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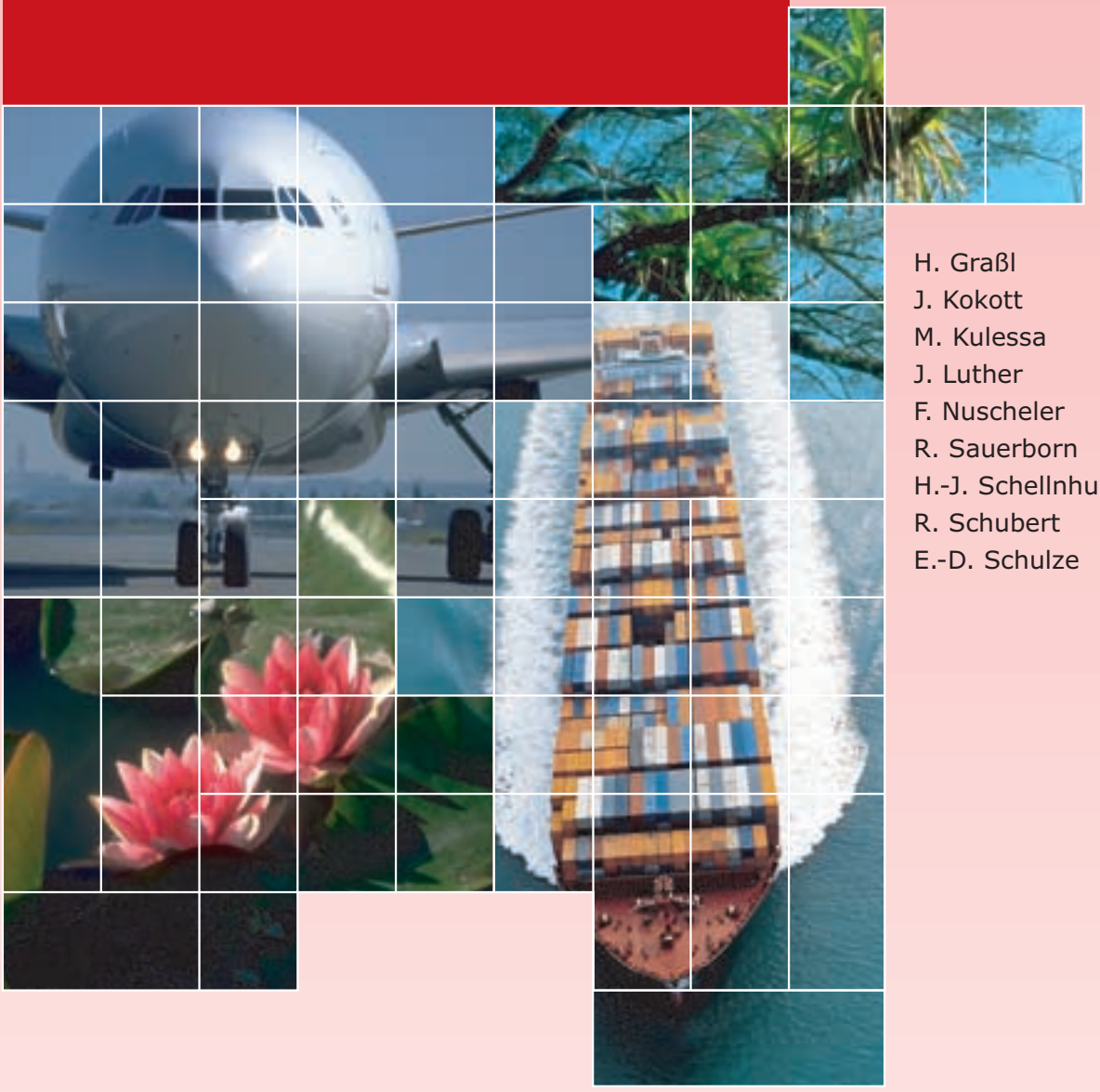
German Advisory Council on Global Change
(WBGU)

Special Report

Charging the Use of Global Commons



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Special Report

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Acronyms

ANCAT	Expert Group on abatement of Noise Caused by Air Transportation (ECAC)
ASA	Aviation Service Agreements
CAEP	Committee on Aviation Environmental Protection (ICAO)
CBD	Convention on Biological Diversity (UNCED)
ChA	Chicago Convention on International Civil Aviation
CDM	Clean Development Mechanism (UNFCCC)
CO_2	carbon dioxide
CTO	Certified Tradable Emission Offsets
ECAC	European Civil Aviation Conference
ECMT	European Conference of Ministers of Transport
GATS	General Agreement on Trade in Services (WTO)
GATT	General Agreement on Tariffs and Trade
GAUSS	Gesellschaft für Angewandten Umweltschutz und Sicherheit im Seeverkehr, Bremen [German Institute for Environmental Protection and Safety in Shipping]
GDP	gross domestic product
GEF	Global Environment Facility (UN)
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
GPGs	Global Public Goods
GT	gross tonnage (of ships)
HAM	Humid Air Motor
HC	hydrocarbons
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation (UN)
IMO	International Maritime Organisation (UN)
kW	kilowatt
LDC	Least Developed Countries
LMIS	Lloyd's Maritime Information Services
LNG	Liquefied natural gas
LPG	Liquefied petrol gas
LTO	(emissions during) Landing and Take-Off cycle of an aircraft
LRTAP	Geneva Convention on Long-range Transboundary Air Pollution (UN)
MARPOL	International Convention for the Prevention of Pollution from Ships
MEPC	Marine Environment Protection Committee (IMO)
MW	megawatt
MWh	megawatt-hour
NAFTA	North American Free Trade Agreement
NASA	National Aeronautics and Space Administration, USA
NGO	Non-governmental Organizations
NO_X	nitrogen oxides
NUCC	Non-Use Commitment Certificate
NUOP	Non-Use Obligation Payment
OBO	Ore/Bulk/Oil ship

ODA	Official Development Assistance
PSC	Port State Control
QS	Quality Shipping (GAUSS)
RoRo	Roll on/Roll off ship
SBSTTA	Subsidiary Body on Scientific Technical and Technological advice (CBD)
SO_2	sulphur dioxide
TBT	tributyl tin
TCC	Tradable Conservation Credits
tdw	tons dead weight
TEU	Twenty Feet Equivalent Unit (shipping container)
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea (UN)
UNFCCC	United Nations Framework Convention on Climate Change
UNFfD	International Conference on Financing for Development (UN)
VOCs	volatile organic compounds
WSSD	World Summit on Sustainable Development
WTO	World Trade Organization (UN)

'Billion' is used in this report to signify one thousand million.

Introduction: User charges to promote global sustainability

In the run-up to the United Nations International Conference on Financing for Development (UNFfD) due in March 2002 and the World Summit on Sustainable Development (WSSD) due in September 2002, the question of how to finance global environment and development policy is moving to the centre of attention. The problems of global change are mounting (WBGU, 2000), and the international community is increasingly pronouncing its willingness to tackle these problems in a cooperative fashion. However, the question of how to raise the necessary financial resources has not yet been resolved satisfactorily.

The unresolved financing questions affect, among other things, the ambitious development goals set by the United Nations at the Millennium Summit in September 2000. These include, above all, halving by 2015 the proportion of the world's people living in extreme poverty, but also improving access to potable water and basic health services, achieving universal primary education and preventing a further spread of HIV/AIDS. Whether these and other sustainability goals can be achieved is called into question not least by stagnating official development assistance (ODA).

This issue is the focus of the UNFfD meeting due to take place in Monterrey, Mexico. The developing countries expect substantial commitments by the industrialized countries to increase resource transfers and to implement promptly the goal of transferring 0.7% of gross domestic product as ODA to developing countries. If no agreement to increase financial transfers from North to South can be found, the success of the WSSD appears endangered. However, the agenda of the UNFfD also includes, in addition to official development finance, other topics such as mobilizing domestic financial resources, private capital flows, international trade, mitigating the indebtedness of developing countries and reforming the international financial system. The question of development financing thus needs to be examined within the context of this comprehensive agenda. Besides increasing ODA this is also a matter of creating appropriate institutional framework conditions at national and international levels so that private and public sources of finance can be harnessed increasingly for concerns of international environment and development policy.

The German Advisory Council on Global Change (WBGU) wishes to contribute to the debate in this area. The Council has already addressed these questions in its 2000 annual report "World in Transition: New Structures for Global Environmental Policy", proposing, among other things, the levying of charges for the use of certain global common goods ('global commons') such as international airspace and the high seas (WBGU, 2001b). In the view of the Council, the concept of user charges should be further developed to form a significant pillar of global sustainability policy.

This special report examines in greater depth the concept of user charges as an innovative instrument for raising financial resources and generating incentive effects, discussing in particular its operationalizability for specific areas of concern. The report first explains the basic ideas of the instrument of user charges and distinguishes it from other instruments (Section 2). It goes on to explore the extent to which the concept can be transferred to user charges at global level, specifically for the use of international airspace (Section 3) and the use of the oceans by shipping (Section 4).

International airspace and the high seas are natural global common goods for which property rights are insufficiently defined. The international community of states is therefore responsible for their conservation. Due to prevailing gaps in international regulatory regimes, they are overexploited and use-related environmental damage occurs. For instance, the CO_2 emissions of international aviation and ocean shipping are not included in national emissions inventories and thus are not subject to the quantitative commitments of the Kyoto Protocol. This regulatory gap could be closed by levying user charges. A user charge creates an incentive to reduce the environmental impact, known in economics as the 'allocative effect' and termed 'incentive effect' in the following. In addition to the behaviour-modifying effect

the anticipated revenue can be channelled to contribute to conserving these common goods.

The report subsequently presents and discusses the concept of non utilization obligation payments (NUOPs; Section 5). In contrast to global user charges, international payments for non utilization obligations are debated not so much for global common goods. Instead, their potential sphere of application is essentially limited to land and freshwater areas situated within the sphere of sovereignty of individual states, but whose conservation generates significant global benefit. Such payments could therefore play a role particularly in tropical forest and biodiversity conservation. However, it needs to be noted that the implementation of a worldwide system of non utilization obligation payments – again in contrast to charges upon the use of international airspace or the high seas – is a 'vision', the operationalization of which will require further research and debate. Accordingly, such payments are given less space in this special report than the user charges which can be operationalized over the short to medium term.

The special report closes with recommendations for action and research for a politically viable operationalization of the concept of user charges for global common goods and argues the case for intensifying the debate on a global system of payments for non utilization obligations (Section 6).

The Council is aware that the implementation of the innovative instruments discussed here will require a major effort to convince the relevant actors. The recommendation to impose burdens on international aviation may appear politically sensitive in view of the economic problems currently experienced by the aviation sector, due in part to the terrorist attacks of 11 September 2001. However, an assessment of any price increases caused by the introduction of user charges must take into consideration that the liberalization of aviation has led to considerable reductions in air fares in recent years, a development which has further removed air travel from an internalization of environmental costs. A similar long-term perspective needs to be applied to the maritime sector. Following a period of high growth rates and corresponding capacity expansion in recent years, this sector is currently in a critical phase of consolidation due to the global economic downturn. Here, too, policy formulation needs to raise its gaze across a short-term dip in a long-term growth trend; measures which are purposeful in terms of regulatory policy, such as levying user charges, should not be excluded from the outset.

By presenting recommendations for a politically viable implementation of the concept of global user charges, the Council aims to stimulate the German federal government to look beyond day-to-day politics and to address the prevailing regulatory gaps at international level. The concept of user charges presents an opportunity to take first pragmatic steps towards an international charging system for the conservation of global environmental goods and for the financing of global sustainability policy. On that basis, experience can be gathered and further options for applying global user charges examined.

Fundamentals of the concept of user charges 2

2.1 The basic idea of user charges

In its reports, the Council has repeatedly stressed the positive contribution that an allocation of property rights to environmental assets – in conjunction with liability law – can have for environmental protection (WBGU, 2001a). However, the global common goods of international airspace and the high seas are 'open access goods' – for which property rights cannot easily be allocated. Where jointly supported rules of good practice in the use of these common goods are not agreed upon, there is a danger of overexploitation because the users of global common goods need not bear the full social costs of their actions. These global common goods would thus need to be administered in trust by the international community.

It is at this point that the concept of user charges comes into play. The term 'user charge' is associated in economics, specifically in public finance, with a financing instrument that has the following characteristics (Tietzel, 1988; Birk and Eckhoff, 2000; Hansjürgens, 2001):

- The use of a certain asset or right is linked to the payment of a sum of money.
- The charge is a payment for the conferral of the right.
- In contrast to the complete transferral of a right, use rights are viewed exclusively as a subset of property rights, i.e. the property rights are retained by the party that confers the right to use.
- Rights to use can be conferred to individuals, but also to groups and states.

If this concept of user charges is transferred to global environmental problems, it is expedient to raise a charge for the use of global common goods. Through the payment that has to be made, users can perceive the scarcity of a good and the costs of its provision. User charges are to be understood as contributions to financing the provision of global common goods. It follows that the charges should be lowered if pressures on the good decline or if the capacity of a good is safeguarded by other measures. This close connection with environmental protection is pivotal to the concept of user charges and has a certain proximity to the concept of 'public charges' used in public finance. The concept of user charges is thus distinct from taxation, which makes no direct connection between the payment of a tax and the service to be financed.

The special feature of the concept of global user charges is that it can both induce incentive effects to reduce environmental pressure and mobilize additional financial resources to promote environment and development policy goals. The incentive effects are achieved by charging the users of a global common good for the use-related environmental costs. For instance, the assessment of charges for the use of international airspace takes into consideration the contribution to global greenhouse gas emissions and the associated environmental damage. The requirement to pay user charges provides economic incentives to reduce environmental damage by means of improved technologies and appropriate changes in behaviour when using global common goods. In addition to these incentive effects, revenue is generated that can be earmarked to finance global sustainability policy. Taking the example of climate policy, earmarking means that the financial resources should be used for measures aiming to conserve and restore the quality of the public good 'climate' and measures aiming to promote adaptation to climate-related damage.

The concept of user charges needs to be distinguished clearly from approaches in welfare economics to internalize external effects, for instance through a 'Pigouvian tax'. Such internalization approaches seek – in highly simplified terms – to impose a charge (e.g. by taxation) upon the production or use of these resources with the aim of integrating all social costs into the cost calculation of producers or users. The aim is thus to bring about a level of use or pollution that is optimal in terms of welfare economics, the transgression of which would cause society more damage (e.g. poorer air quality) than benefit (e.g. additional income). Internalization in the narrower sense generates state revenue, but this

is considered as no more than an unintended side effect by environmental economics and should ideally – in the view of economic allocation theory – even be returned to taxpayers on a per-capita basis. To sum up: The neoclassical internalization concept is all about creating an incentive effect, while the fiscal effect is regarded unimportant if not undesired.

In contrast, within the concept of user charges for environmental assets or natural resources, the fiscal effect is at least as important as the incentive purpose. The aim is not only to ensure via the economic incentive function that the production and consumption of environmentally harmful goods or services is kept to the societally desired level. Above and beyond this, the concept of user charges envisages that the state or global institutions retain the revenue generated and earmark it for measures to conserve or restore the quality of public goods such as the climate.

Ideally, the specific contributions to be paid would be calculated so that the total contributions received meet the costs of producing the public goods. However, with respect to practical implementation it must be noted that determining these costs is non-trivial, certainly for the 'climate' good, and is generally only feasible to a limited degree. For this reason, only partial internalization of the above-mentioned negative external effects is to be expected. Nevertheless, it remains expedient to examine these costs as a rough target level.

The concept of user charges on the one hand and strict internalization on the other also differs with respect to the necessity of measures to mitigate environmental damage. The internalization concept aims to reduce environmental impacts to a level optimal in terms of welfare economics, and assumes that internalization measures will suffice to achieve such an 'optimum'. In practice, however, it needs to be kept in mind that environmental damage has already occurred in the past which has reduced environmental quality to a societally undesirable level. The concept of user charges does justice to this, assuming that measures to improve quality or 'repair' (climate) damage which has already occurred or is anticipated are appropriate. This is an advantage of user charges.

A further crucial advantage of user charges, as compared to taxation approaches optimal under allocation theory, is that political resistance can be overcome more easily if the use of revenue is earmarked clearly and can demonstrate a connection with the resource utilized. This advantage has particular relevance when implementing the approach at international level. The approval by e.g. developing countries of a global system of user charges will depend critically upon the use of revenue and will doubtlessly be gained more readily if disbursements are earmarked for global sustainability policy measures than if revenues are deployed without earmarking.

Building upon this theoretical basis, the Council examines in the present special report a politically viable operationalization of global user charges for international airspace and the high seas and introduces the further concept of non utilization obligation payments (NUOPs).

2.2 User charges as a financing instrument for sustainable development

The concept of user charges has strong links to environmental policy. Thus the rate of the charge should depend upon the use-related environmental damage and upon the financing required for its 'repair'. By earmarking revenue for global environment and development policy measures, user charges also become a financing instrument for global sustainability.

The present proposal by the Council builds upon the concepts previously recommended (WBGU, 2001b). This proposal should not be confused with the levying of a global tax on CO_2 emissions, such as has been proposed in the run-up to the UNFfD in the Zedillo Report produced by the High-level Panel on Financing for Development (High-level Panel on Financing for Development, 2001). While the Zedillo Report proposal is certainly worthy of consideration, the concept of user charges differs in several respects. It is not based upon an international taxation approach, but upon a narrower understanding of charges in conjunction with an earmarking of revenue – consequently, its prospects of political viability are substantially better than those of taxation. Furthermore, the Council is concerned with closing regulatory gaps in global environmental policy in connection with international aviation and ocean transport. Such a perspective, restricted to certain global uses of environmental media, necessarily implies that the user charges proposed by the Council cannot cover the entire financing requirements of global sustainability policy.

User charges are one instrument within a broad range of possible financing instruments (Sagasti and Bezanson, 2001). Consequently, meeting the financing requirements of global sustainability policy beyond the areas discussed in the present report makes it necessary both to examine other novel financing instruments – including global taxes – and to strengthen existing sources of development finance such as ODA. Beyond the public sector, approaches for involving the private sector more

closely in development financing through public-private partnerships also need to be intensified.

The concept of user charges and the issue of the additionality of new financial resources are also to be seen in connection with the current debate on global public goods (GPGs). The notion of GPGs has accompanied global environmental policy from the very outset. At the international environmental conferences of the 1980s and 1990s a number of declarations made reference to the common, but nationally differentiated responsibility of the community of states to preserve global environmental goods. Since the publication of the much-discussed work by UNDP (Kaul et al., 1999), the concept of GPGs has gained new impetus and is also playing an important role in the preparatory process for the UNFfD.

The UNDP study distinguishes between three categories of GPGs:

1. natural GPGs (e.g. the atmosphere),
2. human-made GPGs (e.g. knowledge) and
3. GPGs that are the outcome of political action (e.g. the stability of international financial markets).

The GPG concept is an interesting approach which opens up new dimensions and highlights a need for action in global sustainability policy. However, by no means all methodological issues are yet resolved. The current discussions of the concept illustrate, for instance, how difficult it is to model all relevant aspects of a GPG, not to mention the interrelations with other GPGs. It is thus not surprising that the concept of GPGs is viewed with a degree of scepticism, particularly by the developing countries. There is some controversy over the extent to which this concept is suited in political practice to generate additional financial resources for global sustainability policy.

The Council's approach of levying user charges is limited to the natural global commons. The approach largely tallies with the understanding of natural GPGs developed in the UNDP study. The political challenge in managing natural global common resources is to agree rules at international level for preventing the overexploitation of these resources. However, the concept of user charges makes no attempt to cover all categories of GPGs. It is rather a case of selecting a narrowly defined area of concern from the comprehensive debate on GPGs for which it is comparatively simple to develop, in the shape of user charges, a politically viable scheme for financing certain GPGs.

3 Charging the use of airspace by aviation

3.1 Environmental impacts of aviation

The principal emissions arising from aviation are carbon dioxide (CO_2), nitrogen oxides (NO_X), carbon monoxide (CO), hydrocarbons, water vapour, sulphur oxides (SO_X) and aerosol particles. Each combination of aircraft type and engine has its own emissions profile. The release of pollutants during landing and take-off (LTO) is not identical with the emissions arising during the cruise phase. Hydrocarbons are released above all at low engine power, whereas NO_X are formed particularly during the take-off and ascent phase, but also during the cruise phase, i.e. particularly when thrust is high (at high engine temperature and pressure). CO_2 and water vapour are formed in the combustion of kerosene in amounts proportional to the consumption of fuel.

Within the context of raising charges on the use of international airspace, only radiative forcing (i.e. the impact on climate) is to be taken into consideration as a global environmental impact, but not local air pollution and noise pollution, nor indirect impacts such as energy consumption at airports. Not only the emissions of the greenhouse gases CO_2 and water vapour are relevant in terms of climate impact, but also the impacts of NO_X, SO_X and aerosol emissions upon ozone (O_3) and methane (CH_4) concentrations and upon condensation trail (contrail) formation. A further possible effect of aviation emissions is the formation of cirrus clouds (IPCC, 1999). While, due to their long residence times in the atmosphere, the climate impact of the CO_2 emissions of aviation is indistinguishable from that of other CO_2 sources, the impact of other trace gases (water vapour, NO_X, SO_X, aerosols) can vary regionally; NO_X emissions and the increased ozone concentrations that these generate depend greatly upon the altitude of emission. NO_X emissions lead on the one hand to a regional increase of ozone concentrations (warming effect), but on the other hand to decrease in methane concentrations (cooling effect). Regional disparities notwithstanding, global climate impact can be estimated as the contribution to the change in global radiative forcing (IPCC, 1999). The present contribution of contrails to radiative forcing corresponds roughly to the contribution of CO_2 emissions from aviation; however, the estimation of the former is subject to far greater uncertainty than that of the latter. Next there are the two opposite effects of NO_X emissions; these are in the same order of magnitude, but do not cancel each other out. The direct contributions of SO_X (cooling) and soot (warming) and the still uncertain contribution of water vapour are very much smaller. The contribution of potential additional cirrus cloud formation (in addition to contrails) is still so uncertain that it can not be included purposefully in an overall evaluation.

The overall present radiative forcing from historical and present-day aviation is about twice the radiative effect of CO_2 emissions from aviation (IPCC, 1999). Proceeding from various scenarios for growth in air travel demand and for developments in technology, it is assumed that for the period until 2050 the radiative forcing from aviation will be two to four times that of its carbon dioxide emissions (IPCC, 1999). It is important to note that a reduction in certain greenhouse gases from aviation may possibly result in an increase in other, equally radiatively active but also locally and regionally harmful emissions. For example, curbing fuel consumption reduces CO_2 emissions but tends to promote the formation of NO_X (IPCC, 1999).

Aviation is the source of greenhouse gas emissions with the strongest worldwide growth. The sharp growth in demand for air travel can be explained by the rise in gross domestic product in various regions of the world as well as by population growth, a sharp rise in long-haul tourism and generally increased mobility and longer distances travelled. Between 1990 and 2050, the proportion of the total volume of passengers choosing to travel by air is expected to quadruple from 9% to 36% (IPCC, 1999; Lee et al., 2001).

However, owing to anticipated technological improvements the contribution to climate change will not rise to the same extent. Today, aviation is

responsible for approx. 3.5% of the radiative forcing from anthropogenic greenhouse gas emissions (IPCC, 1999). The IPCC estimates in its reference scenario that the corresponding proportion in the year 2050 will be approx. 5%; scenarios with other rates of increase suggest a proportion of 3.5–15% by that year. As a medium-term trend, i.e. despite the terrorist attacks of 11 September 2001, it is anticipated that the emissions of CO_2 from aviation will treble between 1992 and 2025. Emissions from international aviation do not fall under the reduction commitments of the Kyoto Protocol. This is why there is an increasing demand for measures to make air transport more environmentally sound. In addition to the more stringent regulation of NO_X, a key concern is to reduce greenhouse gas emissions. For instance, the Committee on Aviation Environmental Protection (CAEP) of ICAO, in cooperation with industry, has proposed certain NO_X limit values. Sweden and Switzerland have already introduced emissions-based landing fees. Moreover, the EU Council of Transport Ministers has announced the possible unilateral introduction of an emissions-based EU en route charge.

A major obstacle to reducing emissions consists in the long service life of aircraft (usually more than 25 years), in high capital costs and in protracted licensing procedures for new technologies (frequently, there are more than 10 years between development and going into service). Thus, it would be possible to achieve a significant reduction in emissions if older aircraft were taken out of service, but there are frequently economic reasons for not decommissioning aircraft which are basically still in good working order (IPCC, 1999).

At present the consumption of kerosene per 100 passenger-kilometres in Europe varies between 3 and 10.5 litres (Lufthansa, 2002). However, it can be assumed that the technological and economic possibilities will not be sufficient to achieve a decisive cutback in the consumption of kerosene. Thus, the energy consumption of the fleets in service will fall annually by only 1–2% on account of technological improvements, while demand for air transport will grow by 4–6% per year (Lee et al., 2001). This will result in a further increase in energy consumption and environmental pollution caused by aviation. All in all, it can be expected that worldwide radiative forcing from aviation will in no more than 30 years exceed that of passenger car traffic (CST, 2000).

By the mid-1990s, around one quarter of CO_2 emissions was attributable to transport and mobility. Of those emissions, approximately 12% were caused by aviation, corresponding to 2.4% of the total consumption of fossil fuels (Lee et al., 2001). Asia, in particular, is expected to experience a significant growth in demand. Similarly, the North American market, which is already at a high level, will further expand in the long term.

The economic importance of aviation is apparent, among other things, from the high turnovers of the aviation industry and from the number of people employed. Thus, it is estimated that, in 1992, the aviation market worldwide was worth some € 1,000 billion (Michaelis, 1997), a part of that figure being accounted for by airlines, aircraft manufacturers and suppliers, while the other part was accounted for by economic activities indirectly connected with aviation. According to estimates, the aviation industry employs around 22 million employees worldwide, this figure includes those indirectly connected with aviation.

To date, the proposal of national levies on air transport has been greeted with scepticism, not least because there are fears of losses in competitiveness and rises in unemployment. Developing countries, in particular, fear a weakening of their tourism industries as well as an increase in transport costs for exporting agricultural produce and, consequently, worsening sales opportunities for that produce on the world market which may lead to a fall in foreign exchange revenues.

Nevertheless, there is a growing demand for levies on aviation. The principal argument cited for these demands is the internalization of negative external effects in connection with climate change. Containing the negative environmental impacts of aviation is regarded important for moving towards the goal of sustainability.

In view of the relatively high levels of damage to the environment associated with aviation, efforts to close the above-described regulatory gap must concentrate above all on a significant reduction not only in the volume of emissions and in the growth rate of emissions but also in the harmful nature of those emissions. Levying user charges is a promising option. Such user charges could generate financial resources which could be earmarked for climate policy measures.

All economic assessments conducted to date calculate the systemic damage caused by anthropogenic global climate change in the 21st century in the monetary order of 1–2% of gross world product. This means that without adaptation measures, the annual costs of the consequences of climate damage would amount to about € 300 billion (IPCC, 1996). With active adaptation, these costs could presumably be reduced significantly (IPCC, 2001). Nonetheless, even with a conservative assessment (including adaptation costs), remaining damage in the order of € 100 billion per year is to be expected over a very long period. To this the avoidance costs (e.g. emissions

abatement costs) must be added, which may be on a similar scale (IPCC, 2001). Total costs amounting to some € 100–200 billion per year can therefore be expected.

Given an estimated share of aviation in radiative forcing of 5% in the year 2050 (IPCC reference scenario; IPCC, 1999), costs in the order of € 5–10 billion per year can be attributed to the sector. Assuming a share in radiative forcing of 3.5–15% as calculated by various IPCC scenarios for the year 2050 (IPCC, 1999), a figure of € 3–30 billion per year results as a rough estimate of the minimum global revenue that would need to be targeted over the medium to long term.

The next section discusses the role of ICAO in the implementation of a user charge on aviation (Section 3.2). Then, there is an examination of how the concept of user charges on aviation can be operationalized (Section 3.3) and which undesired side-effects may occur (Section 3.4). Additionally, there is a discussion of the institutional aspects of disbursing the corresponding revenues on environmental and development policy measures (Section 3.5) and of the political enforceability of a user charge on aviation (Section 3.6). Finally, there is a brief conclusion (Section 3.7).

3.2 The role of ICAO

The International Civil Aviation Organization (ICAO) is a specialized agency of the United Nations with 185 member states. In the climate policy, Art. 2 para 2 of the Kyoto Protocol calls upon ICAO to regulate the greenhouse gas emissions of international aviation.

Although it is also possible for individual nations to act unilaterally and not all ICAO resolutions are legally binding, ICAO plays an important role in the global implementation of taxes and charges on aviation. If the will exists to introduce an international environmental levy, ICAO, with its standing executive committee, possesses the means for its speedy elaboration and implementation. In the process, attention must be paid to the different speeds of implementation of the various groups of countries. The role of ICAO as a facilitator of consensus decisions is made difficult by the diversity of interests involved.

ICAO recommended in a Resolution adopted in 1996 the following principles concerning the introduction of levies in the aviation sector:

- User charges are to be given preference over general taxes.
- The revenues are to be used on
  - reducing damage to the environment from aircraft emissions,
  - on research into aircraft emissions and
  - on the development of environmentally-friendly technologies.
- At national government level it is imperative that
  - no fiscal aims are pursued,
  - charges should be related to the costs of use and
  - charges should not discriminate against other modes of transport.

Each of these recommendations will have to be considered when assessing the political enforceability of levies on aviation. However, given the substantial negative external effects of air traffic and the generous financial privileges enjoyed by aviation (exemption from kerosene tax and exemption from value added tax on international flights), these recommendations, although still relevant to the current situation, will have little effect. Therefore, voluntary undertakings are an important instrument of ICAO. The International Air Transport Association (IATA), as a main stakeholder, proposes a CO_2 emissions reduction of 10% over the period from 2000–2010. Furthermore, ICAO has spoken out in favour of introducing an emissions trading system over the long term, modelled on the flexible mechanisms of the Kyoto Protocol (ICAO, 2001b). As yet, however, ICAO has not presented any specific options for designing such a system.

Quite generally, ICAO has in recent times not especially distinguished itself with regard to climate protection. It appears to be concerned that greenhouse gas emissions from international air traffic should continue to be excluded from the Kyoto Protocol and that, in general, no targets and time schedule are set for the reduction of aviation emissions.

3.3 Possible forms of a user charge on aviation

3.3.1 User charges which directly increase ticket prices (ticket levy)

A ticket levy refers to imposing a surcharge on the price of all (international) passenger/freight flights as a charge on the use of airspace. The surcharge may be in the form of a fixed nominal amount, a percentage increase of the existing price or a percentage charge graduated according to kilometres. With regard to basing the assessment of the surcharge on use-related environmental costs, however, the only option which appears compatible with the concept of

a user charge is a percentage charge graduated according to kilometres.

The most important argument in favour of the introduction of such a form of user charge is the existing discrimination of other modes of transport in comparison with aviation. Currently, modes of transport other than aviation are burdened by value added tax and mineral oil tax.

Operational practicability

A ticket levy would be relatively simple and quick to introduce. The corresponding charge could be collected directly by airline companies when selling the ticket.

Financing potential

The turnover generated by worldwide civil aviation amounted to some € 328.7 billion in 2002 (ICAO, 2000). In the case of a levy of around 5% on the price of each ticket and allowing for adjustments in demand for flights in response to higher prices, this would generate an annual revenue of € 10–16 billion.

Environment-related incentive effects

The environment-related incentive effects of a ticket levy must be regarded as relatively minor. With such a form of user charge, airline companies have no incentive to invest in technologies with lower emissions. Any improvement in the environmental situation would be based exclusively on a decline in demand as a result of higher prices for flights. Given the estimated price elasticities, however, such a decline in demand would probably not be all that great (Bleijenberg and Wit, 1998; Section 3.3.2).

Legal enforceability

A ticket levy is not prohibited by international (aviation) law. Such levies have already been introduced in certain countries. For example, Norway has applied a 'green' levy on all national flights for which there is an alternative by rail, and on all international flights starting from Norway since 1 January 1995. However, the use of the resulting government revenues is not tied to a specific purpose (Bleijenberg and Wit, 1998).

Conclusion

The introduction of a ticket levy has the advantage that the various competing modes of transport are treated equally. The ease of implementation and low degree of distortion are further arguments in favour of the introduction of such a charge. In addition, the foreseeable revenues are not inconsiderable.

However, the incentive effects are insufficient and environmental and fiscal therefore represent a crucial weakness of a ticket levy. As will be shown below, other forms of user charges on aviation are much more effective with regard to the objectives.

3.3.2 User charges based on the consumption of kerosene

Unlike other fuels, e.g. for passenger cars or road freight vehicles, aviation fuel has hitherto been exempt from any form of tax in virtually all countries. On the one hand, user charges based on the consumption of kerosene could be introduced as an individual measure, with a certain charge being levied on every litre of aviation fuel. On the other hand, it would be possible to devise a package of measures consisting of a levy based on kerosene consumption and additionally of an emissions-dependent landing and take-off fee (LTO fee) and possibly also of strict NO_X standards.

Two aspects speak in favour of a charge based on the consumption of aviation fuel. Firstly, greenhouse gas emissions rise in step with the consumption of fuel. Secondly, the present absence of taxes or charges on aviation fuel represents an aviation subsidy, because other modes of transport are subject to a fuel tax or similar levies. Therefore, a charge based on the consumption of aviation fuel is aimed at a reduction of undesired emissions and lessens the discrimination against other modes of transport.

A combination of different measures is supported by the fact that, during take-off and landing, aircraft emit especially large quantities of pollutants which could not be covered by a levy limited to kerosene. In addition to levies on take-offs and landings, stricter NO_X standards, differentiated according to aircraft type and engine type, could be used to counteract a one-sided reduction of CO_2 at the expense of NO_X.

Operational practicability

The introduction of a user charge on aviation based on kerosene consumption can be accomplished by means of a percentage surcharge on the price of fuel or by means of a fixed amount per litre. One of the aspects speaking in favour of a fixed amount is that the revenue from the levy will still remain calculable even in the case of fluctuations in the price of aviation fuel and that less distortion is caused. Additionally, a fixed amount is especially plausible with regard to the inclusion of use-related environmental costs. However, such a fixed amount would have to be varied over time in order to avoid a fall in real value and in order to be able to take account of changes in price structure. Furthermore, it would be necessary to make allowance for changes in financing requirements. With regard to financing requirements, the

specific goal is to finance the provision of the public good 'international climate protection' or, more precisely, to finance measures to prevent or remediate climate damage incurred as a consequence of the use of airspace by international aviation.

In the area of road transport, experience is already being gathered with a fuel levy which is imposed on suppliers and is then passed on. As in the case of road transport, an aviation levy based on kerosene consumption could likewise be raised at the supply stage, with suppliers then passing on the levy to the airline companies. The suppliers, i.e. the petroleum companies, have the institutional capacity to collect a kerosene levy.

As far as a graduated LTO fee is concerned, it would be necessary to devise internationally accepted calculation formulas. Different rates of levy would be payable in this case depending on aircraft type and on the type of take-off and landing.

A kerosene levy is already imposed in Japan, Norway, Canada and the USA (Brockhagen and Lienemeyer, 1999). With the exception of Norway, this levy applies only to domestic airlines and domestic flights. In Norway, however, it has been demonstrated that the revenue from and the incentive effect of a regional levy on kerosene are rather small, not least on account of possible evasion reactions.

Financing potential

An aviation levy based on the consumption of kerosene will result basically in certain rises in the price of air transport. Fuel costs account for approximately 10–25% of the operating costs of airlines. However, in view of the great intensity of competition between airlines, higher kerosene prices will not necessarily lead to appreciably higher ticket prices. In addition, it can be assumed that the demand for flights will respond to changes in the price of flights. Higher ticket prices typically lead to a reduction in demand. Holiday travel has a negative price elasticity of roughly 1.1–2.7, whereas business travel is less elastic and falls by only roughly 0.4–1.2% in the case of a 1% price rise. With estimated (negative) elasticity values of between 0.8 and 1.6, freight traffic lies between the other two categories. It should also be noted that the substitution elasticity is very low with regard to international aviation: In the case of an increase in ticket prices, only a fraction of the traffic would switch to other modes of transport (Bleijenberg and Wit, 1998; Oum et al., 1990).

From the demand side, therefore, the revenue base for a kerosene levy appears to be relatively stable. Given the growing overall demand for air transportation services assuming unaltered framework conditions, the revenue base can be expected to increase even if air transport prices rise.

Conversely, the increase in the percentage of operating costs accounted for by fuel costs, as a consequence of the introduction of a kerosene levy, can be expected to lead to an intensification of research into improved engines and aircraft designs as well as to improved operational efficiency of air traffic. Such supply-side responses would, in the longer term, reduce the revenue from an aviation levy based on kerosene consumption. When these supply-side effects are taken into consideration, an estimate of the long-term price elasticity of the demand for kerosene results in values of -0.4 to -0.5 (Bleijenberg and Wit, 1998). That is, assuming a doubling of the price of fuel with demand remaining constant, a reduction in kerosene consumption of between 40% and 50% could be expected in the long term. This reduction, however, would be more than made up for by a rise in demand.

An EU-wide levy of € 0.32 per litre of kerosene with effect from 2005 is expected to generate a revenue of some € 14 billion annually (Brockhagen and Lienemeyer, 1999). In this assessment, the levy rate is derived from an estimate of the external climate-related costs attributable to aviation (ECMT, 1998). It is important to be aware that estimates of externalities are generally extremely difficult and can thus only provide rough orientation. In order to enhance the political enforceability of such a levy scheme and to mitigate undesirable side-effects, it appears expedient to introduce the levy gradually. The above sum would then be the final level at the end of a shorter or lengthier introduction phase.

Various scenarios estimate the worldwide consumption of kerosene for civil aviation for 2015 at 204–334 million tonnes, corresponding to around 255–417 billion litres (Bleijenberg and Wit, 1998). European kerosene consumption accounts for just under 15% of worldwide civil aviation consumption. However, worldwide introduction of a levy would not result in a proportional increase in revenue compared to EU-wide introduction. On the one hand, it is to be expected that revenue under a worldwide scheme is larger. This is because if a kerosene levy is only introduced EU-wide, evasion reactions in the form of 'tankering' will occur. Tankering means the tanking of extra fuel in countries which do not have a kerosene levy. This effect diminishes the revenue of such a levy, but does not arise if introduction is worldwide. On the other hand, it is to be expected that, if the levy was applied worldwide, research and development efforts would intensify, thus leading to a fall in the demand for fuel. Based upon the values for the revenue of an EU-wide levy and global kerosene consumption, overall annual revenues in excess of some € 13-21 billion can be expected worldwide if the levy rate is € 0.05 per litre. Such a sum would be in the

order of the climate costs attributable to aviation, which are assessed at € 3–30 billion annually (Section 3.1). It needs to be noted yet again, however, that, due to the necessary step-by-step introduction and due to likely international coordination problems, the revenues that might realistically be expected over the short and medium term will presumably be substantially lower.

Environment-related incentive effects

Assuming the introduction of an EU-wide kerosene levy, in the case of extra-European flights terminating or starting in Europe, approximately half of the kerosene would be subject to a levy (kerosene tanked at European airports). Assuming a charge of € 0.20 per litre with a graduated LTO fee, there is an estimated greenhouse gas emissions reduction potential of between 25% and 35% by 2025 (Bleijenberg and Wit, 1998). Over the next 20–25 years, a levy of € 0.10–0.30 per litre kerosene would lead to an improvement in fuel efficiency by 20–40%, while demand would drop by 5–10%. The LTO fee alone has the potential to reduce greenhouse gas emissions by 5–10%.

According to estimates, about three-quarters of the reductions in emissions are attributable to technological advances and one-quarter to the fall in demand. The problem with a regionally limited levy is the practice of tankering. This means that more fuel than necessary is tanked in countries in which there is no levy on kerosene, leading to a deterioration in the environmental balance – owing to the increased flying weight and detours flown. Such attempts at evasion could diminish the environmental benefit, expressed by the emissions savings potential, by 35–70% (European Commission, 1999). Moreover, a kerosene levy does not take into consideration the effects of NO_X emissions and contrail formation. Improved fuel efficiency can lead to increased NO_X emissions.

The environmental incentive effects of a kerosene levy, especially if embedded in a 'package', emanate essentially from the supply side, i.e. from technological improvements. Higher fuel costs can lead to savings of kerosene through better route selection, changes to fleets, improved flight handling procedures or a minimization of congestion. Changes to fleets can be accomplished, firstly, through the use of more modern, more energy-efficient engines and optimized cabin designs. Secondly, the consumption of fuel per passenger-kilometre can also be lowered through the use of larger types of aircraft. It must, however, be stated that, despite considerable technological potential, the consumption of kerosene can in the long term only be kept constant or its growth rates kept relatively low if the price of kerosene is significantly and continuously increased.

Legal enforceability

From the point of view of international law, Article 15 and Article 24 of the Chicago Convention, which dates back to the early days of commercial aviation, are of significance with regard to the imposition of a levy on the consumption of kerosene. Article 15 permits the raising of a fee for the use of airports and navigation facilities. However, "fees, dues or other charges" may not be imposed on the transit, entry or exit of an aircraft from a contracting state or of the persons or property on board. In this context, the term 'charges' can be construed either in the sense of levies including taxes or, in a narrower sense, as a levy of a compensatory nature for the granting of privileges. By resolution of the ICAO Council the issue was interpreted in the former sense (ICAO Council Resolution of 14 December 1993). Even if one follows this – legally non-binding – interpretation, this does not constitute a ban on charging a levy on the consumption of kerosene. Namely, Article 15 prohibits only those levies which are charged "solely on the right of transit, entry or exit". Charges which are levied for other reasons, including, therefore, a levy on the consumption of kerosene, are not prohibited by Article 15 (UBA, 2001).

The fuel still on board after an aircraft has landed is exempt from a kerosene levy. Under Article 24 of the Chicago Convention, fuels which, upon arrival in the territory of one state, are on board an aircraft from another state may not be made subject to a national or local charge or levy if they have remained on board when the aircraft leaves the territory (UBA, 2001).

Legal obstacles of a more serious nature may be seen in the 2,000–3,000 bilateral Aviation Service Agreements (ASAs), many of which prohibit the introduction of a kerosene levy. Therefore, it could be expedient for ICAO to provide a solution (in an universal form by means of a convention or by introducing a standard), but this does not seem to be supported by the current political mood. Consequently, the international prospects of introducing a kerosene levy are poor.

Conclusion

The introduction of an aviation levy based solely on kerosene consumption would remove the discrimination against other modes of transport, which are already subject to a fuel tax and other charges. If one adopts a perspective which goes beyond the exclusive consideration of CO_2 emissions, one of the factors speaking against a kerosene levy is that it does not cover other emissions. A package consisting of

kerosene levy, graduated landing and take-off fees and possibly stricter NO_X cruise standards might remedy this deficiency, but would continue to neglect the contribution of contrails. An LTO fee would provide incentives for a reduction of CO, VOC and NO_X emissions at take-off and landing. Namely, the environmentally positive effect of more energy-efficient aircraft, with the associated reduction in CO_2 emissions, could be diminished by increased NO_X production. NO_X standards graduated according to aircraft type and engine could be used to counteract a one-sided reduction of CO_2 at the expense of NO_X.

One of the great advantages of an aviation levy based on kerosene consumption is the fact that the infrastructure already exists for collecting the levy from fuel suppliers. Although there are legal problems with regard to a kerosene levy or a kerosene levy package, with it being necessary for bilateral Aviation Service Agreements (ASAs) to be renegotiated, it ought to be possible to resolve these.

If a kerosene levy is introduced on a regional basis, the environmental incentive effects and financing potential will only be on a small scale owing to tankering. Therefore, it is essential that any kerosene levy be introduced at the global level. However, as the global introduction of such a levy cannot be expected for the time being, it is advisable to consider other forms of user charge capable of leading to significant environmental and fiscal effects, even if introduced on a regional basis only.

3.3.3 User charges based on emissions

An emissions-based aviation levy could be imposed, for example graduated according to the quantity of pollutants emitted. The advantage of an emissions-based levy is its well-targeted incentive effect. Ideally, there would be a charge for every pollutant according to the quantity released. The amount of the levy should be based on the environmental harmfulness of the substance in question.

Operational practicability

At first glance, it is more difficult to introduce an emissions-based levy than a levy based on kerosene consumption, because there are no existing organizational and institutional structures for collecting such a levy. Furthermore, if the levy is based on emissions, complex measuring methods are required. Data is needed not only for the emissions of various pollutants for various air movements. Rather, it is also necessary to have knowledge of the harmfulness of the various emissions if the aim is to achieve as great an environment-related incentive effect and innovation effect as possible. In order to measure the climate impact with one single parameter, it is advisable to make the emissions comparable to each other in terms of their harmfulness and their contribution to radiative forcing (IPCC, 1999; Brockhagen and Lienemeyer, 1999).

It is unlikely that for the time being, the emitted pollutants and their harmfulness could be measured directly. Consequently, it will be necessary to draw on indicators, such as the types of aircraft or engine (on standardized routes) or the actual consumption of kerosene. Such indicators are regarded as relatively simple to determine and very reliable. Both ECAC/ANCAT (Expert Group on abatement of Noise Caused by Air Transportation) and NASA (National Aeronautics and Space Administration) have already calculated NO_X emissions indexes (Brockhagen and Lienemeyer, 1999). The development of a calculation model for appropriate rates of levy is not trivial, but appears feasible. The following specific criteria are under consideration for deciding on the rate of levy: aircraft type, engine type, (average) air route, distance, load or aviation fuel grade (Brockhagen and Lienemeyer, 1999). Moreover, it appears advisable for the levy not to be based simply on average values for these variables, but on deviations from those values associated with the lowest possible emissions. An emissions levy based on criteria such as those just named will be referred to in the following as a 'calculated emissions levy'.

A very simple form of determining a calculated emissions levy could be to assess the volume of the main environmental impacts induced by aviation, for different aircraft types, as a function of the number of seats and capacity utilization (and thus weight) and as a function of distance (Brockhagen und Lienemeyer, 1999). This would include assessments of CO_2 (burning 1 kg aviation kerosene forms about 3.2 kg CO_2), of contrails (for these, approximate proportionality to aviation kerosene consumption can be assumed) and of NO_X. For NO_X emissions, the main variables are flight altitude, distance, aircraft type and engine type. An NO_X index can then be calculated for different combinations of the four variables. Multiplying this index by fuel consumption delivers a purposeful assessment of NO_X emissions.

Applying specific levy rates for the three above types of emissions, an emissions-specific user charge can be calculated as a function of aircraft type, aircraft weight and distance flown. Table 3.3-1 assumes mean levy rates of € 0.12 per litre kerosene for CO_2, € 0.14 per litre kerosene for water vapour and € 0.6 per litre kerosene for NO_X. Specific levy rates are oriented to an estimate of the external climate-related costs attributable to aviation (ECMT, 1998), whereby proportional consideration is given to the additional

Table 3.3-1
Some examples of charges for selected flight distances and aircraft types. The standard levy is the sum of the levies on CO_2 and NO_X emissions plus a levy on contrails, which have a particularly large radiative effect. 50% of the domestic levies are raised on international flights. An average aircraft load factor of 67% was assumed for all examples.
Source: Selected examples from Brockhagen and Lienemeyer, 1999

Aircraft type	Average seats	Distance class	CO_2 levy	NO_X levy	Contrail levy	Sum = Standard levy	Levy per passenger (domestic)	Levy per passenger (international)
		[km]	[€]	[€]	[€]	[€]	[€]	[€]
Boeing 737	123	200	152	77	168	397	4.8	2.4
		400	254	145	280	679	8.2	4.1
		500	269	151	297	717	8.7	4.3
		1,000	476	238	524	1,239	15.0	7.5
		2,000	900	415	991	2,305	28.0	14.0
Airbus A300	259	200	295	186	325	806	4.6	2.3
		400	501	355	552	1,408	8.1	4.0
		1,000	922	550	1,016	2,488	14.3	7.2
		2,000	1,710	891	1,882	4,483	25.8	12.9
		4,000	3,342	1,613	3,679	8,634	49.8	24.9
		8,000	6,930	3,338	7,630	17,898	103.1	51.6
Boeing 747	377	200	574	469	632	1,674	6.6	3.3
		400	1,030	1,046	1,134	3,210	12.7	6.4
		1,000	1,765	1,518	1,943	5,225	20.7	10.3
		2,000	3,225	2,381	3,550	9,156	36.2	18.1
		4,000	6,237	4,297	6,867	17,400	68.9	34.5
		8,000	12,793	8,714	14,085	35,593	140.9	70.4

effects of NO_X and contrails. With an EU-wide introduction, the levies would result on average in an overall charge of € 0.32 per litre kerosene, which would generate an annual revenue of € 14 billion (Brockhagen and Lienemeyer, 1999). These levies are based on a rough estimate of externalities. Different assumptions about damage caused by climate change and their attribution to aviation can lead to different levy rates. Nevertheless, it is an illuminating exercise to identify the scale of a calculated emissions levy and the resulting revenue upon the basis of specific levy rates.

The overall rate of such an emissions-based levy per aircraft type and aircraft weight and as a function of flight distance can be determined on the basis of emissions-specific charges. Table 3.3-1 aggregates the emissions-specific charges. Under the assumptions set out above and with an average load factor of 67%, the resulting emissions charges range between € 3.9 and € 140.9 per passenger for domestic flights and between € 1.9 and € 70.4 per passenger for international flights.

More complex calculation formulas are also conceivable for an emissions-based levy; so, too, are sensitivity analyses of the underlying emissions-specific levy rates. What is important in each case is that the relative contribution of specific emissions to radiative forcing is taken into consideration in accordance with the state of scientific knowledge as summarized by the IPCC in its assessment reports. The figures set out above provide a first impression of the approach and the orders of magnitude in connection with a calculated emissions levy.

A calculated emissions levy would need to be introduced gradually in order to minimize undesired side-effects. It would be conceivable to begin with relatively low levy rates and, already at the time of introduction, to announce a gradual increase of the levy over the following years. This would enable all concerned to adapt to the new situation without incurring excessive costs.

Financing potential

If introduced at the global level, the maximum financing potential of an emissions levy would basically be similar to that of a kerosene levy. The rapid global introduction of a levy on kerosene or emissions is not to be expected, although the EU is indeed moving in this direction. Therefore, when comparing the financing potential of both measures, assuming introduction on a regional basis, it must be borne in mind that, in the case of a kerosene levy, usually no more than half of the kerosene consumed will be covered by the levy. This is because airlines will attempt to tank as much fuel as possible at airports without a kerosene levy and to fly as far as possible on the filled tanks (tankering). If an emissions levy is based on a bundle of indicators, such as those mentioned above,

it can be assumed that it will be possible to generate higher revenues than in the case of a kerosene levy. Namely, it will then no longer be possible to evade an emissions levy by selecting the appropriate air routes. 50% of the rate can be charged for international flights so that the emissions levy is not raised twice if introduced in different regions.

Over the short and medium term, the revenue to be expected from a gradual introduction of an emissions levy would be smaller. Only over the long term, if at all, the maximum revenues set out above may be achieved. However, a calculated emissions levy has in principle the potential to generate revenue of this magnitude – as a maximum sum at the end of a step-by-step introduction process and assuming worldwide introduction of the charging system.

Environment-related incentive effects

The environmental incentive effect of a globally introduced emissions levy can be expected to be much stronger than that of a kerosene levy. A principal advantage is the great flexibility in designing the system and in the consideration that such a scheme gives to different types of emissions. Incentives for technological improvement would be significantly larger because (possibly opposite) effects of different emissions reduction measures would be taken into consideration. In contrast, at a comparable level of state revenue, demand-side incentives would be similar.

In the case of a regional introduction of an emissions levy of the above-described kind, it can be expected that there will be no major evasion reactions. If an EU-wide kerosene levy of around € 0.2 per litre is introduced with effect from 2005, the reduction in greenhouse gases from European air traffic by 2025 is estimated at between 25% and 30% in comparison with the situation without a levy. Viewed in absolute terms, however, the passenger/freight kilometres travelled will continue to rise sharply. Although technological improvements due to changed cost structures ought to make the largest contribution to a relative fall in the emissions from air traffic, it is improbable that this will be able to compensate for the quantitative effect of the increase in demand.

Legal enforceability

From the legal viewpoint, there are no obstacles whatsoever to the introduction of an emissions levy in consideration of the ban on discrimination embodied in Article 15 Sections 1 and 2 of the Chicago Convention, because neither the Chicago Convention nor the ASAs would have to be amended (UBA, 2001).

In the case of an emissions levy dependent essentially on the actual fuel consumption, however, it would once again be necessary to amend many bilateral agreements, because this would be equivalent to a concealed kerosene levy.

Conclusion

If introduced at the global level, emissions levies based on a bundle of emissions-relevant indicators are comparable with a kerosene levy with regard to the achievable revenues. The environmental incentive effect is greater, if introduced globally, because different types of emissions can be taken into consideration. In the event of the far more realistic case of introduction at the regional level, emissions levies are significantly superior to a kerosene levy. Incentive effects and revenues will be greater, because, in the case of a calculated emissions levy, the opportunities to evade the levy are considerably reduced in comparison with a kerosene levy. For this reason, the WBGU considers a calculated emissions levy to be an especially suitable form of user charge on aviation.

3.3.4 Tradable emissions certificates

As an alternative to a calculated emissions levy, it would also be possible to conceive of an aviation charge whereby the use of airspace by aviation is confined to those who are in possession of tradable emissions permits. The available maximum quantity of emissions permits would have to be a matter of political decision.

Trading in emissions permits is under discussion for a number of different areas of application, but is as yet largely untested for the area of aviation (European Commission, 1999). Once again, the principal objective ought to be to specify the maximum permissible total volume of emissions of a certain pollutant and to divide up that volume between individual certificates (emissions permits) (ICAO, 2001a). The individual certificates would then entitle the holder to emit the stated quantity of pollutants and would have to be tradable.

Theoretical considerations show that a system of globally tradable emissions certificates is capable of functioning with comparable efficiency to an emissions levy. One of the advantages of tradable emissions certificates, however, lies in the higher degree of environmental incentive provided: There is a greater probability than in the case of an emissions levy that the tolerated total volume of emissions will not be exceeded.

Operational practicability

The efficacy of an emissions trading system depends crucially upon the specific design of the system. The manner in which global emissions permits are initially allocated is decisive with regard to the performance of the instrument (WBGU, 2001a). Basically, these permits can be issued free of charge in proportion to the existing emissions (grandfathering) or can be sold or auctioned off by a governmental or international institution.

Selling or auctioning offers the advantage of a (high) financial revenue for the issuing agency and comes very close to the previously discussed user charges. In addition, auctioning is considered more efficient than grandfathering. However, it has the disadvantage of probably being scarcely enforceable politically, not least on account of the liquidity required for auctioning. In this connection, levies offer the advantage that they make it easier for user charges to be introduced gradually.

If it is assumed that the certificates are initially issued in the form of grandfathering, this would imply that the instrument is broadly focused on the environmental incentive function. The revenue effects also desired from user charges would be missing.

It is also necessary to ask at what level the trading in emissions is to be carried out. It would be conceivable, for example, for trading to take place between countries or between international enterprises (airlines) or between those airlines serving a certain airport (European Commission, 1999). It also needs to be clarified in this connection how to deal with the circumstance that some airlines are based in developing countries but operate fleets of global significance. It is also unclear whether the trade in emissions should be confined just to aviation or whether, where applicable, enterprises from other industries may take part. There appear to be no easy or unambiguous answers to these questions. Especially where trading between countries is concerned, it must additionally be borne in mind that the financial possibilities of developing countries are significantly and systematically inferior to those of industrialized countries, something which may possibly result in unintended restrictions on the economic activities of developing countries. Since they are unable to buy as many emissions permits as industrialized countries and frequently also lack the organizational ability to participate in the certificates market, all activities directly or indirectly connected with aviation are from the outset fixed at a rather low level.

In comparison with a levy based on emissions or on kerosene consumption, the use of tradable emissions permits also involves higher monitoring costs: In addition to the costs resulting from the monitoring of emissions, further costs are incurred for overseeing and handling the trade in emissions (Horregaard and Reppelin-Hill, 1999). For instance, the certificates must at regular intervals be reauctioned and administered. Furthermore, it is necessary to operate a centre at which the certificates can be traded.

Hitherto implemented schemes with tradable certificates have shown considerable success: Mention may be made here of the EU system of tradable fishing quotas; the tradable emissions permits for SO_X and NO_X in California or the (company-internal) CO_2 trading system used by BP/Amoco (ICAO, 1999). In addition, trading in CO_2 certificates was commenced in Denmark in 2000. Great Britain is planning a similar pilot project for the spring of 2002. The resulting experience ought to provide important information with regard to the feasibility of certificate-based solutions in the field of climate protection at international level. The same applies to the anticipated start of emissions permit trading at European level in 2005 (European Commission, 2001), which excludes the transport sector, and at global level in 2008 under the Kyoto Protocol, which similarly does not yet cover the emissions of international aviation.

Financing potential

If emissions permits are auctioned globally and annually (or at other intervals), the revenue generated will be similar to that in the case of an emissions levy. This will at least be the case if the minimum selling price for the permits is approximately equivalent to the levy which would be charged per unit of greenhouse gases in the case of an emissions-based levy. Greatly reduced revenues can be expected in the case of regional certificate-based systems. No revenues will be generated if the emissions permits are issued free of charge to the existing polluters (Horregaard and Reppelin-Hill, 1999). If, however, an emissions trading system is combined with emissions-related requirements, the possibility to generate revenue would arise, for instance by imposing fines in the event of emissions targets being violated.

Environment-related incentive effects

If global trading in emissions functions correctly, the resulting innovation incentive – for a roughly equivalent environmental incentive effect – will be approximately the same as in the case of an emissions levy. Also, there will be a similar fall in demand (for an equivalent level of levy). However, trading in emissions certificates can be regarded as more targeted in its environmental impact than the use of emissions levies: The total quantity of emissions tolerated can be fixed and, in principle, transgression of that quantity can be prevented, whereas, if use is made of emissions levies, merely the rate of the levy

is fixed and the effect on the quantity of emissions produced is indirect. If demand is relatively price-inelastic, the emissions reduction produced by emissions levies may be very small. If trading in certificates is introduced only at regional level, the environmental incentive effects will fall short of what can be achieved if trading were introduced at a global level.

Legal enforceability

From the legal viewpoint, there appears to be no obstacle to the idea of trading in emissions permits. As already mentioned, similar schemes have already been implemented in various countries in other fields. Also, the Kyoto Protocol explicitly provides for emissions trading, at least between industrialized countries, as a flexibility measure.

Conclusion

In principle, a system of tradable emissions certificates represents an attractive method of ensuring that the environmental impact of aviation is reduced in an economically efficient and environmentally pinpointed manner. The revenues generated – for a comparable environmental incentive effect – ought to be similar to those achieved with a globally introduced levy on kerosene or emissions, if the emissions permits are sold annually (or at other intervals). Realistically, however, a certificate-based system will probably only be enforceable if the certificates are initially issued free of charge, which means that no revenues would be generated. In addition, a decisive disadvantage of a certificate-based solution as compared with an emissions-based user charge on aviation is its increased organizational complexity. Overall, therefore, tradable emissions certificates do not appear for the time being to be a suitable means of reaching the principal goals of user charges, namely achieving incentive effects to the benefit of the environment and generating revenues earmarked for specific purposes. Consequently, the Council concludes that a calculated emissions levy remains the most attractive form of user charge on aviation.

3.4 Undesired side-effects

If an emissions-based user charge on aviation is introduced at the regional level only, there is the risk that competition may be distorted if passengers switch to countries that do not impose such a levy. Such evasion reactions, however, will probably not be of great consequence, because they will only be possible if neither the country of origin nor the country of destination applies such a levy. If a calculated emissions levy were introduced, say, in Europe, the scale of evasion reactions would probably be rather small, even in the case of international flights. Moreover, it must be remembered that, already today, there are, in some cases, significant differences between neighbouring airports with regard to airport charges without this resulting in major shifts in passenger flows.

It is not probable that a calculated emissions levy would have a lasting and serious impact on jobs in the aviation sector or in other areas of industry. Despite short-term declines in demand for air transport as a consequence of the terrorist attacks of 11 September 2001, the long-term growth trend of the aviation market will be sustained. Therefore, an emissions levy will not result in any major negative impact on the economies of the various countries.

Structural shifts, however, can be expected. For example, it can be assumed that, if the costs of air transport are increased as a consequence of an emissions levy, those products which are traded on world markets and whose comparative advantage is due above all to the fact that the calculated transport costs do not include all the actual costs impaired on society, will cease to be competitive. Here, one can think of numerous products which are produced in developing countries and are carried by air to other countries, particularly to industrialized countries, where they are sold, such as cut flowers, lobsters, shrimps, fruit, vegetables and also, to an increasing extent, leather goods and textiles. Since the internalization of external transport costs is indispensable for the improved welfare of the world, corresponding structural changes and adaptations must be accepted. It can be assumed that, in the medium and long term, new products, now with internalized transport costs, will again acquire comparative advantages. These adaptation problems will presumably not be so severe if a user charge such as a calculated emissions levy is introduced gradually.

With regard to the previously mentioned types of product, it can be assumed that mainly those developing countries integrated into such a charging system may experience temporary disadvantages in trading on world markets – and therefore problems with unemployment – as a consequence of an increase in the costs of air transport. It must further be noted that, in developing countries, air transport is also very important for national trade, because the distances inside the countries or regions are often great and overland transport is often difficult due to inadequate infrastructure. This appears to be the case above all in Africa and the Asia-Pacific region, but less so in Latin America.

Finally, developing countries will be particularly affected by an emissions levy on aviation because

long-haul travel will become more expensive as a consequence of such a levy and, therefore, there will be a tendency for demand for such travel to fall. Here too, as in the case of trade in products, the objective must be, to ensure that supply and demand adjust to the incentive effects through structural adaptations. It is difficult to forecast whether there will be a lasting decline in tourism or whether that industry is capable of suitably adapting. Basically, however, it may once again be assumed that if user charges are introduced gradually the adaptation problems will not be very severe. Temporary assistance with structural adaptation, of strictly limited duration, may facilitate the path towards successful structural change achieved in the medium to long term.

3.5 Use of funds

3.5.1 Purposes

The principal purpose in deploying the revenues from charges on the use of airspace by aviation is to restore or maintain the quality of the global good that is to be protected, i.e. the climate. This would mainly entail the prevention of greenhouse gas emissions in sectors other than aviation. In concrete terms, these could be measures to improve energy efficiency or to intensify the use of renewable energy sources. Furthermore, measures to adapt to or 'repair' climate-related damage would need to be financed. Here care needs to be taken that the connection between damage for which adaptation measures are to be financed and the climate changes causing the damage is as close as possible. Coastal protection measures such as dike construction in response to climate-related sea-level rise are an example of measures closely connected to climatic changes ('first order' connection; IPCC, 1994). Revenue loss suffered by countries whose touristic attractiveness declines due to climate-related damage (e.g. through the degradation of coral reefs) is an example of damage further removed from the initial cause in the causal chain of climate impacts; even social disruption (e.g. rising levels of criminality) are part of this chain. These are cases of 'higher order' climate-related damage. Whether and with which priority measures to repair higher order damage should be financed from the revenue of user charges remains open to debate. To determine the scope of earmarking, there is a need for criteria. These must be formulated through intergovernmental negotiations, building upon further research activities.

Financial resources should be deployed primarily to countries that have explicit climate policies, experience high levels of environmental damage attributable to aviation-related air pollution and have low economic capacity. It is appropriate to give consideration to the efficiency with which resources are deployed. With this in mind, financing could be mainly programme- or project-focused in those countries that are fundamentally eligible for support.

3.5.2 Institutional arrangements

International and national institutions enter into consideration as agencies for handling the technical aspects of the disbursement of the revenues generated by the user charges on aviation.

In national budgets, such revenues would be itemized as transitory accounts forwarded directly to the corresponding international organizations, in analogy to the financing of the EU budget by its member states.

As far as international organizations are concerned, thought could be given above all to the three new funds set up by the Marrakesh Accords, i.e. the Special Climate Change Fund, the adaptation Fund and the Least Developed Countries Fund. All three are administered by the Global Environment Facility (GEF). Some of the financial resources might possibly be allocated directly to the climate window of the GEF, which is the financing mechanism of the Climate Convention. Criteria for the scope of earmarking should be developed within the structures of these funds. At the same time, these financing institutions guarantee that the corresponding financial resources flow mainly to those regions which experience particularly large environmental damage attributable to aviation emissions. In addition, it must be ensured that existing GEF funding is not reduced as a consequence of the new allocation of funds.

As far as national institutions are concerned, consideration can be given to all those institutions engaged in tasks relating to environment and development policy. The specific allocation of roles should, for the most part, be left to the individual countries.

An important question is what percentages of the revenue from aviation levies should be allocated to international and national institutions. Especially in connection with environmental or economic adaptation measures, disbursement at the national level would have the advantage that there would be more accurate knowledge of areas of concern and possible solutions, with the result that the available funds could be put to especially efficient use. With regard to general policy on climate, it is advisable – in view of

the global nature of the climate problem – to opt for 'common' disbursement at international level, notwithstanding the possibility to make use also of specific locally available knowledge.

With regard to political enforceability, it would presumably only be possible to implement a model which permits the revenue from the user charges to be allocated to both national and international institutions. What percentages of the revenues are to be allocated to the two categories of recipients would have to be negotiated at the international level. Possible criteria for deciding on the percentages might be, for example, the extent of national damage as a consequence of climate change as well as the independent economic ability to pay of the various countries. In principle, however, at least in the medium and long term, the majority of the funds should go to international institutions. Institutions organizing such negotiations could be the conferences of the parties to the Climate Convention and Kyoto Protocol. With regard to the political enforcement of appropriate mechanisms for disbursement of the revenues from user charges, it appears indispensable to conduct a sensitive evaluation of previous experiences with international climate policy or environment and development policy in general.

3.6 Political enforceability

ICAO is the United Nations organization of initial competence for the introduction of a worldwide environmental levy on aviation. The global introduction of such a levy will certainly not be accomplished without a great struggle to arrive at a solution acceptable to all member states. Not only will this process be time-consuming. There is also the risk that a consensus based on the smallest common denominator will not do justice to the importance of air traffic emissions with regard to climate protection.

The introduction of a regional environmental levy under the regime of regional civil aviation associations (such as the European Civil Aviation Conference, ECAC) or international organizations such as the EU, NAFTA or ECMT (European Conference of Ministers of Transport) appears to be easier in this regard.

Political enforceability, however, is problematic also at the regional level. Particularly those countries with an economy heavily dependent on long-haul air traffic could suffer a loss of competitiveness through the non-global introduction of a levy. Of importance in this context are increased product prices as a result of rising air transport costs as well as concerns with regard to a decline in tourism in traditional holiday countries.

Consequently, it can be expected that there will be opposition to the introduction of an emissions levy. Such opposition, however, could possibly be overcome by financing temporary measures, of strictly limited duration, to promote adaptation to structural economic problems caused by the introduction of an emissions levy. Moreover, it is to be assumed that if user charges are introduced gradually this type of adaptation problem will not be very severe.

It is further to be expected that developing countries affected by economic structural adjustment problems as a consequence of the introduction of user charges will agree to such introduction if the revenue is deployed as a matter of principle only or predominantly for such developing countries that – perhaps under less strict terms – have joined the user charging system.

3.7 Conclusion on user charges on aviation

The levying of user charges on airspace is advisable, because this is capable both of giving rise to emissions-reducing effects and also of generating revenues for climate protection measures and/or measures for adapting to the climate change in which aviation plays a causal role. It appears advisable to introduce such charges in a gradual process. The target revenue should therefore not be very high over the short and medium term. Over the long term, however, the revenue from a worldwide charging system could correspond to the share of climate damage attributable to aviation.

It also appears advisable to earmark the revenues generated – this being entirely consistent with the concept of user charges. In this context, it must be ensured that funding is concentrated on climate protection measures and on first-order measures for adaptation to the climate change jointly caused by aviation. From the environmental point of view, it is important to fund measures particularly in those places in which the existing and predictable future environmental damage is especially great. From the point of view of the ability-to-pay principle, it appears reasonable to fund measures above all in those countries which have only a limited capacity to implement such measures themselves, developing countries being a particular case in point.

Of the various conceivable user charges on aviation, an especially attractive option appears to be a calculated emissions levy based on a variety of indicators, such as aircraft type, engine type, average air route etc. The precise design of an 'optimum' charg-

ing scheme should be determined by international institutions. Even if introduced solely at the regional level, such a user charge would allow only few evasion responses and is associated with considerable environment-related incentive effects and revenue effects.

The introduction of a calculated emissions levy may cause a need for structural adjustment in a variety of countries. If user charges are introduced in a gradual process, these effects should not be very severe. The temporary financing of corresponding national adjustment measures in developing countries, of strictly limited duration, from international financial resources could in fact rather have the effect of promoting the political acceptance of a charging system. Acceptance could be further promoted by a conditionality of deployment. To this end, only those developing countries should profit from the earmarked use of the revenue that join such a charging system, i.e. also levy user charges nationally. One of the institutions which may, in principle, play an important role in connection with the levying of a user charge on emissions is ICAO. The greenhouse gas emissions of the international aviation sector are not yet subject to any reduction commitments. A user charge such as an emissions-based levy could close this regulatory gap in climate protection, and ICAO could commit itself to playing a role in the collection of the levy. Such a commitment could consist in negotiating emissions-specific levy rates, negotiating the calculation formula for the overall levy or negotiating the shares of revenue that are to flow to international organizations or national institutions. However, ICAO can only exercise a purposeful function in these areas if it is integrated more closely into global environmental policy. Given the political will, environmental policy objectives could be attributed priority in ICAO over particularistic and short-term economic interests of individual countries.

For instance, it would be conceivable that the parties to the Climate Convention and Kyoto Protocol request ICAO to define binding targets for the abatement of greenhouse gas emissions from aviation. If, after agreed deadlines have expired, no binding measures are adopted by ICAO, the CO_2 emissions of aviation could also be integrated into the Kyoto Protocol. This could be done e.g. by introducing a user charge within the framework of the climate regime, or including these emissions in the emissions inventories of the convention parties. As it is likely that ICAO has an interest in establishing a regime within its own organizational structure. ICAO may perceive an incentive to give greater weight to concerns of climate protection and start to elaborate an emissions-based user charge regime without delay.

4 Charging the use of the oceans by shipping

4.1 Marine pollution

Despite intensified efforts to protect the oceans in the last few years at both international and national level, their condition continues to deteriorate. Considerable progress may have been achieved in some regions but on the whole the marine environment is coming under increasing pressure from the ongoing expansion and intensification of various human activities. The ecosystems of the coastal regions are being subjected to the highest input levels of pollutants, nutrients and sediment particles. However, many exchange processes occur between the coastal waters and the waters of the open ocean. The shallow coastal waters with their high primary production rates form the 'nursery ground' for the shoaling fish of the open ocean but they are also reliant on the introduction of oxygen- and nutrient-rich waters from the open ocean. The ecosystems of the open ocean may be largely intact. Nevertheless increasing levels of damage are also becoming apparent here (GESAMP, 2001a).

According to the views of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) – a joint committee of experts formed of representatives of various UN organizations for the purpose of marine environmental protection – the developments causing most concern, besides the risks associated with the anticipated global warming, are as follows (GESAMP, 2001a):

- *The destruction and alteration of marine and coastal habitats.* These include particularly valuable habitats such as coral reefs and mangrove forests, which are being degraded by pollution, inappropriate use of land, deforestation or other harmful activities.
- *Overfishing and effects of fishing on the environment.* The overexploitation of marine fish stocks is of particular concern if we consider that around 3,500 million people are dependent on the oceans as a primary source of protein (Simonis, 1996). Furthermore, commercial fishing also leads to the unintentional removal of fish, turtles, marine mammals and other animals (so-called by-catch) which has a negative impact on the biological diversity of the oceans (WBGU, 2001a).
- *The effect of untreated effluent and chemicals on the health and environment of humans.* Recent studies have shown a closer connection than previously believed between the emergence of certain infectious diseases and the quality of the ocean waters in coastal regions. Heavy metals and chemicals which disrupt hormonal systems, such as tributyl tin (TBT), are harmful to numerous species. The environmental effects of many chemicals discharged into the oceans are still largely unknown.
- *Increased eutrophication.* The excessive growth of marine plants caused by nutrients introduced into the oceans destroys the natural balance of the marine ecosystems and the resulting rapid breeding of toxic algae (red tides) can contaminate fish, shellfish and – through the food chain – humans.
- *Alterations in hydrology and sediment transport.* Dams, extensive irrigation programmes and changes in land use may affect the sediment transported by rivers leading to changes in the coastline or – in the event of increased inputs of turbidity matter and sediment particles from deforestation activities – result in the destruction of wetlands, river deltas and coral reefs (GESAMP, 2001a, b).

These kinds of problems clearly illustrate the close correlation between land use and marine environmental protection. The rapid urbanization primarily observed in the coastal regions of developing countries is a particular source of severe marine environmental pollution. The high rate of population growth and enduring poverty make it near impossible for the problem to be dealt with in an appropriate manner locally (GESAMP, 2001a). The legally non-binding Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) was adopted in 1995 by UNEP with a view to combating the marine environmental damage stemming from land-based sources, which makes up 80% of overall damage. The programme under-

scores the connection between the protection of freshwater, the coasts and the oceans and sees the conflicts of use being resolved by an integrated management of resources and an environmentally acceptable economic development. Even though the first regional successes may be noted, a global implementation of the GPA is still long overdue. In particular, the issue of financing the GPA is still unresolved (UNEP, 2001).

The present report is particularly concerned with the types of marine pollution caused by shipping. The Council believes that levying a user charge in this area would be particularly beneficial given the potential to improve the environmental qualities of ships. However, the Council does not rule out the possibility that user charges in other areas could also contribute to the protection of the oceans. For instance, it could also be examined whether user charges may be useful to protect the endangered fish stocks of the high seas.

4.2 Environmental impacts of ocean transport

Shipping is by far the most environmentally sound form of transportation. In particular, it is much more energy-efficient than aviation, which generates up to 100 times higher CO_2 emissions per tonne of freight. Nevertheless, the environmental impairments induced by ocean shipping do cause severe damage in some areas that would often be avoidable considering the available options to improve the environmental performance of ships.

4.2.1 Discharges and inputs to the oceans

Shipping is still a major contributor to the degradation of the marine environment although progress has been made in the last few decades to reduce the marine pollution caused by shipping. Even though experts consider oil discharges to be less threatening than previously believed (GESAMP, 2001a), they still cause considerable damage to the local ecosystems affected (Table 4.2-1). Tributyl tin (TBT), introduced through toxic anti-fouling paint, which is intended to protect ships' hulls from the growth of marine organisms, accumulates in the sediments of the seabed. It retains its toxicity and its hormonal effects may, for example, lead to sex changes in marine snails (ISL, 1999). Alien species are introduced to distant ecosystems by the uncontrolled exchange of ballast waters which under certain circumstances may have a destructive impact on biological diversity in the new host ecosystems and lead to considerable economic losses (GESAMP, 2001a). For example, a type of jellyfish brought in from American waters decimated the anchovy stocks in the Black Sea to such an extent that the annual fishing yield in the Black Sea fell from 700,000t to 70,000t (ISL, 2001).

4.2.2 Emissions to the atmosphere

Shipping is responsible for around 7% of the CO_2 emissions from the transport sector or for around 2% of global CO_2 emissions. Furthermore, around 7% of all SO_2 and 11–12% of all NO_X emissions may be attributed to shipping.

SO_2 and NO_X are responsible for acid rain which causes considerable pollution of land ecosystems. Moreover, more recent studies show that NO_X emissions borne by the atmosphere also contribute to eutrophication in both coastal areas and the open ocean. Particularly in those ocean areas where the lack of nitrogen limits biological production, the influx of nitrogen oxides via the atmosphere may cause sustained damage to the balance of the regional ecosystems (GESAMP, 2001b).

If international shipping continues to be excluded from the efforts to reduce emissions, it is anticipated that the land-based efforts to reduce SO_2 and NO_x emissions will lead to an increasing proportion of these becoming attributable to shipping. Reducing the emissions from ships to comply with the requirements of the Convention on Long-Range Transboundary Air Pollution (LRTAP) by 2010 will also be achievable at significantly lower costs than the reduction of land emissions. Estimates for the costs of abatement on ships are put at € 300 million per

Type of oil discharge	[t per year]	[%]
Oil, oily compounds	252,000	45.0
Tankers – normal operation	158,000	28.4
Tanker accidents	121,000	22.5
Ship repairs	4,000	0.6
Accidents excl. tankers	20,000	3.5
Total	555,000	100.0

Table 4.2-1
Examples of oil discharges to the oceans due to shipping.
Sources: GAUSS, 2000; OECD, 1997

annum, while the same abatement effect would cost € 2,400 million on land. In the European context, this would reduce total costs from € 7,000 million to € 4,900 million (T&E, 1999).

Medium-sized and large tankers, bulk freight ships and container ships are generally powered by slow speed two-stroke diesel engines. These operate on cheap heavy oil which is extremely harmful to the environment compared to other fuels. Heavy oil has a sulphur content of up to 5% depending on its origin. The costs of reducing the sulphur level are around € 20 per ton and percentage point. Using a low sulphur heavy oil requires no engine modifications. Marine diesel, which contains only 0.2% sulphur in accordance with an EU directive, has mostly been used by modern ferries and cruise ships to date (ISL, 2001; T&E, 1999).

A whole range of technical possibilities are available to reduce NO_X. A 90–95% drop in NO_X emissions may be achieved by the addition of urea through a selective catalytic reduction process. The costs of this process amount to € 29,000–46,500 per MW and the use of this technology will increase current expenditure by around € 2 per MWh. Cheaper methods achieve smaller reductions in NO_X emissions (HAM technology: 70–80%, exhaust gas recirculation around 60%, direct water injection 20–50%, combustion optimization 25%, injection of a fuel-water emulsion 10%; ISL, 2001).

4.3 The structure of the ocean shipping sector

The increasing economic globalization has ensured high growth rates in the ocean shipping industry in the past and average growth rates of 1–4% are expected to continue during the coming years. The majority of shipping activities take place within the group of developed and transition countries (those included in Annex I of the UN Framework Convention on Climate Change). Only 16% of shipping begins and ends in different countries and a large part of the goods transported is concentrated on a small number of routes. Container traffic is mainly focused on the east-west routes between Europe, the USA and the Far East/Southeast Asia with the north-south services being of less importance and East and West Africa playing hardly a role at all (ISL, 2001). Bulk cargo is primarily transported via the sea routes used for transporting mineral oil from the Near East and other raw materials from the southern continents to the consumer centres in the north. The most important routes for mineral oil are the routes from the Persian-Arabian Gulf to Southeast Asia and the Far East and those from the same starting point to Europe around Africa or through the Suez Canal to Southern Europe. Exports to the USA are also transported around Africa and are also sourced from West Africa and Venezuela. Other regional routes include those from North Africa to southern Europe, from Alaska to California and also those between the countries bordering the North Sea (Table 4.3-1).

Table 4.3-1
Leading export and import regions for crude oil in 1999. Source: ISL, 2001

Region	Exports [Mill. t]	Region	Imports [Mill. t]
Near East	748	North America	456
Caribbean	228	Asia excl. Japan	361
West Africa	166	Mediterranean	236
North Africa	90	Japan	209
North Sea	78	North Western Europe	157

Despite the fact that the majority of the worldwide shipping fleet is owned by companies and private individuals from OECD states, only 52% of these ships sailed under the flag of an OECD state in 1999. All in all, more than two-thirds of all ships bore the flag of a developing or newly industrializing country (OECD, 1997 and 2001). The most important countries are listed in Table 4.3-2.

Registering a ship in a country subjects that ship to the jurisdiction of the relevant country. The flag state is therefore fundamentally responsible for monitoring compliance with international environmental and safety standards. The flag state also determines the terms and conditions to be adhered to under labour regulations and is entitled to impose income taxes on a ship's revenues. The possibility of choosing flag states freely (with so-called 'open' shipping registers) often promotes inadequate compliance with international standards which often leads to considerable competitive advantages for the relevant shipowners. By means of a series of international agreements the port authorities are now empowered to check whether the ships berthed in their harbours comply with international standards and where necessary detain these until the faults are rectified (OECD, 2001).

At the beginning of 2001 the world trading fleet was composed of around 41,000 freight and passenger ships (gross tonnage (GT) above 300), around 10,000 of which were tankers, 6,000 ships for dry bulk cargo, 2,500 container vessels, 18,000 parcel and roll-on/roll-off (Ro/Ro) freight ships, 2,500 combined freight and passenger ships and ferries together with 1,500 pure passenger boats. Tankers and bulk cargo

Table 4.3-2
The leading flags of the world as at 1 January 2001. NIS = Norwegian International Ship Register.
Source: ISL, 2001

Controlled tonnage (according to registered office of controlling shipping companies)	Number	Gross tonnage [millions]	Register flag	Number	Gross tonnage [millions]
Greece	3,484	85	Panama	5,538	113
Japan	3,803	70	Liberia	1,529	51
Norway	1,920	39	Bahamas	1,218	31
USA	1,905	31	Malta	1,466	28
China	3,054	27	Greece	1,175	26
Germany	2,195	25	Cyprus	1,427	23
Hong Kong	669	20	Norway/NIS	1,731	22
South Korea	1,420	18	Singapore	1,112	21
Great Britain	1,041	14			
Russia	3,672	14			
Denmark	853	14			

ships head up the list in terms of tonnage (see Table 4.3-3).

4.4 Designing a charge on the use of the oceans by shipping

4.4.1 General principles

The high seas are not subject to the legal sovereignty of any state, and are thus a classic example of a global open-access good. Scientific findings to date do not lead us to believe that the high seas are being overexploited to such an extent that considerable damage is being done, although there is growing concern about the environmental pollution of coastal marine waters.

Nonetheless, the Council considers it justified to classify the oceans as such, including the territorial coastal waters, as a scarce global common good – regardless of their legal allocation to the different levels of national sovereignties established in the United Nations Convention on the Law of the Sea (UNCLOS), and to consider the introduction of user charges. The following reasons speak in favour of this: Even though UNCLOS attaches considerable significance to territorial sovereignty – also in the exclusive economic zone – the provisions regarding marine environmental protection (Arts. 197ff UNCLOS) oblige all contracting states to establish international rules and standards at a global and regional level to protect the marine environment. With regard to ocean shipping, the classification of the oceans as a common good goes along with the right of the ships of all states to peaceful transit through coastal waters and the exclusive economic zone as stipulated in UNCLOS (Arts. 17ff UNCLOS; Ipsen, 1999).

Moreover, an inseparable ecological connection exists between coastal waters and the open ocean. The worldwide degradation of the ecosystems of coastal waters is threatening to extend to the open ocean and even to the deep sea. This is increasingly jeopardizing marine biodiversity. As the conservation of biodiversity is a matter recognized as a common concern of humankind (Biodiversity Convention), the oceans in their entirety should be regarded as a scarce common good – and one that is threatened with overexploitation. Current research moreover indicates that the biological diversity of the deep sea is far greater than initially assumed (GESAMP, 2001a).

The use of the oceans by shipping leads to a range of negative effects on the marine environment which, in conjunction with the various land-based discharges, causes the progressive degradation of coastal waters in particular. Even though around 80% of total marine pollution may be attributed to land-based discharges, the level of marine pollution from shipping is so severe that the Council considers the imposition of a charge as justifiable. The initial objective of levying a charge is to achieve an incentive effect which will reduce marine pollution. In view of the energy efficiency of ocean transportation and the significance of shipping for world trade, the Council is of the opinion that the aim of such a charge can not be to reduce the volume of ocean transportation. The aim is rather to create an incentive for measures to be taken – particularly in the areas of technology and environmental management – to reduce shipping-induced marine pollution. The Council considers it appropriate to pursue an integrated approach and include environmental impacts which

Table 4.3-3
World trading fleet according to type of vessel as at 1 January 2001.
Source: ISL, 2001

Type of vessel	Number of vessels	Tonnage [million GT]	Share of tonnage [%]	Average tonnage per vessel [GT]
Oil and product tankers	7,473	169.8	31.2	22,722
Chemical tankers	1,342	5.4	1.0	4,024
Gas tankers (LNG, LPG)	1,101	19.6	3.6	17,802
Bulk carriers	5,835	149.6	27.5	25,638
OBO carriers (ore/bulk/oil)	205	8.6	1.6	41,951
Container ships	2,580	59.9	11.0	23,217
Multi-purpose freighters	9,054	29.3	5.4	3,236
Tween deckers	4,959	24.4	4.5	4,920
Reefers	1,329	6.9	1.3	5,192
Special ships	1,145	20.1	3.7	17,555
Roll-on/Roll-off freighters	1,165	10.5	1.9	9,013
Passenger ships	1,532	9.1	1.7	5,940
Ferries and combined passenger/freight ships	2,465	13.8	2.5	5,598
Fishing vessels	8,636	8.8	1.6	1,019
Other non-freight carrying vessels	6,412	8.5	1.5	1,326
Total	55,233	544.3	100.0	9,855

are only indirectly related to marine pollution, in particular CO_2 and SO_2 emissions caused by shipping.

4.4.2 Legal considerations

A number of legally binding instruments have been developed, under the auspices of the International Maritime Organization (IMO) and also the OECD, to reduce the environmental damage caused by shipping. In this context Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL) was adopted in 1997 which set upper limits for the sulphur content of fuels (4.5% in general, 1.5% for the Baltic and North Seas) and NO_x standards, but this has not yet come into force. However these standards are not considered adequate for the heavily polluted waters of the Baltic and North Seas in view of the technology available to reduce emissions. IMO is an important player in the climate policy arena because Art. 2 para 2 of the Kyoto Protocol establishes that the industrialized countries initiate measures to limit and reduce the greenhouse gas emissions of international shipping under IMO auspices. Although this issue has already been on the agenda of the Marine Environment Protection Committee (MEPC) of the IMO for several years, scarcely any progress in the decision-making process is yet perceptible (UNFCCC/SBSTA, 2001). The IMO adopted an agreement in its Autumn 2001 session prohibiting the application of ship paint containing TBT from the beginning of 2003 and stipulating that the existing paint must be removed or sealed by 2008. This convention will come into force 12 months after ratification in 25 states which together represent at least 25% of the world trading fleet. It must therefore be stated in summary that the environmental standards elaborated by the IMO have remained fragmentary from an environmental policy perspective and that, as a result of the conflicting interests of individual states, the final outcomes of these standards are frequently unsatisfactory.

The issue of whether IMO member states may exercise more stringent standards than those of the IMO for ships calling at their ports raises a number of difficult legal questions. However, in the final analysis there are no legal problems regarding the compatibility with IMO standards of a user charge system which is differentiated in accordance with the level of environmental performance (BMT, 2000a).

The Council is of the opinion that levying a charge on the use of the oceans by shipping is also consistent with WTO rules. As the charge is not dependent on the transportation capacity of a ship, it cannot be interpreted as a tax or duty on the import of the goods transported. GATT may therefore not be applied in this instance. The charge could, however,

be seen as a tax or duty on a service, namely ocean transport, and would therefore fall in principle within the sphere of application of the General Agreement on Trade in Services (GATS). Only individual states to date have entered into binding commitments under GATS in the shipping sector but there is a possibility that more commitments will be concluded in the new round of negotiations. Even so it is not anticipated that GATS will oppose the introduction of a reasonable, non-discriminatory system of levying user charges (BMT, 2000a).

4.4.3 Determining the participants in a system of user charges

From an environmental perspective the levying of a user charge on a global basis would be desirable. Experiences within the IMO indicate that an environmentally stringent system of levying charges would be near impossible to implement on the basis of global participation. There are fears that the environmental incentive would be lost in negotiations with global participation, not only in respect of the levying of the fee but also with regard to the use of the revenues. In addition there is also the question of whether the developing and newly industrializing countries would be willing and able to summon up the administrative resources required to implement an environmentally-differentiated system of charges. Lastly, global application would imply the development of a comprehensive control system. This suggests initially limiting the group of participating states to the industrialized countries. In any case, all ships that call at ports in one or several of the participating states should be covered by the system – regardless of flag state and seat of the shipping company.

The Council therefore takes the view that user charges should initially only be levied for all ships that call at ports in the industrialized countries. The fact that the majority of ocean transport ends or begins in industrialized countries means that the main shipping parties would be included. In parallel, levying user charges may also serve as a clear signal of the willingness of the industrialized countries to contribute to financing global sustainability if the funds were deployed accordingly.

If a system of levying user charges was applied in industrialized countries only, it seems reasonable that such a system should be established within the framework of the OECD – in substantive coordination with the IMO – without, however, limiting the participants to OECD members. In the past the OECD has developed a range of activities in the shipping sector and has the competence and staff to monitor the satisfactory implementation of such a system. Other industrialized countries and interested developing and transition countries may possibly be motivated to take part in such a system at a later time. This applies particularly if a part of the charges levied is made available to finance the work of national shipping authorities (Section 4.6).

4.4.4 Possible models for levying charges

A number of countries have already employed various instruments to control the adverse environmental impacts of shipping. These instruments are primarily based on granting reductions in the charges levied with regard to shipping, whereby the level of the discount is dependent on compliance with certain environmental standards (BMT, 2000b). In addition, a levy on shipping fuel or CO_2 emissions has also been discussed in the past.

Fairway and harbour dues

Ships are obliged to pay various fees for the use of the fairways and docks. The fees take various forms and amounts and do not only differ between the individual states but also between the ports within states. The most important fees include the fairway dues, which are levied, inter alia, for the maintenance of the fairways, and the actual harbour dues to be paid for the use of the docks. Harbour dues are imposed regularly by port authorities but fairway dues are also collected by the customs authorities in some countries. No fairway dues are imposed in Germany at present and the funds necessary to maintain the fairways come from general tax revenues.

A number of incentive systems already exist granting ships which fulfil certain criteria discounts in harbour and/or fairway dues. Widespread discounts are available for tankers with segregated ballast water tanks or double hulls. In Sweden discounted harbour and fairway dues are granted to ships whose SO_2 and NO_x emissions do not exceed the ceilings stipulated in Annex VI of the MARPOL Convention. The Green Award system certifies ships which satisfy special requirements with regard to technical issues and also management and staffing matters. Certified ships are granted discounts of varying degrees in some ports in the Netherlands, Portugal, South Africa, Spain and Great Britain and also more recently in Hamburg. The certification system has hitherto only encompassed large tankers and other very large ships (BMT, 2000b).

The most far-reaching proposals for the introduction of a penalty/bonus system have come from Nor-

way. Discounts based on indexing ships in relation to the environment were proposed by Norway within the framework of the IMO. Under the proposal, a points system could be used to assess, among other things, the levels of CO_2, SO_2 und NO_x emissions, the disposal of waste and effluent and the ballast water system. Discounts of up to 50% may then be achieved depending on the number of points. No decision has yet been made on the Norwegian proposal by the IMO. Critics regard the indexing system, which is only partly compatible with the existing certification system, as too complicated and complain about the administrative effort associated with the indexing process (ISL, 1999).

Competition between ports is an important issue when considering the application of an environmental differentiation system to existing fees. The mandatory introduction of a bonus/penalty system of harbour dues would have a marked effect on competition between ports. As a minimum requirement, therefore, all the countries whose ports compete with one another should be subject to a uniform system. To avoid the distortion of competition, levying a new, uniform charge that includes a bonus/penalty system is the preferred option. Existing bonus systems for harbour dues could then continue to be applied. Fees should not be set too low so that an incentive effect may be achieved. In Sweden – in conjunction with other incentives such as subsidies for technology refits – first successes with regard to ship-based emissions have already been achieved (BMT, 2000b).

Charge on fuel or CO2 emissions

Discussions on levying a charge on shipping fuel as a way to promote environmentally sound ships are primarily focused on the imposition of a comprehensive CO_2 levy. The incentive effect of a charge on heavy oil will depend largely on the level of the charge. However, levying such a charge will cause some practical problems. It is common practice nowadays for large ships on the high seas to be refuelled by smaller tankers and the costs of transporting the fuel to Europe from Africa or the Near East has been put at € 10–15 per tonne by the OECD. If a charge was levied which clearly exceeded this amount, the instances of large ships on the high seas being refuelled with heavy oil bearing no charges are expected to increase. The Californian heavy oil suppliers already experienced considerable falls in revenue in 1991 when heavy oil became subject to VAT for a year in California. Such loopholes may only be avoided by the global introduction of such a charge. In this instance the charge should be levied directly at the oil companies as the number of heavy oil traders is very high making a charge less reliable to impose (OECD, 1997).

Alternatively a direct CO_2 levy may be imposed upon ship operators. The charge could be imposed by port officials in conjunction with the harbour dues, on the basis of the origin of the relevant freight for instance, thereby closing the loophole mentioned above. Whether the charge is levied on the basis of actual heavy oil consumption – which would necessitate the establishment of appropriate fuel balance sheets on ships – or on the basis of certified technical characteristics of the ships, this approach would mean a considerable amount of administrative work for shipowners and port authorities (OECD, 1997). The Council is of the view that levying an environmentally-differentiated charge which comprises all the main aspects of environmental pollution caused by shipping is the preferred option over a charge on shipping fuel (Section 4.4.5).

Levying a charge via tonnage tax

As the relevant flag states impose income taxes on shipowners and as fierce competition prevails between the flag states, a charge levied via the relatively low income taxes on shipping revenues (tonnage tax) would provide little opportunity to achieve adequate incentive or financing effects. Norway is, nevertheless, planning to develop a tax incentive system. Tonnage tax would firstly be increased by 50% in order that adequate discounts may then be granted to 'green ships'. No great financial benefit is expected to be achieved by this incentive but it is hoped that the differentiated tonnage tax will give the desired signal (ISL, 1999).

4.4.5 The Council's preferred model for the levying of user charges

Criteria for levying user charges

The Council favours levying a new, environmentally differentiated charge to be paid on an annual basis. In the opinion of the Council, the systems introduced to date are either too restricted in scope or too complicated to be introduced on a supra-regional or global basis. The former relates to the concentration on exhaust gas in the Swedish model and the latter concerns the Rotterdam 'Green Award' certificate which is based on such extensive criteria that it would be necessary to pay for certification which would be too expensive for smaller ships.

The charging system proposed by the Council is based primarily upon the deadweight tonnage of ships and the power of ship engines. It is not based upon the length of the journey completed because the recording and accounting processes would require much evidential documentation and exten-

sive calculations. The ship is deemed to be in service for the whole year exerting a permanent adverse effect on the environment. All measures taken to reduce adverse environmental effects and to improve safety are taken into detailed consideration as 'Quality Shipping' measures leading to a bonus in the charge calculation.

To identify Quality Shipping aspects, a catalogue containing 19 criteria grouped in three categories is proposed. These categories are: shipping company policy and management; ship design, construction and equipment; and the management and technology of operations on board ship. The catalogue was drawn up by the German Institute for Environmental Protection and Safety in Shipping (GAUSS – *Gesellschaft für Angewandten Umweltschutz und Sicherheit im Seeverkehr*). All these criteria can be evidenced by already existing internationally accepted certificates and documents, which leads to a rapid and straightforward monitoring process. Table 4.4-1 details the 19 criteria and the points achieved for fulfilling these criteria (ISL, 2001). The higher the number of points, the larger the bonus granted as a rebate on the base charge. In the system, concrete measures to protect the environment which have direct environmental effects score higher than management tools and systems which have positive effects on the basic frameworks for implementing concrete measures and often benefit other non-indexed areas.

The catalogue must be reviewed regularly in order to integrate new technologies which become available or to remove criteria which have become legal requirements and thus no longer qualify for a bonus. For example, bonus points are only granted for the removal of TBT anti-fouling paint if this is achieved well before the final IMO ban in 2008.

The absolute level of the bonus needs to be determined in the policy arena and should be oriented to the intended environmental incentive effect and fiscal revenue. The concessions granted are not intended to achieve complete payback of the required capital expenditure and operational costs. Discounts and reductions will be granted more as an additional incentive to implement the Quality Shipping criteria.

The granting of a bonus seeks to amplify the positive effects of environmental protection measures from the perspective of shipowners (meeting the requirements of charter and forwarding companies, exploiting market potential through public relations, gaining image, increased safety, etc.).

Concessions should be given for relatively low numbers of points so that they may act as a signal. The concessions granted are also based on a parallel progression which respects the rising marginal expenditure required to gain further points.

A concession of 25% of the maximum possible bonus will be granted for points of 50 and above which may be achieved at relatively low expense on

Criterion	Points	Σ	Evidenced e. g. by
CATEGORY I: SHIPPING COMPANY POLICY AND MANAGEMENT			
1.1 Environmental liability insurance	10		Insurance policy
1.2 Quality management	3		ISO, ISMA, GA certificate
1.3 Environmental management	3		ISO, ISMA, GA certificate
1.4 Personnel management	15		ITF blue card, training record, GA certificate
1.5 Green Award	3	34	Certificate
CATEGORY II: SHIP DESIGN, CONSTRUCTION AND EQUIPMENT			
2.1 Selection and use of materials	5		Material pass
2.2 Collision protection measures	10		Class notation
2.3 Redundant systems	10		Class notation
2.4 Hull stress monitoring	10		Certificate
2.5 Emergency tug systems	10	45	Certificate
CATEGORY III: MANAGEMENT AND TECHNOLOGY OF OPERATIONS ON BOARD SHIP			
3.1 Gaseous emissions from refrigeration plant	15		Specification of refrigerants
3.2 Sulphur oxide emissions	20		Certificate
3.3 Nitrogen oxide emissions	20		Certificate
3.4 Soot and particulate emissions	10		Certificate
3.5 Solid waste	15		Waste log, certificate
3.6 Black and grey water (sewage)	15		Disposal protocol, certificate
3.7 Bilge water	5		Certificate
3.8 Anti-fouling	20		Specification
3.9 Ballast water	10	130	Certificate, log
	Total	209	

Table 4.4-1
Quality Shipping criteria and records.
Source: GAUSS, 2001

the part of the ships. Commitment is therefore rewarded and an incentive is created to undertake further improvements with regard to the operational management of environmental and safety issues. The next level of concession is granted for more extensive improvements and for points of 100 and above. A substantial concession of 60% of the maximum possible bonus may be achieved in this instance. A bonus of 100% may be granted for points of 150 and above. This number of points is only achievable by a small number of existing ships as it involves significant measures. The relationship between the concessions and number of points may be adjusted in the long term as the environmental compatibility of shipping develops.

This graduated model is based on the following considerations:

- Bonus points may be achieved regardless of the type and size of the ship or of the requirements in certain shipping regions.
- Certified management systems are themselves not sufficient to achieve the required minimum number of points. Further criteria relevant to environmental and safety issues must be fulfilled.
- The maximum concession may be achieved solely by adhering to the stringent criteria contained in the category of management and technology of operations. If this is achieved, it may be assumed that the shipping company has achieved a high level of quality performance.

Technical implementation

The user charge proposed here should generally not be levied in conjunction with harbour dues. In order to simplify matters, an annual charge for all the ships on the registers of the participating countries is under consideration. Only ships from non-participating countries will be subject to the levy of a user charge in conjunction with harbour dues. The whole annual charge may be paid or, if the ship rarely calls at ports, a small fraction of the charge may be paid. Paying such a fraction of the charge should preclude the ship from paying further charges in the waters of the participating states for a certain period. Voluntary registration on the participating ship registers may also be considered as a way of levying the user charge.

The notion of calculating concessions on ship-related charges rather than on harbour dues leads to many crucial advantages:

- The accounting process would be considerably simpler if the charge and the entitlement to a bonus were determined only once a year by a central office.
- The ship would benefit from a higher total concession per annum compared to the sum of the individual concessions gained when calling at each port as long as there is no prevailing bonus model that encompasses all ports. The annual concession should be set in such a way as to have an appreciable incentive effect.
- The level of savings may be calculated by the shipowner and does not depend on the often random number of calls at certain ports.

The most expedient solution, therefore, appears to be the introduction of a user charge which is conditional upon the characteristics of a ship. Ships which fail to meet the environmental criteria pay the full charge; the others receive concessions which can amount to the majority of the charge for exemplary ships. Port state control should take on the task of fixing the concession on the basis of their expertise.

Amount and calculation basis of the charge

A ship's tonnage is one of the bases for calculating the base charge. Relating the charge to the volume of goods handled does not appear to be feasible as ship-based environmental damage does not depend on whether or not it is loaded to capacity or on the type of load being transported. Moreover a measurement in terms of load would not encompass non-cargo ships. Measurement by way of gross tonnage also raises issues such as the relatively high charge that would have to be paid by Ro/Ro ships with their large enclosed interior areas but low deadweight carrying capacity. It should also be mentioned that the gross measurement of most ships is kept low by the current practice of calculating cubic capacity fees which endangers the safety of the ship and the cargo.

The charge should therefore be related to the deadweight carrying capacity of ships, measured in tonnes deadweight (tdw). Charges for tankers and bulk cargo freighters would then be clearly dependent upon ship size. Parcel, container and Ro/Ro ships would pay slightly less in comparison to a charge based on gross tonnage. This type of calculation also contains the first environmental factor: Ships with the highest deadweight carrying capacities have the largest draughts which tends to lead to more dredging work. The resulting disposal of dredging spoil is difficult and causes further natural damage.

Another, more significant environmental factor may be integrated by taking account of the ship's engine power in kW as ships with larger engines also cause more environmental impact. Due to the fact that parcel and regular service ships have a relatively low tdw value but more power than tramp and bulk cargo ships, the lower tdw values will approximately be balanced out in the total calculation. As parcel and regular service ships carry more valuable loads at far higher rates, higher charges for more powerful ships are acceptable.

Gross tonnage would need to be used as an assessment basis for non-cargo ships, but might possibly be weighted with a different factor than deadweight tonnage.

The Council initially proposes the simplest way to calculate the base charge on the basis of the tdw and kW values. The charge will be calculated from the sum of the deadweight tonnage in tdw and engine power in kW, these being weighted by the charge factors F_1 and F_2 respectively, both of which are dependent upon the intended incentive effect and the total revenue targeted:

Base charge [€] = T x F_1 + L x F_2

Deadweight tonnage T	[tdw]
Factor F_1	[€/tdw]
Engine power L	[kW]
Factor F_2	[€/kW]

Table 4.4-2 contains examples of charge calculations on the basis of tdw and kW values for selected ships with the application of charge factors of € 0.5 and € 1. The charge factors could also be used to treat L and T differently, in order to thereby reflect environmental impacts in a more differentiated manner.

All examples are based on ships which called at German ports in 2000 with the exception of the large, high-speed ferry (46,000 kW engine power, speed 29 knots) which was running in Rostock for a short time. This large ferry would be subject to around double the charge of a ferry of the same size with a conventional speed (20 knots). This would draw attention to the environmentally dubious trend towards high speed ships which consume significantly more fuel and therefore cause increased CO_2 emissions. This model therefore offers an incentive to reduce the CO_2 emissions of international ocean shipping, thereby closing the regulatory gap left by the Kyoto Protocol.

The Council is of the opinion that a reasonable incentive effect may be achieved with a factor of € 0.5–1 per tdw or kW. Revenues of around € 360 million (at € 0.5 per tdw or kW) or € 720 million (at € 1 per tdw or kW) would be achieved at a rough estimate under the assumption that each ship controlled by a shipowner resident in the EU pays an annual charge to traverse EU waters. The concessions for Quality Ships would then have to be deducted from the net amount due (ISL, 2001). These revenues would increase accordingly if all OECD states were to participate.

The OECD would monitor whether the user charges were levied and paid by the participating countries in a legitimate manner in accordance with the model proposed here.

4.5 Undesired side-effects

No real effect on trade flows is anticipated from the Council's proposed charge. With a factor of € 0.5 per tdw or kW, the charge equals a charge per tonne of

Type of vessel	Deadweight tonnage [tdw]	Engine power [kW]	Charge for F_1 = 1 €/tdw F_2 = 1 €/kW [€]	Charge for F_1 = 0,5 €/tdw F_2 = 0,5 €/kW [€]
Coaster	1,230	625	1,855	928
Multi-purpose freighter	4,900	3,960	8,860	4,430
Container	7,946	6,600	14,546	7,273
Container	44,966	18,757	63,723	31,862
Container	104,969	54,840	159,809	79,905
Vehicle transporter	21,505	14,314	35,819	15,910
Ro/Ro freighter	7,440	11,030	18,470	9,235
Bulker	6,258	2,795	9,053	4,527
Bulker	17,162	6,840	24,002	12,001
Bulker	37,448	6,620	44,068	22,034
Bulker	71,747	7,834	79,581	39,791
Tanker	801	441	1,242	621
Tanker	13,050	4,200	17,250	8,625
Tanker	32,250	8,340	40,590	20,295
Tanker	99,122	14,050	113,172	56,586
Tanker	159,719	13,440	173,159	86,580
Ferry	631	3,820	4,451	2,226
Ferry	6,538	18,000	24,538	12,269
Ferry	6,900	46,000	52,900	26,450
Catamaran	36	3,676	3,712	1,856
Passenger cruise ship	5,500	15,400	20,900	10,450

Table 4.4-2
Examples of annual user charges for different types of ships.
Source: modified after ISL, 2001

€ 0.04–0.06 (factor 1 € per tdw or kW: € 0.08–0.12) for short sea traffic, € 0.08–0.14 (factor 1 € per tdw or kW: € 0.16–0.28) for medium-sized ships including large container ships and up to € 0.20 (factor 1 € per tdw or kW: € 0.40) for large tankers.

The maximum charge of € 0.20 or € 0.40 would apply to a tonne of crude oil at a value of around € 100. A tonne of coal or grain in a Handymax bulker would be subject to a charge of around € 0.08 or € 0.16 with a complete container or trailer being charged € 0.60–1 or € 1.20–2.0. A tonne of cellulose in Baltic Sea trade would incur around € 0.04 or € 0.08. In total the Council's proposed charge equates to 0.4–4.0% of turnover (factor 1: 0.8–8%). This percentage is practically negligible compared to the fluctuations in charter rates (ISL, 2001).

No negative effects on exports by developing countries are expected. Slight disadvantages may be experienced if old ships are used which are harmful to the environment and are subject to the full charge. In view of the comparatively slight effect of the proposed charge on charter rates, no drop in shipping revenues is expected. It is therefore assumed that there will be no negative effects on the labour market. Due to the low charge per tonne of cargo, trade flows are not anticipated to shift to the roads. This has been demonstrated by past experience with increases in freight rates. Such a shift is often impossible for purely technical reasons (ISL, 2001).

The fundamental assumption is that the burden imposed by the user charge will only have a minimal effect on rates and the shipowners may pass on the cost of the relevant discounted charge to the forwarders or the recipients of the cargo. The charge will therefore be at least partly borne by the consumer. Nonetheless, the levy rates graded according to environmental criteria will result in competitive advantages for shipowners with environmentally sound fleets which should trigger an incentive to modernize older fleets more quickly (ISL, 2001).

4.6 Use of funds

Levying a charge, as proposed here, which is graded in accordance with environmental criteria, establishes a direct relationship between the use of the oceans and the charge to be paid. The catalogue of criteria presented offers shipowners various opportunities to achieve a reduction in the charge, all of which serve to improve quality although the ease with which these may be achieved will differ depending on the type, size and age of the ship. Grading the charges according to the environmental impact of ships provides an incentive to modernize shipping which will lead to a reduction in ship-based environmental damage. However it is assumed that the incentive effect of levying this charge will not be sufficient to reduce pollution from shipping to an environmentally acceptable level. Even those ships which largely fulfil the criteria of the catalogue presented will still have an adverse effect on the environment which, in conjunction with land-based emissions, will continue to endanger the marine environment. This is where the fiscal function of user charges comes into play. The revenues from the charge are to be earmarked to protect the marine environment as a global common good.

After the introduction of the charge, two possibilities for deploying the funds should be considered. First and foremost financial support should be provided to shipyards and shipping companies to adapt to more environmentally sound standards. Secondly, the funds should be deployed to restore some of the marine environment impaired by shipping.

4.6.1 Use of funds to provide financial support for the application of more environmentally sound technologies?

In principle, the modernization of the world trading fleet could be accelerated by way of a financial subsidy from the user charge revenue. This could serve to reduce shipping-induced environmental impacts.

However there are a number of reasons why the revenues from the charges should not be used to support shipping. Environmentally-intensive activities are potentially furthered by the false impression that the oceans are available for use 'free of charge'. The proposed system of graded charges should provide more information about the use and cost of exploiting the oceans for transportation purposes (Klemmer and Wink, 2001). The Council believes that the costs for ships, which would enjoy a reduced charge and also a subsidy to improve their environmental quality, would no longer correspond to the social costs of shipping. Moreover, it hardly seems possible that a subsidy system could be developed which takes account of all the environmental criteria evaluated in the proposed catalogue. A one-sided subsidy for technical adaptation measures would reduce the significance of the other environmental criteria contained in the catalogue thereby undermining the careful targeting of the catalogue.

The primary reasons against using these revenues for shipping arepractical ones. Much bureaucracy would be involved on the national level with regard to selecting the targets and monitoring the correct purpose of the funds. On the international level, a

new, comprehensive monitoring system would have to be developed. It is possible that direct aid to shipowners may be regarded a circumvention of WTO agreements, such as the Agreement on Subsidies and Countervailing Measures, or the General Agreement on Trade in Services (GATS). Conflicts may also arise with European Community law, such as the general prohibition of subsidies (Art. 87 EC Treaty) (ISL, 2001; BMT, 2000a). Furthermore such a use of funds would lead to freerider effects which discriminate against the shipowners who made a timely effort to comply with high environmental standards. Consequently the Council is not in favour of using the revenues to fund measures on board individual ships.

4.6.2 Use of funds to remedy damage to the marine environment

In order to maintain the connection between the levying of the charge and the use of funds, the revenues from the user charge must be used to protect the oceans. For the sake of political acceptance these funds should be used where possible for the specific purpose of remedying damage caused by shipping. There are, however, a number of problems associated with this objective. Firstly, it will be difficult to localize the pollution caused by shipping, in particular in relation to the diffuse emissions and discharges such as NO_x, VOCs or TBT. Problems will also arise attributing the cause of individual environmental damage directly to shipping due to the fact that ship and land-based pollutants act in combination.

The Council therefore proposes that the purpose for which the funds are earmarked be extended: the revenues should be used to protect the oceans in their entirety. Besides the obstacles mentioned above, there are two primary arguments in favour of using the funds in such a way to remedy the damage caused by shipping. Firstly, experiences to date in marine protection have shown that the oceans, and in particular the coastal waters, may only be protected effectively if all the relevant pollutants are taken into account. This is due to the combined effects of various environmental influences and the complexity of the marine ecosystem. Secondly, the available resources should be used as efficiently as possible. We should therefore promote those measures which ensure the greatest benefit to the marine environment, regardless of the cause. The Council is therefore of the opinion that the revenues from the user charge should be employed mainly in the area of integrated coastal management, as the integrated approach is to be reduced to an environmentally acceptable level (UNEP, 2001).

On the basis of the fact that the developing and transition countries lack the resources to develop and implement an integrated coastal management programme, the Council considers it justifiable to deploy the available resources primarily in these countries. An efficient use of funds is also essential in this case. It is assumed that the developing and transition countries provide the greatest potential to achieve a comparatively cost-effective reduction of marine environmental pollution. However, there are also political considerations in favour of reducing the number of recipients. Firstly it should be mentioned that developing and transition countries will not be willing and able to use their limited resources to achieve a reasonable level of marine protection while an improvement in the situation is already apparent in industrialized countries. However, more importantly, such a deployment of the funds would lend a clear development policy element to the proposed charge which promises to enhance political enforceability at international level.

International structures are available which may be developed with regard to the administration of funds. At project level the funds should be administered by the Global Environment Facility (GEF) whose operational programmes already cover the area of marine environmental protection. The principle of limiting support to the 'agreed full incremental costs' should be adhered to in this instance. The substantive specifications for allocating the funds should be determined within the framework of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA). The integrated approach of the GPA and the close collaboration with the UNEP Regional Seas Programme make the GPA the most suitable forum for developing the required priorities and political standards. Close coordination with the Biodiversity Convention would also be recommendable. There are already marine environmental protection projects currently being supported within the context of GEF activities.

In the light of the additional responsibilities for port state control, the Council considers that it is necessary to use a limited portion of the revenues to expand the capacity of this institution. Ensuring the environmental compatibility of a ship's structure and operation requires, besides the adherence to legal requirements, a number of voluntary measures as detailed in the catalogue of criteria mentioned above. A reasonable level of funding is required to develop port state control into a fully functioning tool. This will ensure that a sufficient number of adequately certified inspectors are available in all partic-

ipating countries, a reasonable and uniform level of training is achieved resulting in substantiated inspection results, and that the technical equipment permits worldwide cooperation. In parallel, eligibility of port state control for financial support may serve as an incentive for countries outside the OECD to participate in the system of user charges.

4.7 Political enforceability

The Council is of the opinion that the introduction of a charge on the use of the oceans by shipping is based on a win-win situation which should facilitate the political enforceability of the proposal. Industrialized countries will benefit from the modifications in behaviour associated with the charge which in the medium term should lead to a significant improvement in marine water and air quality in the industrialized countries themselves and elsewhere. The industrialized countries will also obtain funds to strengthen port state control at the same time. Finally the user charge may be presented at international level as a sign of a renewed commitment to improving the financing of global sustainability. Developing countries will also benefit from the incentive effects in terms of the environment and will in addition gain access to new financing resources which may contribute considerably to the improvement of the marine environment and therefore also to human health.

Considerations within the EU regarding the introduction of an emission levy for shipping indicate that levying a charge would be politically enforceable. However we should not underestimate the aversion of the industrialized countries to a restriction of their financial sovereignty by the earmarking of user charges and their disbursement by international organizations. The discussion regarding an EU-wide introduction of a CO_2 levy shows the difficulty of implementing international levies. It is possible that the United Nations International Conference on Financing for Development (UNFfD) will provide an opportunity to reduce this resistance because of its focus on the North-South context.

Resistance from shipowners should be surmountable in view of the transparency of the system, the low level of influence on freight rates and the competitive advantages for shipowners with modern fleets resulting from the differentiated system. Resistance from OPEC states, which benefit from low costs in respect of oil transport, should also not stand in the way of implementing a user charge thanks to the deployment of the funds.

4.8 Conclusion on charging the use of the oceans by shipping

The Council is of the opinion that levying a charge on the use of the oceans by shipping will make a considerable contribution to the protection of the marine environment. Levying an annual user charge graded according to environmental criteria promises to generate an incentive effect which could promote the introduction of an effective management of the environment as well as investment in environmentally sound technologies in the shipping sector. Deploying the revenues from the charge in the area of integrated coastal management will contribute in the long term to an abatement in the pollution of the particularly endangered coastal waters. Especially encouraging results are anticipated from concentrating the use of the funds in developing and transition countries. Much can be learned from existing international institutions with regard to administering the funds at project level and developing political specifications for their use. Overall, the concept presented here of a charge on the use of the oceans by shipping may make a promising contribution to the UNFfD process, with the focus on the North-South context also facilitating the political enforceability of the concept.

Non utilization obligation payments (NUOPs) 5

5.1 Introduction

In its 2000 annual report, the Council took up the concept of "compensation for abstaining from using a resource" – in short: non utilization obligation payments (NUOPs) – as an instrument of global environmental policy and outlined the more far-reaching idea of a "worldwide system of commitments not to use particular resources" – in short: non utilization commitment certificates (NUCCs) (WBGU, 2001b).

The following discussion examines the two concepts in greater detail. In contrast to the user charges discussed in the previous sections, the two concepts do not provide any direct mechanisms for generating (additional) funding for global sustainability policy. On the contrary – their implementation will require additional state funds. Nonetheless, they are in some respects similar to the concept of user charges, as they share the ultimate goal of safeguarding the conservation of environmental resources by establishing a system in which payments are made for their use.

However, unlike user charges for airspace and the high seas, instruments based on non utilization obligations cannot be implemented on a global level over the short to medium term. This is particularly true for a system of NUCCs, which can presumably only be realized with a long-term horizon.

5.2 The concept

The emergence of global environmental problems is not limited to elements of the global commons for which the allocation of property rights is absent or entirely inadequate. In contrast to airspace or the oceans, most land and freshwater areas fall clearly under the sovereignty of states. These have, as a matter of principle, the sovereign right to fully use their national environmental assets and, including the right to destroy them. As soon as a natural resource yields significant external benefit of global scope, the destruction of this resource presents a global environmental problem. One example among many is the loss of forests, which serve as carbon sinks and regulators of macroclimate and contribute to the conservation of biological diversity. Biodiversity is also an example of a good that is distributed largely across the sovereign territories of states, but whose existence and conservation has benefits for the whole of humanity and thus has global value. As such environmental resources fall under the sovereignty of individual states and do not 'belong' to the global community, they are not counted as global common goods in the narrower sense. That their conservation must nonetheless be a "common concern of humankind", as the Convention on Biological Diversity (CBD) formulates it for the conservation of biodiversity, stems from the high global value of such environmental resources (Biermann, 1996). It must be said, though, that the boundaries between global common goods in the narrower sense and national-level goods of global value are fluid.

In the case of ecologically highly sensitive and particularly valuable resources of global concern that are located in national lands and waters, the Council argues for priority of nature conservation over all other interests (WBGU, 2001a). From a perspective of global ecology, it is advisable – at least in the case of such "landscape-use type N" (WBGU, 2001a) – to abstain from a degrading use of national land or water areas.

However, it is a fundamental problem that the costs of non utilization (more precisely: of abstaining from degrading types of utilization) are incurred locally and would be borne predominantly by the host country, while all states would benefit from conserving the resource. The costs of abstaining from destructive local forms of utilization include on the one hand the costs of safeguarding non-degrading utilization, and on the other hand the opportunity costs such as the foregone income from forest clearance and subsequent agricultural utilization. The host country thus has less interest in conserving the resource than the rest of the international community (Suplie, 1996).

The geographic distribution of these environmental goods is often highly uneven. As a consequence, the (opportunity) costs of conserving the goods would also be distributed very unevenly. This is particularly apparent in the case of tropical forests and biological diversity in general. The greater part of these resources is located in 'hotspots' in developing countries (Myers et al., 2000). Many developing countries have economies highly dependent upon the unrestricted use of natural resources and are neither willing nor able to bear the costs of non utilization desirable from the perspective of the global environment (Swanson, 1997).

This is the starting point for the concept of non utilization obligation payments (NUOPs) in the narrower sense, which are also termed compensation payments.

Compensation payments

In order to motivate developing countries, in particular, to engage in non utilization to the globally desired degree, international compensation payments are made in return for their abstaining from a degrading local utilization. The international community, which benefits the conservation of a resource, because it at least indirectly exploits its existence or global systems control function (existence value and functional value; WBGU, 2001a), makes a payment in return for this. The resultant revenue is used to give the host countries incentives to safeguard the conservation of the resource and its functions.

The level of the compensation payment corresponds in the ideal case – under simplified assumptions – both to the benefit that those countries making the payment derive from the non-occurrence of resource degradation and also to the net costs of non utilization incurred by the host country (monitoring and opportunity costs of abstaining from degrading local utilization less the host country's own benefit from resource conservation). In other words: If the compensation payment is marginally higher than the net costs of non utilization incurred by the host country, then the host country has an incentive to enter into the NUOP contract.

If the compensation payment is marginally lower than the level of the benefits derived by the potential payers through conservation of the resource or marginally lower than the level of damage which the potential payers would suffer as a result of degradation of the resource, then a NUOP contract is worthwhile for them.

NUOPs can be implemented by various groups of actors. Potential payers can be a state, a group of states, the international community or also private organizations (e.g. foundations, environmental NGOs). Potential recipients are in the first instance the host states, but also private entities in these countries if the property rights to an environmental resource are assigned to them.

In connection with compensation payments, the Council wishes to stress that it does not take 'non utilization' to mean an abstention from every kind of utilization. First, even in the case of total protection of a natural good of global value, the purpose is precisely to be able to continue to use the good globally, in the sense of participating in the benefit derived from conservation of the resource. In other words: The payment is made for the use of the functional value and existence value of an ecologically intact resource. Second, this does not exclude the possibility that certain local forms of utilization continue, so that 'non utilization' means above all abstention from degrading local forms of utilization.

A fundamental aspect of NUOPs is thus that the approach can be applied to individual forms of local utilization. For example, non utilization can refer to non-clearcutting a specific forest area while leaving other – sustainable – forms of utilizing the same area unaffected. NUOPs therefore are consistent with the ecosystem approach of the Biodiversity Convention (CBD, 2000), which integrates the conservation and sustainable use of biological diversity. It would thus be more accurate to speak of 'payments for obligations to abstain from unsustainable types of utilization' instead of 'payments for non utilization obligations'. However, the following discussion uses the shorter, latter form due to the unwieldiness of the former.

Implementing NUOPs

NUOPs can be implemented by various mechanisms (WBGU, 2001b). The most obvious avenue is through negotiations on concrete non utilization projects between the relevant players, i.e. those parties interested in the conservation of the resource on the one side and the owners on the other (in a fashion similar to bilateral tropical forest conservation programmes, debt for nature swaps and similar schemes).

A more far-reaching variant would be the attempt to institutionalize a market or a clearinghouse for the purchase of non utilization obligations. In this market, governmental and private owners of resources would offer a supply of non utilization obligations. Those parties interested in conserving the resources would constitute the demand. The advantage of this approach as compared to case-by-case negotiations is that the level of payments would be determined by competitive processes. In an ideal case, resources would always be conserved where the costs of non utilization are lowest. However, the problem with

this variant is that it presupposes a sufficiently high level of supply and, above all, a sufficiently high level of demand. Moreover, the resources on offer for non utilization must be comparable, i.e. largely homogeneous. If these two preconditions are not met, this 'market' in non utilization obligations ultimately does not differ from 'conventional' international negotiation mechanisms.

Market in non utilization units (TCC approach)

In order to improve the supply and comparability of the rights traded, use could be made of the concept of 'tradable conservation credits' (TCCs). TCCs are under discussion primarily for the conservation of soil and biological diversity in the tropics (Panayotou, 1996; McNeely, 1999; Plän, 1999). In highly simplified terms, the system operates as follows: A (tropical) host country splits up into individual plots the conservation area potentially available for non utilization (or, more accurately, for sustainable use) and provides information on the type and state of the plots and on the species occurring in each plot. This provides the potential demand side of the market with an overview of the available supply of non utilization units that could otherwise only be obtained through wearisome bilateral negotiations and at great cost. If it were possible to develop international standards for the selection of conservation areas suitable for TCCs – for instance based upon experience with criteria for designating internationally recognized protected areas (e.g. IUCN, Ramsar Convention, World Heritage Convention; WBGU, 2001a) – this would facilitate the applicability of NUOPs at the international level and would support the emergence of a market in non utilization units. For one thing, it would bolster supply; for another, the improved transparency would have the effect of stimulating demand owing to the reduced transaction costs.

In order to integrate further demand-promoting effects into the concept of creating a market in TCCs, it has occasionally been proposed that industrialized countries give domestic companies the opportunity to purchase TCCs in lieu of a part of their local environmental and nature conservation obligations. This would raise awareness of global interrelationships and enhance economic efficiency. If implemented, the opportunity for companies to exploit such compensation measures in their advertising would even create an incentive for these companies to become involved in the mechanism.

A system of tradable non utilization commitment certificates

This leads us to a third option for implementing NUOP arrangements, which the Council terms tradable NUCCs (WBGU, 2001b). The initial function of NUCCs is above all to generate demand for non utilization obligations. The approach can be outlined using the example of tropical forests: A precondition is that as many states as possible – ideally all, but at least a large group – undertake to ensure that a certain amount of tropical forest area is not utilized destructively. The second step is to distribute this undertaking among the individual countries. States that have a 'surplus' of tropical forest for non utilization on their own sovereign territory can consequently sell NUCCs to those countries that have no or too little unused tropical forest. From an economic perspective, the attractiveness of the tradable NUCCs approach lies, as with tradable emissions permits, in a high level of efficiency. Moreover, this approach would create an automatic financing mechanism for the conservation of environmental goods of global value.

Once again, however, there is the problem that the resource would need to be relatively homogeneous so that tradable non utilization units can be created. Finally, the tradable NUCCs approach presupposes that the international community can resolve to undertake these commitments and that they are also complied with. The initial distribution of the certificates is crucial. Consideration would need to be given not only to the proportionate benefit derived by a country from the conservation of the global environmental resource, but also to that country's economic capacity and physiographic endowments. Poorer countries whose territories harbour no areas for which NUCCs can be undertaken can hardly be expected to deploy their scarce financial resources to purchase NUCCs.

Whether NUOPs can contribute to conserving environmental goods of global value depends upon a range of conditions. The key preconditions include sufficient demand for non utilization obligations (i.e. willingness and ability to pay), unequivocally resolved use rights with respect to the resources and adequate means of monitoring and enforcement. Regardless of whether NUOPs are actually suitable and feasible, an international debate on them would have the positive effect of making it clear that the conservation of goods of global value by host countries cannot be taken for granted, but involves costs to which all states should contribute, because, after all, they all derive benefit from the conservation of these goods. The necessity to monetarize the benefit may contribute to making apparent the existence value and functional value of these goods (WBGU,

1999), thereby enhancing the incentive and willingness to conserve the resources in both North and South.

5.3 Existing similar mechanisms

Mechanisms similar to NUOPs are known mainly from the local or national level. Examples – albeit less motivated by environmental policy considerations – include the land set-aside payments made by the European Union, the 'water penny' (Wasserpfennig) of the German regional state of Baden-Württemberg, urban planning approaches in the USA (Tradable Development Rights; Panayotou, 1995) and various instruments for forest and coastal conservation in Costa Rica. In Costa Rica, Tradable Reforestation Tax Credits for primary forest conservation were initially issued; after a trial phase, these were followed by a system of Certified Tradable Emission Offsets (CTO) (Panayotou, 1998; Castro et al., 2000).

A number of mechanisms similar to NUOPs can be found at the bilateral level. These include debt for nature swaps, development cooperation projects or transboundary regional cooperation schemes. In these arrangements, one state makes payments explicitly or implicitly to neighbouring states for certain environmental protection services. However, all these mechanisms are only sporadic. They are inadequate for ensuring the enforcement of an appreciable and lasting non utilization of an environmental good of global value (Didia, 2001). Moreover, these schemes are often environmental protection projects of limited duration, at the end of which further conservation is not guaranteed. However, precisely the aspect of long-term protection is of great importance in connection with global environmental resources.

At the global level, no NUOP schemes are yet in place. However, there are moves to extend national pilot projects to the international level. Moreover, there are a number of mechanisms into which NUOPs could be integrated, at least theoretically, and institutions that may provide starting points for designing a mechanism for implementing NUOPs. These include some aspects of the Convention on Biological Diversity (CBD), the Global Environment Facility (GEF) and the Kyoto mechanisms in particular.

The CBD provides an international arena in which an 'international ecological network' (Bennett and Wit, 2001) could be established. NUOPs could possibly be integrated, as a financing mechanism, into such a network. The Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) of the CBD has already elaborated recommendations – focussing specifically on forest biodiversity – for the establishment of protected area networks (CBD, 2001). The strategic decision in favour of an 'international ecological network' is already being called for in various quarters and may be taken by the CBD COP-6 in April 2002. This would also provide an opportunity to put NUOPs – and, if appropriate, the concept of NUCCs – on the agenda and to examine to what extent these instruments could be operationalized through the GEF, which is the financing mechanism of the CBD.

In addition to biodiversity conservation projects, GEF funds are also used to finance other environmental projects, e.g. in the fields of climate protection and ozone layer protection (Klemm, 1998). The GEF and similar funds are concerned above all with the 'agreed full incremental costs' (Biermann, 1997), in which, at least in theory, the opportunity cost concept, which characterizes NUOPs in the narrower sense, is already of importance. However, giving greater weight to opportunity costs within the concept of 'agreed full incremental costs' is hampered by substantial practical difficulties in identifying, demarcating and monetarizing the opportunity costs, as well as by the scarcity of funds (Plän, 1999).

For the concept of NUCCs set out above, it appears expedient at first sight to consider the flexible instruments under the Kyoto Protocol (CDM, emissions trading) as a mechanism that might provide a number of starting points for the design and operationalization of a worldwide system of non utilization obligations. In principle, the difficulties in practical implementation set out above are also to be expected for the Kyoto Protocol's flexible mechanisms. However, it needs to be kept in mind that a worldwide system of non utilization obligations does not establish international trade in emissions and thus use rights that might, at least theoretically, be put on offer by every country or from whose purchase each country can abstain. The concept rather aims to establish international trade in non utilization units that can only be put on offer by host countries. Non-host countries would accordingly be forced to procure tradable non utilization units. In general, (future) experience with the flexible Kyoto instruments can be expected to be helpful in implementing a worldwide system of non utilization obligations, but the transferability of the Kyoto mechanisms is limited.

Finally, experience gained with instruments similar to TCCs that are currently being trialled in a number of countries (e.g. Costa Rica, Mexico) would need to be evaluated. These can be expected to provide, in particular, an understanding of the technical feasibility of creating a market in non utilization

units (Castro et al., 2000). If, in the field of biological diversity, the vision of an 'international ecological network' is to be realized, NUCCs represent an option worth considering.

5.4 Preconditions for the application of NUOPs

For the NUOP approach to be applied, at least five criteria must be met:

1. The abstention from commercial utilization of the resource, or its conservation by means of non-degrading utilization, generates significant transboundary benefit.
2. The parties entitled to use the resource (state, owner or association of owners) and thus the potential negotiating partners and recipients of payments are known.
3. Monitoring of compliance with non utilization (or sustainable use) is possible at reasonable expense.
4. Non-degrading utilization is clearly definable.
5. The parties entitled to use the resource locally are capable of enforcing their right of use vis-à-vis third parties.

The first and second criteria illustrate that NUOPs initially only enter into consideration for 'non-real' global commons for which the property or use rights are clearly defined and whose degradation generates transboundary negative effects. Nonetheless, there is a connection between such national-level resources of global value and global common goods. The conservation of an environmental good of global value can contribute indirectly to conserving a 'real' global common good. This once again is apparent with reference to the example of tropical forest conservation: Non-degradation of forest areas contributes to, among other things, the protection of the Earth's climate, a component of the global commons.

Besides the special case of forest conservation, it is above all biodiversity conservation in general that is under discussion as a potential field of application for NUOPs. Here, interest is focused on the designation of protected areas, as this is most likely to meet the third criterion in addition to the first two.

The fourth criterion can most simply be met if the status quo is to be preserved through total non utilization, as this condition is particularly easy to define (e.g. IUCN protected area categories I-III; McNeely et al., 1994). In the field of biological diversity it is necessary to combine the conservation and sustainable use of ecosystems and to distinguish these from degrading utilization, so that the scope of application of NUOPs need not be limited to 'strict total protection'. However, ecosystem conservation by means of NUOPs will scarcely be compatible with those forms of extractive use of biological resources (logging, grazing, hunting etc.) that trigger changes in ecosystem structure and function and thus in biological diversity.

As financing by means of NUOPs is most suitable for areas in which nature conservation has priority, this is not a 'universal' tool. Indeed, care needs to be taken that the application of this specific instrument is embedded in an overarching strategy (a system of differentiated intensities of use; WBGU, 2001a). In ecosystem management, the entire spectrum from total protection through to 'artificial' ecosystems (e.g. intensively used agro-ecosystems) must be viewed from an integrated perspective and accordingly other instruments would need to continue to be taken into consideration (WBGU, 2001a).

To what extent the fifth criterion is met depends above all upon the structures for enforcing property and use rights. Contracts with the owner (the state or other parties) on the designation of a tropical forest conservation area make little sense if, for instance, the owner is unable to effectively prevent fire clearing by others. NUOPs for nature reserves that themselves are damaged by negative spillovers (e.g. watercourse pollution, acid rain) also appear dubious.

Contracts with private owners are more susceptible to these problems than contracts obliging states to commit themselves to non utilization, as states are more likely to be in a position to remedy such effects.

Potential areas in which to apply NUCCs must also meet the above criteria. The range of resources entering into consideration will likely be substantially narrower than for NUOPs because, firstly, a multilateral non utilization obligation needs to be entered into. Secondly, the resources need to be comparable (cf. the discussion of a market in non utilization obligations). For instance, it will not suffice for each country to give a certain overall quantity of land protected status and then to meet this obligation by paying another country for not using the same quantity of land. Mudflats, deserts and rainforests are not interchangeable. It will be very difficult to define conversion factors. Consequently, NUCCs would only enter into consideration for comparatively few environmental resources, namely those for which TCCs or similar schemes can in principle be standardized at the international level.

All in all, NUOPs, TCCs and NUCCs appear most readily implementable for the conservation of those land and freshwater areas whose ecological function necessitates largely total protection (IUCN Categories I-III or WBGU Category N; WBGU, 2001a). Consequently, pilot projects in this field appear advisable. This is not to say that the approach should remain restricted to payments for abstaining from all kinds of local utilization. On the contrary, certain

forms of utilization that are in harmony with the ecological conservation of the resource can be explicitly permitted (positive limiting list within the context of an ecosystem approach). However, it is essential that the permitted utilization options are narrowly defined and not too numerous. For ecological reasons in particular, the Council is sceptical about proposals which provide for international compensation payments if specific forms of utilization are abstained from, as would be the case with a worldwide system of 'transferable development rights' (Panayotou, 1998). With such a negative list approach it would never be possible entirely to preclude the risk of degrading utilization.

5.5 Aspects of operationalization

5.5.1 Modalities

First of all, a time horizon needs to be defined over which non utilization is to be agreed. From an ecological, preventive perspective, a period that is as long as possible – possibly unlimited – is generally desirable. If non utilization should prove to be counterproductive or unnecessary due to new information or developments, then the contract can be terminated or the non utilization obligations bought back. On the other hand, the aspect of political enforceability of non utilization in the country of the recipient of the payments speaks against a very long obligation period, as do uncertainties concerning the future value of non utilization and thus the 'proper' level of the payments.

It further needs to be decided whether one-off payments for non utilization are to be made or, alternatively, recurrent, conditional payments. In most cases, recurrent payments (analogous to leasing) will be preferable because, in the absence of effective international enforcement mechanisms, there would otherwise be a comparatively great incentive to breach the contract (cf. on leasing in the environmental sphere Oberndörfer, 1989; Swanson, 1995; Richards, 2000).

One-off payments and theoretically infinite non utilization are ultimately only conceivable in the case of the purchase of, for example, land areas, and presuppose, in turn, a stable, functioning state governed by the rule of law in order to enforce the property and use rights. However, strictly speaking, the purchase of 'resources of global value' by the international community (or by foreign private-sector entities) for the purpose of conservation does not fall under the NUOPs approach. In the NUOP approach no property rights are transferred, but use rights are 'leased'. Moreover, the purchase of areas by other states or private entities would encounter political and legal limits. For NUOPs proper, finite periods of about 10–30 years are conceivable and recurrent annual payments expedient, the payments roughly matching the annual costs of non utilization (monitoring and opportunity costs). Largely the same considerations apply to tradable NUCCs.

5.5.2 Financing sources

NUOPs can be agreed upon bilaterally between payers and recipients, and financed accordingly. Depending upon the type of payer (state or private-sector/NGO entity), the payment comes out of the general state budget or from donations. Depending upon the form of fiscal law and the law of foundations, the general public bears a part of the costs of payment even in the case of private-sector contracts. In principle, financing for bilateral NUOPs would scarcely differ from that of ongoing resource conservation programmes operated by environmental organizations or development cooperation agencies, including debt for nature swaps. Less obvious similarities can also be seen with the CDM under the Kyoto Protocol, particularly if private-sector entities could partially 'exempt' themselves from specific local nature conservation obligations by purchasing non utilization obligations from developing countries. With regard to *multilateral* approaches, it needs to be resolved who contributes how much finance. In principle, the same issues arise as for the GEF and other international environmental funds.

Financing through voluntary contributions not bound by any specific set of rules is the most readily enforceable approach, but provokes freerider behaviour among payers and thus leads to a deterioration in payer honesty (global commons dilemma). Moreover, such an approach creates planning uncertainty, which would greatly impede the very long-term conservation of environmental resources of global value. On the other hand, binding payment commitments are harder to enforce, as they necessitate permanent expenditure commitments by payers that can be expected to encounter political resistance. Finally, paying states need to agree on an allocation formula. Under the benefit principle, all states would have to participate in financing NUOPs in accordance with the benefit that they derive from the conservation of the resource. However, this approach founders upon the circumstance that the specific benefit cannot be identified and quantified, particularly as each coun-

try has an interest in concealing its benefit and declaring it to be very small in order to make its contributions as small as possible. Population numbers could therefore be taken as a proxy allocation formula. However, both the benefit principle and – quite particularly – this proxy indicator would run counter to development policy goals, as developing countries not endowed with the resource in question would have to contribute to financing to a degree similar to that of industrialized countries or would even have to make higher payments.

The ability-to-pay principle suggests the participation of states according to their economic performance (e.g. the UN financing formula). As it can be assumed that the monetary benefit derived from environmental conservation tends to rise in step with income, this principle would also partially do justice to the benefit principle. Moreover, it is argued for the field of tropical forest conservation that its conservation contributes to protecting the Earth's atmosphere, which is under pressure from impacts caused mainly by the industrialized countries. An allocation formula based upon the economic performance of countries thus would indirectly also do justice to the polluter-pays principle.

In the case of tradable non utilization units and with a more far-reaching system of NUCCs, financing would be up to the individual states. No allocation formula for financing would be necessary. However, in a system of NUCCs, the allocation of certificates among the countries is crucial in determining the extent to which individual countries are required to contribute to financing. If the system obliges all countries to ensure non utilization of certain quantities of a resource within their own territory or abroad, it is not impossible that – depending upon the resource – a developing country will become a net payer and/or an industrialized country will become a net recipient. It therefore appears advisable to exempt from the commitment poorer developing countries that are not endowed with the resource to be conserved and, if appropriate, to exclude industrialized countries from the group of recipients. Besides the ability-to-pay principle as a distributional criterion, in the field of biosphere conservation the area of a country would enter into consideration as a supplementary basis of assessment.

5.5.3 Level of payments (financing requirement)

It is scarcely possible to make statements in advance on the level of the compensation payments to be made for a specific field of application. For one thing, there are major problems in identifying the benefits and costs of non utilization, be it due to general information deficits and/or as a result of asymmetrically distributed information among the negotiating parties. Attempts to monetarize the costs and benefits of tropical forest conservation illustrate that the level of payments considered necessary depends very greatly upon the underlying assumptions with respect to time horizons and the discount rates chosen (Diehl, 1993; Costanza et al., 1997; Plän, 1999; Cremen et al., 2000; Pimm et al., 2001). Nevertheless, these estimates do show that the sums will be in the region of thousands of millions of Euros.

The level of payment – in other words the price of a non utilization obligation – ultimately depends upon whether non utilization obligations are tradable and how high the demand for them is. While with 'traditional' NUOPs the price is determined through bilateral negotiations and information costs are relatively high, in the case of tradable non utilization units pricing is left to the market. Under the system of NUCCs, the agreed overall quantity of units to be conserved critically determines the level of demand and thus the price.

5.5.4 Recipients of payment and use of funds

It is normally assumed that the recipients of international NUOPs are the host states and that compensation payments are ultimately made to governments. On the other hand, if the use rights to the non utilized resource are allocated within the host country to other levels (e.g. local authorities, private-sector entities), then it is in principle conceivable that these may be the recipients of payment. However, private ownership of resources does not necessarily imply that the private owners must receive the payment directly. Thus, a host country that enters into non utilization obligations can provide compensation to the private-sector owner or can take coercive measures. Equally, depending upon the statutory situation, the state can prevent private-sector entities from entering into NUOP arrangements directly. Because the concept of NUOPs should not be overburdened in intergovernmental debate by the specific problems of the inner-state distribution of property and use rights and since, moreover, the recipient state is better able than private-sector entities to ensure effectiveness, it is advisable to proceed initially with the state as negotiating partner or market partner and recipient of the payments. Such an approach need not exclude per se a conditionality of the use of funds, such as the requirement that they be channelled to those economic units that effectively bear the opportunity costs of non utilization .

The original concept of international compensation payments makes no explicit provision for conditions upon the way funds are deployed. However, there are good reasons for introducing conditionality for a large part of the payments (Plän, 1999). This can prevent abuse of the instrument by elites (Section 5.6) and can enhance the acceptance of the instrument among the population in both the payer and recipient countries (Section 5.7). Moreover, soil degradation in particular is poverty-induced in many instances. Abstaining from degrading utilization can, in specific cases, impact upon the economic livelihoods of the poorest, so that it is essential to deploy funds to their benefit.

5.5.5 Conclusion

The considerations set out above illustrate that the most varied preconditions need to be met before the NUOPs approach can be operationalized on a broader scale at the global level. These preconditions include:

- Removing information deficits and asymmetries relating to the costs and benefits of non utilization,
- standardizing reasonably homogeneous non utilization units,
- developing 'specimen contracts' (thus reducing transaction costs),
- defining non utilization or non-permitted forms of utilization, and
- ensuring effective monitoring and penalties.

In summary, NUOPs – and NUCCs in particular – will best be operationalizable for those ecosystem areas for which largely total protection is the aim, or for which there is a clear positive limiting list that sets out permitted, sustainable forms of use and prohibits all other, degrading uses.

Although a need for research on many aspects remains, the Council nonetheless recommends examining to what extent a framework might already exist now, notably in the shape of the Biodiversity Convention, within which the concept of NUOPs or NUCCs may be operationalizable. The strategic decision to establish an international ecological network – which may already be taken at CBD COP-6 – would be a possible first step. A declaration by the WSSD in favour of such a worldwide system, already proposed by the Council elsewhere (WBGU, 2001b), would be a further important step. NUOPs and NUCCs could be considered as elements of the financing of such a network. The GEF, in its capacity as the financing mechanism of the Biodiversity Convention, would have the role of implementing these instruments.

5.6 Undesired side-effects

NUOP instruments harbour the risk of freerider and substitution effects in the host countries. With regard to freerider effects NUOPs create incentives to designate areas for conservation that would anyway not have been used degradingly, substitution effects involve an intensified utilization of unprotected areas. This 'perverse' substitution effect may even be exacerbated by 'successful' NUOPs, as these lead to scarcity and price increases of the products for whose production the resource is degraded. Rising prices, in turn, create an incentive to intensify production on those areas that are not officially protected.

Moreover, the risk of 'moral hazard' must certainly not be underestimated: NUOPs can create an incentive for host countries to contribute intentionally to the destruction of ecological resources in order to qualify as NUOP recipients. However, the moral hazard problem could be mitigated greatly by means of a global system of conservation commitments in which (tradable) NUOPs are embedded. As soon as the resource has been inventoried and, above all, as soon as the commitments have been allocated in binding form, the above behaviour is no longer worthwhile.

Moreover, compensation payments have in common with other international transfers for environmental protection the danger that states and sections of the population develop an attitude in which conservation is viewed primarily in exchange for international funding (recipient mentality), which weakens their own responsibility for the conservation of the ecosphere. In the extreme case, NUOPs create a situation in which natural resources are only conserved if international compensation payments are made in exchange. This danger is smaller in a non utilization obligation system than in 'ordinary' compensation payment systems. This is because every country participating in the system and endowed with the relevant resource must initially undertake a commitment to ensure the conservation of at least a certain quantity of the resource in question without receiving any payment for this undertaking.

The undesired side-effects of NUOPs further include the risk of their abuse by the elites in the host countries for their own advantage. If the behaviour of the government is not geared to the greatest benefit of the economy as a whole, but to the interests of individuals, then there is an increasing risk that NUOPs will become an impediment to development. This potentially perverse effect speaks in favour of conditionality on the use of funds as well as involvement of the local population.

Finally, it is necessary to examine the international distributional effects generated by a global NUOP system. NUOPs imply a redistribution of financial resources from the 'North' to those developing countries that are rich in resources of global value. Within the context of scarce financial resources for international environment and development policy, it must be expected that this will be at the expense of less resource-rich developing countries. These, however, are frequently precisely the poorest developing countries (Myers et al., 2000). The redistributive effects of NUOPs and similar mechanisms can thus quite well run counter to development policy objectives, such as that of commensurability with specific needs.

5.7 Political enforceability

The political acceptance of NUOP instruments can be expected to be greatest in the industrialized countries (the payer states) in cases where the resources in question are those whose global benefit is readily appreciable and for whose conservation there is a high degree of sensitivity, such as tropical rainforests or individual animal and plant species. However, the concept of opportunity costs is difficult to communicate to the public, so that there might be resistance if the recipient states were rewarded for 'doing nothing'. Consequently, acceptance could be enhanced by making the use of funds subject to conditionality and by spending the funds at least partly on projects worthwhile in terms of environmental and development policy. This would have the further effect of reducing pressures on official development cooperation. However, this effect stands and falls with the assumption that the political enforceability of a budget item titled 'global environmental protection' is greater than that of an attempt – at present scarcely feasible in Germany – to increase the budget item for state development cooperation activities.

On the part of the South, which will be rewarded by payments for its provision of natural goods of global value, acceptance will be far greater. However, it should not be underestimated that NUOPs have, at first sight, an aspect of charity, against which resistance may quite well emerge. Moreover, they may heighten the economic dependence of economically poorer countries upon more wealthy countries. Above all, however, NUOPs may be viewed as an assault on the sovereignty of countries and as an attempt to transform them into the 'nature conservation park of the North'. Finally, those who suffer income loss by abstaining from locally degrading uses or whose future sources of income are blocked can be expected to argue against NUOPs. Not least for this reason, it would make sense to require that the funds are channelled to the (potentially) damaged parties or into development projects that benefit them. Above all, though, those immediately affected – such as local communities, including indigenous peoples – need to be involved intensively in the development and implementation of the concept (participation principle).

5.8 Conclusion on non utilization obligation payments (NUOPs)

On the one hand, NUOPs differ from global user charges in that they are not a financing instrument in the narrower sense. Rather, they are a vehicle for valorizing a limited set of (national-level) goods of global value. On the other hand, it is precisely for this reason that NUOPs are related to the concept of user charges: The payments that must be made can be viewed as a charge for using or deriving benefit from the conservation of an environmental resource.

Moreover, NUOPs can be utilized to generate additional funds for development cooperation if private demand for them strengthened. For instance, promoting the TCC approach could increase the participation of private-sector entities (NGOs, foundations, possibly companies) in NUOP arrangements. The influx of funding from the private sector could be further increased if state incentives were created to enter into private-sector NUOP arrangements (e.g. through fiscal law and the law of foundations, or by partially exempting companies from local environmental protection requirements in return for purchasing TCCs).

A system of NUCCs is the only variant of NUOPs that would create an international automatism for the financing of resource conservation. However, the preconditions for operationalizing this concept are not in place at present. Nonetheless, the Council recommends promoting international policy debate on this concept. An examination of whether non utilization units can be defined worldwide (for instance in the tropical forests or another biodiversity field, or within the context of a global ecological network) could be a first step. The second step would be an international agreement defining how many units each individual country must possess, i.e. for how many units of a resource each individual country must ensure that they are not degraded.

6 Recommendations for action and research

The present special report of the German Advisory Council on Global Change (WBGU) is concerned with the politically viable operationalization of the concept of charges for the use of global common goods. This proceeds from the understanding that regulatory gaps are causing global common goods to be overexploited which is jeopardizing their functional capacity. Global user charges could close the prevailing regulatory gaps. Charging use-related environmental costs creates economic incentives to reduce the use of global common goods (environment-related *incentive function* of user charges). At the same time, financial resources are mobilized that can be used to preserve functional capacity or to adapt to damage resulting from overexploitation (*financing function* of user charges).

The Council has applied this basic idea of global user charges to three environmental fields and recommends to the German federal government that it

- promotes the levying of an emissions-based charge for the use of the atmosphere by international aviation,
- promotes the levying of an environmentally differentiated charge for the use of the oceans by international shipping,
- promotes the intensified integration of ICAO (for aviation) and IMO (for ocean transport) into global environmental policy,
- raises the profile of the concept of non utilization obligation payments (NUOPs) on the international agenda, and
- deploys the revenue generated by global user charges as true additional resources for the financing of global sustainability policy.

Charging the use of the atmosphere by international aviation

International aviation generates numerous environmental problems. The Council has concentrated upon the atmospheric impacts of aviation in the present report, thus largely focusing on the radiative forcing emissions. Aviation is the source of greenhouse gases with the highest growth rate worldwide. In various scenarios, the IPCC estimates that by the year 2050 the contribution of aviation to overall radiative forcing from anthropogenic greenhouse gas emissions will reach 3.5–15%. It is a cause for concern that, despite this considerable climate impact, the emissions of international aviation are not yet subject to any reduction obligations. They are not included in the emissions inventories of states and therefore do not fall under the quantitative commitments of the Kyoto Protocol. The Council thus views the use of the atmosphere by international aviation as a major regulatory gap that urgently needs to be closed for reasons of climate protection. This could be achieved by a user charge.

Among the various design options for a user charge on aviation, an emissions-based charge is particularly suited. The levy rate could be based upon the specific radiative forcing from the various emissions of aviation. An emissions-based charge would have a relatively high degree of practicability and would establish a largely direct connection between the extent of impacts, the level of revenues and the purpose for which revenues are used. This is of great importance with regard to the acceptance of a user charge on aviation and thus the efficacy of the measure.

The Council therefore recommends to the German federal government that it uses its influence to promote the introduction of an emissions-based user charge on aviation, ideally at the global level. According to the provisions of the Kyoto Protocol, ICAO should regulate this matter. If resistance at global level should prove to be too great, the Council recommends initially introducing an emissions-based user charge at the European Union level.

Assessment of the levy rate should be based primarily upon climate protection goals. Consequently, the revenue from the user charge would have to meet the proportionate financing requirement for measures to restore the global climate and adapt to climate damage – particularly first-order damage. It follows from the estimated share of aviation in the overall climate impact from anthropogenic greenhouse gas emissions by 2050 that costs in the order of € 3–30 billion annually can be attributed to aviation. It can

be assumed that an emissions-based levy can indeed deliver a long-term revenue in this order. This would make air transport more expensive – an effect that is desirable from an environmental perspective. This can dampen the growth in demand for air transport and stimulate the development of new emission control technologies. In order to avoid the resistance that will doubtlessly emerge against introduction of such a charge, the Council recommends commencing initially with a moderate levy rate. This applies particularly in the case of EU-wide introduction in order to avoid excessive competitive disadvantages for the European aviation sector. The further rises of the rate dictated by climate protection considerations should be set in a fixed time schedule in order to both enhance the environmental incentive effect on a continuous basis and permit long-term calculations for the aviation sector.

The funds are to be deployed for climate protection goals. The Council recommends that the greater part of the revenue of the emissions-based user charge be channelled to the new funds established under the climate regime (special climate change fund, adaptation fund and least developed countries fund). A part of the revenue should also be allocated to the climate window of the GEF, being the financing institution of the Climate Convention. In that case, however, it would need to be ensured – in order to do justice to the concept of user charges – that the revenue is used to finance climate-related measures.

Charging the use of the oceans by international shipping

As yet, the use of the oceans by shipping is only inadequately regulated. The Convention on the Law of the Sea calls upon the states parties to agree regulations to protect the oceans against the negative effects of ocean shipping, but the results achieved to date within the IMO context are unsatisfactory. This is all the more so considering that the overall state of the oceans is continuing to deteriorate. It should be mentioned in this context that marine pollution stems predominantly from land-based inputs via discharges and the atmosphere. Nevertheless, the Council views the use of the oceans by international shipping as a further regulatory gap that leads to considerable damage and thus justifies levying a user charge. However, the case of the oceans must indeed be distinguished from the use of the atmosphere by international aviation. Over long distances, ocean transport is the most environmentally sound mode of transport and also particularly energy-efficient compared to aviation. Attention should therefore not focus on reducing ocean transport as a whole by means of correspondingly strong environment-related incentive effects. Incentives should rather be given to make ocean transport more environmentally sound. The revenue generated through a user charge could then be used for the targeted protection of the most severely affected waters.

The Council recommends to the German federal government that it urges the introduction of an environmentally differentiated user charge to be levied on an annual basis. The list of 'Quality Shipping' criteria and assessments developed by GAUSS and the corresponding calculation formula provide a good basis for this. Such a user charge should initially only be levied in the industrialized states, but regardless of flag state and shipowner. This group of participants would cover the greater part of ocean shipping. An initial participation of all OECD countries would be desirable. At a later time, other states could join a charging system agreed at OECD level in coordination with the IMO. If resistance is too great, the Council proposes an initial EU-wide introduction.

In implementing the charging model proposed here, the Council recommends setting the charge factors, which are decisive for both the incentive effect and the revenue, at between € 0.5 and 1.0 per tdw or kW. Given an EU-wide introduction, this would mean an annual revenue between about € 360 and 720 million (minus the rebates for environmentally sound ships). The funds generated by the charge should not only be deployed for the environmental damage arising directly from ocean transport but should also be used as efficiently as possible for the regeneration of the oceans as a whole. Considering the importance of land-based pollutant inputs, financing integrated coastal management measures in developing and newly industrializing countries will be a particularly effective use of funds.

The greater part of the funds should be assigned to the GEF, whose operative programmes already cover the marine environmental protection sector. The substantive conditions for awarding funds should be defined within the context of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA). Close coordination with the Biodiversity Convention would also be recommendable. There are already marine environmental protection projects currently being supported within the context of GEF activities.

Integrating ICAO and IMO more closely into global environmental policy

ICAO or IMO could assume an important function within the process of introducing user charges. The Council recommends to the German government that it urges, in the course of international negotiations, a stronger integration of the two organizations into global environmental policy. The aim of this should be to ensure that in both bodies global envi-

ronmental objectives are given greater importance vis-à-vis the short-term economic interests of individual countries.

Climate policy objectives could be strengthened within ICAO by the contracting parties to the Kyoto Protocol calling upon ICAO to take measures to reduce the greenhouse gas emissions of aviation within a set period. If this does not produce the desired result after expiry of that period, an emissions-based user charge on aviation should be introduced by the parties to the Kyoto Protocol.

In the view of the Council, a similar strengthening of environmental objectives within the IMO could be promoted by the introduction at OECD level – in coordination with the IMO – of a user charge on ocean shipping that is graduated according to environmental criteria. Implementation of the approach of user charges for the oceans would not only give a strong political signal for the strengthening of environmental concerns in the ocean shipping sector. The development of a catalogue of criteria could also give decisive impulses for the swift (further) development of binding environmental standards.

Payments for non utilization obligations

In contrast to the two forms of user charges set out above, the concept of non utilization obligation payments (NUOPs) does not address global common goods in the narrower sense, but goods whose conservation is a 'common concern of humankind'. These can be, for instance, the conservation of biological diversity or of land and freshwater areas. These goods fall clearly under the sovereignty of states. In that sense, there is no regulatory gap. Nevertheless, the regulation up to today endangers the conservation of biological diversity, for example, because for many states the degrading use of their natural resources generates (over the short term) higher yields than the provision of the good 'conservation of biological diversity'. This is where the concept of NUOPs comes into play. In the framework of the concept, abstaining from degrading use is rewarded by payments in order to provide incentives to conserve goods of global value. The generation of funds is to be seen in connection with payments for the global use of the conservation of resources. Among the possible forms of NUOP arrangements, a system of tradable non utilization commitment certificates (NUCCs) is the only one that establishes an international automatism for the financing of the conservation of these goods.

The Council is aware that the concept cannot be implemented over the short to medium term and that, in particular, there is a considerable need for further research. The Council is nonetheless convinced that the idea of a global system of NUCCs is worth pursuing as an alternative to other financing mechanisms such as a tropical forest fund. For the conservation of biological diversity, for instance, the extent to which the idea of NUOPs or NUCCs could be operationalized within the context of the Biodiversity Convention should be examined. The Council therefore recommends raising the profile of NUOPs on the international policy agenda and intensifying research activities in this field.

True additionality of financial resources from global user charges

Various studies of budgets for official development assistance show that a considerable proportion of these funds needs to be provided for the creation and preservation of global public goods, notably those in the environmental sphere. The United Nations Development Programme (UNDP), for instance, estimates this proportion at about 25% (Kaul et al., 1999). Methodological problems in calculating such proportions aside, it is clear that the pressures on development cooperation funds traditionally allocated to development purposes could be reduced substantially by levying user charges. However, this will require a corresponding political will. The Council therefore recommends factoring the financing contribution of user charges out of ODA. The revenue of global user charges would then correspond to an imaginary budget item, namely 'Global sustainability policy'. The availability of additional financial resources for global sustainability policy makes it possible to deploy development cooperation funds in a more targeted manner for the 'classic' tasks of development cooperation. This approach would achieve true additionality of the funds from the revenue of user charges.

User charges promise positive global environmental protection effects due to their environment-related incentive function, and generate additional funds for the financing of environment and development policy measures. The Council therefore recommends to the German federal government that it exploits the opportunity of Monterrey by arguing in favour of implementing the forms of user charges set out in this special report.

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