized countries to take action.

It is scarcely possible to assess at present whether further steps will become necessary over the medium term. If improved cooperation among international organizations and programmes – including the establishment of a new UN specialized agency for environmental issues modelled on the WHO or UNCTAD – does not suffice to remedy the deficits identified, a strengthened representation of environmental concerns modelled on the World Trade Organization (WTO) could be considered. This would involve integrating the specific environmental agreements and their Conferences of the Parties within a common Framework Convention Establishing an International Environmental Organization. Within such a structure, the environmental conventions and their Conferences of the Parties would then continue to operate as in the WTO system as separate committees of the ministerial conference with a considerable degree of autonomy.

The Council urges adherence to the principle of subsidiarity; initially only the first step should be taken, before, proceeding from a painstaking analysis of effectiveness, further steps are considered. It is only through such an approach that the confidence of the developing world can be gained with regard to reforming the UN system in the environmental sphere. The debate on the establishment of an International Environmental Organization should not obscure the fact that the global environmental crisis is more than a problem of environmental protection – it is a global environment and development crisis that calls for efforts and new global policy approaches in the sphere of 'traditional' development cooperation too (Chapter D). Revocation of the German government's drastic cuts in official development assistance funding would be a key contribution to promoting effective and globally acceptable environmental policies.

F 3.2
Specific actions relating to sectoral environmental regimes

The analysis of institutional responses to the most pressing global environmental problems has shown that the individual sectoral regimes also present a considerable need for action by the community of states (Chapter C). To meet this need, the Council has identified a number of principles for good regime design that can also be transferred to other regimes and new arenas of conflict (Chapter C).

Using protocols to advance the purposes of framework agreements

Today, the strategy that for the most part prevails is to initially only draw up general framework agreements and to leave the concrete terms to further rounds of negotiation, whose results then take the form of protocols that supplement the convention, making it more precise and more strict (Section C 3). The Council rates this approach as positive, because in this way it is possible to draw into the negotiation process a large part of the community of states, even those that tend to hold back. In view of the steady intensification of global environmental problems,

however, it must be urgently pointed out that a very lengthy period of time will elapse between entering into a convention and actually overcoming the problem on the local level. The protocol negotiations following adoption of a framework agreement must therefore proceed swiftly.

Making voting procedures more flexible where needed

Voting procedures are a crucial determinant in the flexible evolution of regimes. Urgently necessary agreements are repeatedly delayed because amendments or supplements to protocols or annexes need to be approved explicitly by all participating states. However, the examples of the ozone and MARPOL regimes also show that it is indeed possible to put in place more flexible voting procedures (Section C 3). The Council therefore urges that an effort be made in the direction of softening the consensus principle in international negotiations, especially where it is a matter of conserving irretrievable environmental assets or warding off imminent hazards. A particularly useful procedure in this context is that of 'tacit acceptance' (Section C 3). In modifying protocols or annexes that do not involve negotiating completely new fields, North-South parity decisions based on qualified majority votes should be promoted as a general principle, since, owing to the small loss of national sovereignty that this entails, this is the form that is most likely to gain consensus.

Furthermore, in decisions that impact the human heritage as a whole, a modification of the formal 'one state, one vote' principle should be reconsidered in favour of a 'one person, one vote' distribution. Schemes in which population size is considered in the allocation of voting rights already exist for instance in European Community law and in the parliamentary assemblies of international organizations, albeit only assemblies that have no decision-making powers. Consideration of population size as a further element in the voting systems of international organizations or conferences – in addition to the conventional 'one state, one vote' principle and financial weighting of vote allocation (such as in the Bretton Woods institutions: 'one dollar, one vote') – would take into account the increasing integration of the individual subject within the body of international law, and the increasing circumscription of the bounds of state sovereignty.

Strengthening information procurement rights and linking these to reporting procedures

In addition to introducing more flexible voting procedures, the institutional design of international compliance monitoring is a major criterion for a regime's success and should therefore be organized rigorously. Experience shows that the obligation of member states to report on the fulfilment of their commitments is an indispensable tool for monitoring international compliance (Section C 4). The Council urges that the numerous and voluminous reports are collated from factual and legal perspectives, assessed in detail and summarized by the secretariats, in order to maximize their usefulness at sessions of the Conferences of the Parties. Where the need arises, further rights to procure information should be created, such as the queries and ad-hoc on-site inspections by international bodies provided for in the ozone and CITES regimes.

Options for responding flexibly to implementational difficulties

The findings of case studies show that cooperative solutions in the event of implementational difficulties can be highly effective in specific environmental regimes, since the spirit of partnership that this engenders strengthens both international relations and transparency (Section C 4). Guaranteed instruments to assist compliance that are not attached to any kind of conditions can, however, blunt the motivation of parties to meet obligations out of their own means. Moreover, in some cases concerted sanctions have helped to swiftly eliminate implementation shortcomings (for instance in the CITES regime; WBGU, 2001). For these reasons, the Council rejects any dogged adherence to either confrontational or non-confrontational approaches. It recommends, instead, providing for flexible options for responding to implementational difficulties and non-compliance in order to allow for decisions appropriate to each specific case.

Involving non-governmental organizations as partners in environmental protection

Non-governmental organizations (NGOs) provide valuable links on all levels – from local to international – and ensure that social concerns are taken into consideration. The participation of environmental associations has proven particularly effective for gathering information and implementing agreements (Section C 4). The Council therefore supports approaches that integrate NGOs into the decision-making and implementational processes of environmental regimes by granting them consultation and participation rights. Participation rights of civil society actors, such as are in place under the Desertification Convention, can initiate learning processes for democratic actions that have an important function in promoting 'good governance' (Section C 4.3). When negotiating future environmental regimes, such participatory elements that generate societal

leverage should be integrated and existing regimes amended accordingly. However, due to their lack of democratic legitimation, direct co-determination rights and decision-making competencies for NGOs need to be examined critically. In most cases, their participation needs to be restricted to consultative and implementational functions.

Non-state cooperation: Ensuring that environmental certification systems are fair

Worldwide product certification is another activity that is well suited to international non-state cooperation for environmental protection. Whether or not international cooperation among enterprises or certification initiatives can make a contribution to the long-term, sustainable use of global resources cannot be determined at present. Be this as it may, the Council definitely perceives in these an incentive system that – as a supplement to international governmental cooperation – must not be neglected. One possibility for regulating environmental certification or labelling would be accreditation by the Earth Commission (Section E 1), which could develop appropriate criteria.

F 4 Earth Funding: Financing global environmental policy

To reform the international institutional architecture, funding global environmental policy is one of the most difficult tasks, both because of the volume of the funds required and in view of the associated global distributional conflicts between net providers and net recipients of funds. It is also one of the most necessary tasks. The potential for conflict is apparent in the present situation, in which OECD countries are steadily reducing their share of gross national product (GNP) allocated to development cooperation transfers, while financial requirements rise and these countries persistently criticize the inefficient and ineffective structures by which interntional organizations spend the funds. The present report has illustrated repeatedly that, in view of the interconnections among economic and social development and changes in the global environment, the financial requirements of global environment and development policy go well beyond the internationally agreed target, confirmed in the UNCED follow-up process, of a GNP share for development cooperation of 0.7 per cent. The Council therefore reaffirms its recommendation that efforts be made to increase this share over the long term to 1 per cent of GNP.

However, the Council warns against viewing this recommendation in isolation from the question of the sources and spending of funds. Recent debates on the reform of international organizations have shown that responses to such demands for more money are increasingly sceptical. Economic analyses of political and bureaucratic procedures have shown that international institutions can be characterized by inefficiency, a tendency towards continuous expansion of budgets and substantial institutional inertia despite the loss of original tasks. For the funding of global environment and development policy, this means that

– donor countries have little incentive to increase their disbursements for global environment and development projects, and
– even if available funding were increased, it is questionable whether the additional funds would really trigger the desired impulses benefiting global environment and development policy.

The structural vision for financing global environmental policy set out in the following comprises three approaches for reform which – in addition to potentially increasing available funds – would above all lead to a more efficient spending of these funds (Section E 3). These three approaches are: To reorganize both internal and external controlling structures in multilateral institutions, to levy charges for the use of global common resources, and to intensify the integration of both state and private-sector financing mechanisms within the overall context of the funding of global tasks.

F 4.1 Making multilateral organizations more efficient

The Council assumes that in future, the primary instrument for global environment and development policy will continue to be direct financing of global tasks through contributions from national budgets. This system offers, significantly, the advantages of direct and regular control by national democratic institutions and constant pressure on money-distributing bodies to demonstrate accountability vis-à-vis such institutions. Numerous international organizations have come under the scrutiny of the national parliaments of OECD countries for non-transparent or less than efficient handling of funds; willingness to provide financial support for UN organizations is waning. On the other hand, the UN organizations enjoy high acceptance in most developing countries as a result of positive experiences with UN capacity-building inputs and because UN voting procedures give each country a voice regardless of its economic strength.

Section E 3 discusses in detail the determinants and preconditions of efficient spending of funds in multilateral organizations (Section E 3.4.3). This shows that there is no prototypical institutional design for efficient spending that could be applied across the board to all environmental problems. However, the need for reform identified among mul-

tilateral organizations certainly calls for case-by-case review of the extent to which

– the use of funds can be concentrated on a single, narrowly defined environmental problem or whether diverse interplay with other environmental problems must be taken into account as well,
– auditing procedures within the organization are producing incentives for increased operational efficiency,
– external control might be improved by additional monitoring bodies and modified voting procedures,
– lack of efficiency in recipient countries can be overcome by capacity-building measures that integrate local initiatives,
– the temporal, structural and spatial aspects of the process of adjustment needed to cope with global environmental problems are being taken into account, and
– the organization of fund spending is geared to the type of environmental protection measures needed (from individual projects on up to comprehensive economic structural reforms).

The Earth Funding vision thus includes continuing the financing of global environmental protection and development projects through the existing diversity of multilateral organizations. In particular, this can build upon the positive experience gained with reforms within the World Bank and the GEF. Nonetheless, the Council recommends tackling the reform needs identified in the individual organizations in order to both enhance willingness to increase national contributions and enhance the impact of funds spent.

F 4.2
Levying user charges for the global commons

Linking price mechanisms on private-sector markets to the use of natural resources is in many instances the decisive factor for their prudent management. Prices indicate scarcity, which enhances willingness to manage prudently these resources to which a value has thus been attached. This mechanism has its limits, however, where property rights are non-existent. Numerous environmental assets – such as international air space, the high seas, or outer space – are open access resources. Since it is impossible to put a price on such resources, only placing them within a common global trusteeship can prevent their overexploitation for exclusive use.

For the funding of global environment and development policy, such a trusteeship provides an opportunity to make clear, through a user charge system, that available environmental resources are limited and thus to create incentives to improve the efficiency of environmental use, and, second, to raise funds dedicated to the conservation of global common resources (Section E 3.2.3). In the Earth Funding system, the levying of user charges for the tapping of such global community resources provides an important alternative to contributions from government budgets for financing global environment and development policy. The Council wishes to draw attention in this context to three aspects that are indispensable for the understanding of and terms governing such charges:

- The charges must serve a clear purpose which is directly linked to the availability of the global common resource in question. They are not a general environmental levy.
- Decisions as to the type, amount and uses of user charges are to be geared to the unique nature of each global common property resource. In many cases, systems can build upon existing (multilateral or private) organizations. It may prove impossible to derive additional revenue from some global common resources; however, even in these cases incentives for greater efficiency can be produced through the granting of and trade in individual use rights or emission rights.
- The trusteeship entity is to be subjected to constant monitoring and approval by individual governments or their designated regulatory bodies.

Consequently the Council views user charges as an expedient means by which to supplement the existing range of multilateral financing tools. The direct linking of charges to environmental uses and the linking of funds raised to specific purposes have the particular benefit of preventing the intransparency of past ways in which funds have been raised and spent.

F 4.3
Promoting interlinkage with governmental and private-sector financing tools

The Council has already pointed out repeatedly in the present report the growing significance of the private sector and innovative financing tools on local and national levels. The preconditions to greater involvement of private actors and to expanding non-commercial national environment and development funds have also been discussed (Section E 3.4.5). In the Council's Earth Funding vision (Section E 3) this decentralized element is an important factor for

– taking advantage in individual cases of the familiarity of actors with on-site conditions and the corresponding requirements and options for action,
– using the efficiency gains provided by a more decentralized and thus more manageable struc-

ture and by greater competitive pressure in the private sector and among different sites, to the good of global environment and development policy,
– increasing intrinsic motivation by means of more direct access to global environment and development projects.

The Council recommends creating suitable institutional framework conditions that can galvanize the private sector and strengthen national, non-commercial funds – e.g., in combination with the worldwide debt relief initiative discussed at the world economic summit in 1999 (Sections E 3.2 and E 3.4.5). In contrast to the first two areas of reform – reorganizing multilateral institutions and introducing user charges for global common resources – these elements are not measures that need to be taken worldwide in a concerted manner, but rather emerge as the outcome of changed institutional framework conditions on the national (and in some cases bilateral) level. Indeed, in this area of reform the Earth Funding system positively needs competition among a variety of individual, innovative financing schemes, whose respective efficiency will determine how widely they are taken up in other countries, sectors or problem areas. With this in mind, the Council recommends examining to what extent – above and beyond the recommendations for action made here – institutional incentives might be developed to intensify on the international level, too, the competitive element in efforts to make innovative contributions to financing global environment and development projects.

To summarize: The Earth Funding vision comprises further development of existing organizational forms and development of innovative financing tools (especially user charges for global common resources). In the combination of these two types of action lies a distinct opportunity: The first successful steps toward reform could inspire an openness to financial agreements on specific global community resources – agreements that appear almost utopian today. At the same time, a firm focus must be maintained not only on gaining revenue but above all on the efficient spending of available financial resources.

F 4.4
Making the most of the World Summit on Sustainable Develepment

In the opinion of the Council, this vision should serve as a model for the urgently required reform of global environmental policy. In particular, the WSSD due to take place in 2002 should serve as an opportunity to get some elements of this structural reform under way. As early as 1997, the German government spoke out in favour of setting up an International Environmental Organization. French President Jacques Chirac reiterated this proposal a year later. In June 2000, French Prime Minister Lionel Jospin announced the intention to revive debate on an International Environmental Organization during France's presidency of the EU. The first international conference of environment ministers in Malmö also highlighted the need for organizational reform of global environmental policy. This auspicious political moment should, in the view of the Council, be seized, and an initiative launched, possibly by the EU. The present report seeks to inform and stimulate such action.

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Agenda 21 is the legally non-binding programme of action for sustainable development that was adopted in 1992 at the ➥ United Nations Conference on Environment and Development (UNCED). Agenda 21 comprises 40 chapters.

Agenda setting means to position an issue in the public or political debate.

Biodiversity Convention (or Convention on Biological Diversity, CBD) is the key international regulatory instrument pertaining to the biosphere. It was signed in 1992 at the ➥ United Nations Conference on Environment and Development and entered into force in 1993. The parties to the CBD undertake to conserve biological diversity, to use its components sustainably and to share the benefits arising from the utilization of genetic resources fairly and equitably. The Cartagena Protocol on Biosafety was adopted in January 2000.

Brundtland Report was published in 1987 by the World Commission on Environment and Development, chaired by Norwegian Prime Minister Gro Harlem Brundtland. The report, titled 'Our Common Future', underscored the interdependence of environment and development and introduced the concept of ➥ sustainable development.

Climate Change Convention (United Nations Framework Convention on Climate Change, UNFCCC) was adopted in 1992 and entered into force in March 1994. The ultimate objective of the Convention is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner. The Kyoto Protocol, adopted in 1997, sets out binding commitments to reduce greenhouse gas emissions.

Commission on Sustainable Development (CSD) is a commission of ➥ ECOSOC and was set up in 1992 as the central forum for the Rio follow-up process. It monitors and supports the implementation of ➥ Agenda 21. The annual meetings of the CSD are attended by governments and international organizations, but also by more than 1,000 non-governmental organizations.

Convention often refers in non-legal usage to a treaty under international law that has particular importance or scope. However, the Vienna Convention on the Law of Treaties does not distinguish between different forms of treaties, and gives 'conventions' no special status. (In German legal language the English term 'Convention' is generally translated as 'Übereinkommen'.)

Core problems of global change are, in the ➥ syndrome concept, the central phenomena of ➥ global change. They manifest themselves either as particularly significant trends of global change, such as human-induced climate change, or they comprise several interrelated trends. One such 'megatrend' is the core problem of 'soil degradation', which comprises several trends including erosion, salinization, contamination, etc.

Debt swaps refer to the 'exchange' of debt titles (usually in developing countries) for certain actions, such as a certain environmental policy (debt-for-nature swaps) or a certain food security policy (debt-for-food-security swaps). The form that these transactions take depends on the type of debts. In the case of debts to foreign banks, for example, the debt-for-nature swaps open up opportunities to simultaneously score successes against the debt crisis and for environmental protection.

Desertification Convention (or United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, UNCCD) aims to conserve soils in arid regions and to mitigate the effects of drought. The UNCCD was adopted in 1992 at the ➥ United Nations Conference on Environment and Development and entered into force in 1996. As it is limited to arid, semi-arid and sub-humid zones, the UNCCD only covers a part of global soil degradation. It was negotiated under the impression of the severe drought in the Sahel and the failed 1977 Plan of Action to Combat Desertification. As a result, the UNCCD has explicit links with poverty and is distinct in this respect from the other two Rio conventions on climate change and biodiversity.

Economic and Social Council of the United Nations (ECOSOC) is one of the six principal organs of the UN. Its task is to coordinate UN activities in the sphere of economic and social policy and to report on the social state of the world.

ECOSOC ➥ Economic and Social Council of the United Nations

General Agreement on Tariffs and Trade (GATT) was adopted in 1947. Its purpose is to promote free world trade exploiting comparative cost advantages. GATT rules require most-favoured nation treatment for all parties to the agreement, legal non-discrimination of domestic and foreign goods, the prohibition of quantitative restrictions, dumping and export barriers and the principle of reciprocity in removing barriers to trade. The ➥ World Trade Organization (WTO) emerged from GATT in 1986.

Global change refers to the interlinkages among global environmental changes, economic globalization, cultural transformation and a growing North-South gradient.

Global common resources are environmental resources such as the high seas, the Earth's atmosphere or orbits, which are accessible to all and over which there are no property rights or specific sovereignty rights.

Global Environment Facility (GEF) is a multilateral financing mechanism established in 1991. The GEF is implemented jointly by ➥ UNDP, ➥ UNEP and the ➥ World Bank. It provides grants and low-interest loans to developing countries and eastern European transformation countries to help them carry out projects and measures to relieve pressures on global ecosystems. The focal areas are climate protection, biodiversity conservation, ozone layer protection and the protection of international waters. Soil conservation measures in arid zones and forest conservation measures also receive support if they have links to one of the four focal areas.

Global governance is a term that is gaining currency in both political practice and political science. Nonetheless, there is no final and universally agreed definition of the term; it is used normatively by some, and analytically by others. Often global governance refers to the proposition that the strong growth in international institutions over recent decades has created a new quality that transcends the traditional understanding of intergovernmental policy. It is important to note that global governance is not the same as global government. (There are, with varying connotations, several German counterparts to the term. These include 'Weltordnungspolitik' and 'globale Strukturpolitik'.)

Global network of interrelations means, in the ➥ syndrome concept, a qualitative network embracing all ➥ trends of global change, as well as their interactions. The global network of interrelations provides a highly aggregated characterization of ➥ global change in terms of specific phenomena.

Group of 77 and China (G-77 and China), formed in 1964, is a loose grouping of developing countries now numbering 132 (1999). At international negotiations, the G-77 and China often act as a common interest group.

Guard rails demarcate, in the ➥ syndrome concept, the domain of free action for the people-environment system from those domains which represent undesirable or even catastrophic developments and which therefore must be avoided. Pathways for sustainable development run within the corridor defined by these guard rails.

Incremental costs are costs incurred by states in addition to their regular expenditure when implementing environmental measures that are entirely in the global interest (such as climate protection). In the conventions on ozone, climate change and biodiversity, the industrialized countries have committed themselves to reimburse the agreed full incremental costs incurred by developing countries in implementing these treaties. The Montreal Ozone Fund and the ➥ Global Environment Facility serve the fulfilment of this commitment.

Institutions are common arrangements established by actors in society to regulate their relations. They range from the United Nations prohibition of the use of force to the institution of marriage. In international politics, the key institutions are termed 'international regimes', the term referring to a body of common principles, norms, rules and decision-making procedures among international actors (usually states). The climate regime, for instance, is an institution that regulates the behaviour of its parties in the interests of climate protection and imposes certain obligations upon them.

Intergovernmental Forum on Forests (IFF) was established in 1997 by a special session of the UN General Assembly in order to elaborate the elements of a forest conservation instrument binding under international law.

Intergovernmental Panel on Climate Change (IPCC) was established in 1988 and is one of the most influential international scientific institutions for climate policy. In 1990, the IPCC presented a draft convention providing the basis for climate negotiations. It publishes at regular intervals assessment reports on global climate change.

International Monetary Fund (IMF) was set up following the Bretton Woods Agreement (1944) to make funds available to secure the functioning of the stable exchange rate system; that system was superseded almost three decades ago. Governments, as members of the IMF, pay a contribution in the form of Special Drawing Rights (SDR), which can be used for low-interest, sometimes only partially repayable loans and bonds to overcome short-term liquidity crises or to support structural financial reforms.

International regimes are bodies of implicit or explicit principles, norms and decision-making procedures within which the expectations of actors – usually states – converge in a specific arena of international relations. The ➥ Climate Change Convention, for instance, is such a regime.

Official Development Assistance (ODA) comprises all financial transfers from government agencies

to developing countries and multilateral organizations for the improvement of living conditions.

Organizations are administrative units with their own budget, personnel and letterhead. The Climate Secretariat in Bonn is a small international organization, while the climate regime is an ➥ institution.

Scientific committees and subsidiary bodies of the Conferences of the Parties (COPs) have the task of stimulating and evaluating scientific reports at the specific request of the respective COPs. The results of these expert reports then need to be processed into draft resolutions for the COPs. For the ➥ Climate Change Convention, there is the Subsidiary Body for Scientific and Technological Advice (SBSTA), for the ➥ Desertification Convention the Committee on Science and Technology (CST) and for the ➥ Biodiversity Convention the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA). In their capacity as subsidiary, instruction-bound bodies of the COPs, they are closely linked to the programmes of work of the latter.

Sustainable development is mostly understood as a concept of environmental and development policy that was formulated by the ➥ Brundtland Report and further developed at the ➥ United Nations Conference on Environment and Development in Rio de Janeiro in 1992. In the process, democratic decision-making and implementation processes should promote development that is ecologically, economically and socially sustainable, and should take into account the needs of future generations.

Syndrome concept is a scientific concept developed by the WBGU for the interdisciplinary characterization and analysis of ➥ global change. Key elements of the syndrome concept, in addition to the syndromes, are the ➥ global network of interrelations, comprising ➥ trends and their interactions, and the ➥ guard rails.

Syndromes of global change refer to patterns of critical relationships between humankind and the environment that manifest themselves spatially. These are characteristic, globally relevant constellations of natural and anthropogenic trends of global change as well as the interactions between them. In analogy to medicine, every syndrome is a 'global symptom'; it represents an anthropogenic cause-effect complex with specific environmental stresses and thus forms a discrete pattern of environmental degradation. Syndromes reach beyond individual sectors such as industry, biosphere or population, as well as across individual environmental media such as the soil, water or air. Syndromes always have a direct or indirect spatial reference to natural resources. A syndrome can usually be identified in several regions of the world with differing degrees of intensity. Several syndromes may occur simultaneously in one region.

Tacit acceptance is a voting procedure applied under, for instance, the Montreal Protocol for annexes to the Protocol or their adjustment. They are binding through a two-thirds majority decision, even upon states that did not vote in favour. Such states have the opportunity to reject the decision expressly and in writing within a certain deadline. Amendments to the overall Protocol continue to require ratification in each instance to be binding.

Trends of global change are in the syndrome concept phenomena in society and nature that are relevant to ➥ global change and characterize it. These are changeable or processual factors that can be determined qualitatively, such as the trends of 'population growth', 'intensified greenhouse effect', 'growing environmental awareness' or 'medical progress'.

UN specialized agencies are the outcome of functional specialization within the UN system, with the United Nations Organization (UNO) at the centre, surrounded by a group of independent UN specialized agencies for special policy fields, such as for food and agriculture (FAO, since 1945), education, science and culture (UNESCO, since 1945), health (WHO, 1946), aviation (ICAO, 1944) or meteorology (WMO, 1947). Most were established almost simultaneously with the UNO because national governments feared at the time that the vast range of tasks would overburden the UNO. All UN specialized agencies are linked intimately with the UN, in particular with ➥ ECOSOC.

United Nations Conference on Environment and Development (UNCED, the Earth Summit) took place in 1992 in Rio de Janeiro. It was the second world environment conference; the first took place in 1972 in Stockholm. At UNCED, ➥ Agenda 21 was adopted.

United Nations Conference on Trade and Development (UNCTAD) is since 1964 a permanent body of the UN General Assembly, to which it reports directly. The goals and tasks of UNCTAD are to promote international trade, define principles for international trade relations and conclude legally binding trade agreements. Its work centres on relations between trade, economic development and international economic assistance. UNCTAD played a major role in the debate on a new world economic order in the 1970s.

United Nations Development Programme (UNDP) was established in 1965 and is the central financing, coordinating and steering body for the United Nation's operative development policy functions.

UNDP is represented by regional offices in 132 countries. Thematically the Programme emphasizes the areas of poverty reduction, gender issues, good governance and environmental protection.

United Nations Environment Programme (UNEP) was established in 1972 by the UN Conference on the Human Environment in Stockholm. Its objectives are to support national activities and regional cooperation in environmental protection and nature conservation, and to develop, assess and monitor international environmental and conservation law. The activities of UNEP include hosting and coordinating various convention secretariats, creating databanks and preparing environmental status reports (Global Environment Outlook – GEO), advising governments and financing advanced training and regional programmes.

World Bank Group is an international organization connected loosely with the United Nations by special agreements. Founded in 1944, it is today the largest source of development assistance finance. The objective of the Bank is to reduce poverty in developing countries. The Bank grants loans and provides political advice, technical assistance and, increasingly, services for knowledge exchange. The World Bank Group comprises five closely linked institutions. The priorities in granting loans are: Health and education, environmental protection, supporting private-sector economic development, strengthening the capability of governments to provide services efficiently and transparently, supporting reforms to attain stable economic conditions, and social development and poverty reduction.

World Summit on Sustainable Development (WSSD) is the follow-up conference ten years after the ➥ United Nations Conference on Environment and Development, to take place in 2002 at Johannesburg. This will involve a first assessment of the impacts of the Rio agreements. The institutional reform of global environment and development policy will also be on the agenda.

World Trade Organization (WTO) came into being in 1995 within the context of the Uruguay Round of the ➥ General Agreement on Tariffs and Trade (GATT). Its aim is the global liberalization of trade by means of principles such as most-favoured nation and national treatment, banning import quotas and generally preventing discrimination against trading partners. Since the failed attempt by the European Union in Seattle in 1999 to launch a 'Millennium Round', calls for the WTO to observe environmental policy standards have become louder.

The German Advisory Council on Global Change I

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Joint Decree on the Establishment of the German Advisory Council on Global Change (April 8, 1992)

Article 1

In order to periodically assess global environmental change and its consequences and to help all institutions responsible for environmental policy as well as the public to form an opinion on these issues, an Advisory Council on 'Global Environmental Change' reporting to the Federal Government shall be established.

Article 2

(1)

The Council shall submit a report to the Federal Government by the first of June each year, giving an updated description of the state of global environmental change and its consequences, specifying quality, size and range of possible changes and giving an analysis of the latest research findings. In addition, the report should contain indications on how to avoid or correct maldevelopments. The report shall be published by the Council.

(2)

While preparing the reports, the Council shall provide the Federal Government with the opportunity to state its position on central issues.

(3)

The Federal Government may ask the Council to prepare special reports and opinions on specified topics.

Article 3

(1)

The Council shall consist of up to twelve members with special knowledge and experience regarding the tasks assigned to the Council.

(2)

The members of the Council shall be jointly appointed for a period of four years by the two ministries in charge, the Federal Ministry for Research and Technology and the Federal Ministry for the Environment, Nature Conservation and Reactor Safety, in agreement with the departments concerned. Reappointment is possible.

(3)

Members may declare their resignation from the Council in writing at any time.

(4)

If a member resigns before the end of his or her term of office, a new member shall be appointed for the retired member's term of office.

Article 4

(1)

The Council is bound only to the brief defined by this Decree and is otherwise independent to determine its own activities.

(2)

Members of the Council may not be members either of the Government or a legislative body of the Federal Republic or of a Land or of the public service of the Federal Republic, of a Land or of any other juristic person under public law unless he or she is a university professor or a staff member of a scientific institute. Furthermore, they may not be representatives of an economic association or an employer's or employee's organization, or be permanently attached to these through the performance of services and business acquisition. They must not have held any such position during the year preceding their appointment as member of the Council.

Article 5

(1)

The Council shall elect a Chairperson and a Vice-Chairperson from its midst for a term of four years by secret ballot.

(2)

The Council shall set up its own rules of procedure. These must be approved by the two ministries in charge.

(3)

If there is a differing minority with regard to individual topics of the report then this minority opinion can be expressed in the report.

Article 6

In the execution of its work the Council shall be supported by a Secretariat which shall initially be located at the Alfred Wegener Institut (AWI) in Bremerhaven.

Article 7

Members of the Council as well as the staff of the Secretariat are bound to secrecy with regard to meeting and conference papers considered confidential by the Council. This obligation to secrecy is also valid with regard to information given to the Council and considered confidential.

Article 8

(1)

Members of the Council shall receive all-inclusive compensation as well as reimbursement of their travel expenses. The amount of compensation shall be fixed by the two ministries in charge in agreement with the Federal Ministry of Finance.

(2)

The costs of the Council and its Secretariat shall be shared equally by the two ministries in charge.

Dr Heinz Riesenhuber
Federal Minister for Research and Technology
Prof Klaus Töpfer
Federal Minister for Environment, Nature Conservation and Reactor Safety
May 1992

— Appendix to the Council Mandate —

Tasks to be Performed by the Advisory Council Pursuant to Article 2, para 1

The tasks of the Council include:

(1)

Summarising and continuous reporting on current and acute problems in the field of global environmental change and its consequences, eg with regard to climate change, ozone depletion, tropical forests and fragile terrestrial ecosystems, aquatic ecosystems and the cryosphere, biological diversity and the socioeconomic consequences of global environmental change. Natural and anthropogenic causes (industrialisation, agriculture, overpopulation, urbanisation, etc) should be considered, and special attention should be given to possible feedback effects (in order to avoid undesired reactions to measures taken).

(2)

Observation and evaluation of national and international research activities in the field of global environmental change (with special reference to monitoring programmes, the use and management of data, etc).

(3)

Identification of deficiencies in research and coordination.

(4)

Recommendations regarding the avoidance and correction of maldevelopments.

In its reporting the Council should also consider ethical aspects of global environmental change.

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