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Globalisation and the environment: targets and tools for measuring progress

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Human influences on the environment reached global level in the 20th century. Such consequences of human activities are unintended, however. As soon as these processes are recognised, there is an urgent need (i) to monitor their escalation closely and assess their possible implications and (ii) to develop and implement the necessary response policies. For the latter purposes, global quantitative characteristics/indicators are used to set firm targets and measure progress towards them. Such indicators, along with the related global targets and timetables, are based on scientific assessments and have become the most critical subjects in intergovernmental negotiations. This paper describes the process of selecting such global environmental indicators and setting targets, taking as examples three familiar global environmental issues: ozone depletion, loss of biodiversity and climate change.

1. Environmental variability and increasing human influence

Ecosystems and societies adapt to the ambient environmental conditions, their average characteristics and annual or multiannual variability. Extreme environmental events, natural hazards – heat waves, forest fires, droughts, floods, tsunamis and others – cause severe damage and even large numbers of casualties. However, in many cases, they are followed by an almost complete recovery of the ecosystems and societies in the regions affected. In contrast to such recurring cases, prolonged and/or extraordinarily large anomalies in certain environmental conditions have had substantial and sometimes even irreversible consequences. In the recent past, prolonged drought in the sub-Sahelian region in the 1960s and 1970s resulted in catastrophic famine with countless

environmental victims and refugees. The potato famine in Ireland in the 19th century – a disaster created partly by environmental factors and partly by economic mismanagement – caused a death toll of about 1.5 million because of the consequent starvation and diseases and also forced about one million Irish to emigrate.

Human interference with the environment remained on a rather limited scale up to the 19th century. The industrial revolution marked the beginning of rapidly increasing use of fossil fuels until eventually, in the middle of the 20th century, it was discovered that the acidification of Scandinavian lakes was a direct consequence of the sulphur emissions from coal combustion in western Europe. The sharply increasing population, urbanisation, demand for food, mobility and many related processes resulted in large-scale changes in land use, deforestation, ever growing consumption of natural resources and increasing volumes of waste. The shrinking area of forest cover worldwide and the ever faster loss of biological diversity are only two familiar indicators of the impact of these human activities. In the 1950s synthetic gases were invented which could be used, for example, as effective coolants in refrigerators and for many other purposes. However, after about two decades it turned out that these substances cause depletion of the ozone layer in the upper atmosphere. Of course, at least one more example should be added, namely the emissions of greenhouse gases that trigger global climate change.

2. Environmental globalisation, response policies and role of quantified targets

This escalating socio-economic globalisation goes hand in hand with *environmental globalisation*. It is mainly a consequence, but also a cause and driver, of some aspects of socio-economic globalisation and the relevant international cooperation.

It is a consequence not only in terms of the large-scale environmental effects of certain human activities (atmospheric emissions, chemical pollution such as widespread use of DDT, deforestation, etc.) but also in terms of overconsumption of natural resources ("overfishing" and, generally, rapid loss of biodiversity, increasing consumption of crude oil, etc.). It is also a cause, for instance, of closer global cooperation on environmental monitoring and research. Measuring and analysing global environmental processes make

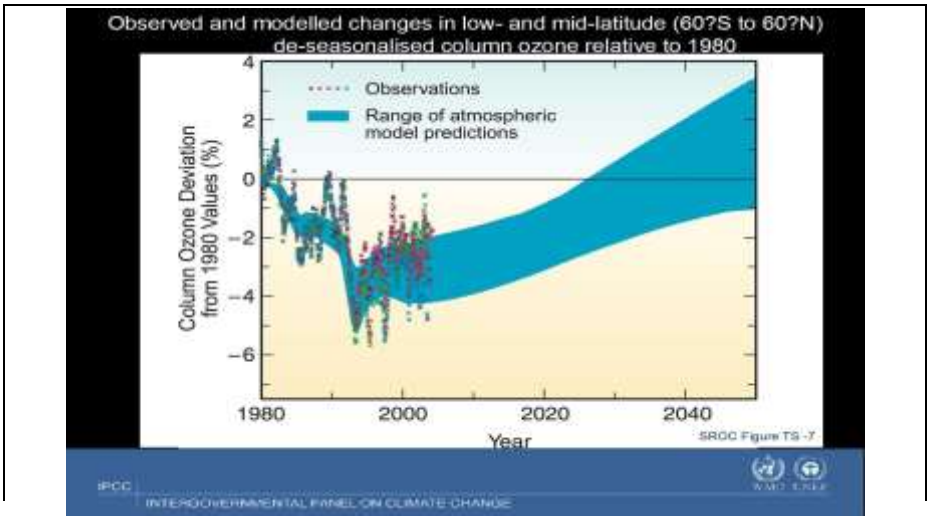
it possible to identify their causes and impact. They also give rise to calls to stop or at least limit the underlying human interference with the global environment.

As part of the process of controlling the global environmental effects of certain human activities, common objectives and more or less firm targets are usually set, based on scientific foundations. Sometimes this means using certain environmental principles, clear-cut arguments or relatively simple (backward) calculations. In other cases, sophisticated theoretical and numerical models reflecting the complex, interlinked nature of the global processes are developed and applied.

Let us consider three very familiar cases of such global processes and international target-setting.

3. Phasing out ozone-depleting substances

The discovery that certain substances produced since the 1960s have the effect of depleting the ozone layer and increasing solar UV-B radiation, combined with the understanding that unintended emissions of these synthetic gases could have a dramatic impact on all living organisms, prompted international deliberations on the possible action which should be taken. In spite of the remaining scientific uncertainties, it was clear from the very beginning that these dangerous substances should be phased out and substituted as soon as possible because of their long atmospheric residence time.

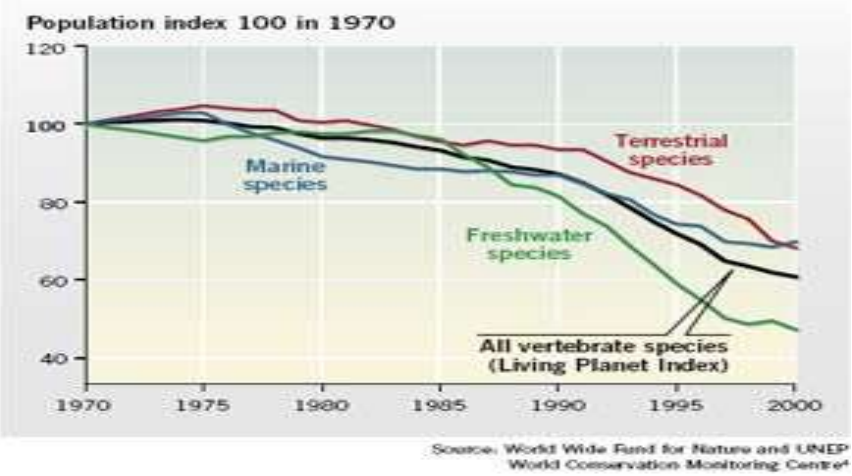


In the 1985 Vienna Convention, only a general objective could be agreed, namely to further develop and harmonise policies controlling, limiting, reducing or preventing production and use of those substances. Two years later, however, firm targets were adopted in the Montreal Protocol, including that production and consumption of freons should not exceed the 1986 levels and should be reduced by 20% by mid-1994 and 50% by mid-1999. Related provisions also stipulated that statistics on production, imports and exports of each controlled substance had to be submitted to the international secretariat.

Consequently, the "elementary" indicators of human influence on the environment, namely the amounts of freon production, were used to set the most appropriate qualitative targets alongside regular monitoring of the ozone levels in the upper atmosphere by means of a specific measure (Dobson units). Of course, the ultimate goal was and still is to protect the stratospheric ozone layer, first halting its depletion and then followed by a gradual recovery to its "original" level.

4. Halting the loss of biological diversity

The ever increasing human influence on the Earth's biological diversity has turned into another global phenomenon. Compared with depletion of the ozone layer, this is a much more complex process for at least two reasons. Firstly, various human activities (extensive changes in land use, use of chemicals, etc.) have interfered with a multitude of natural factors of all kinds, which have triggered gradual or sometimes abrupt changes in the qualitative and quantitative characteristics of biodiversity at all levels. Secondly, there was no relatively simple solution – technological "fix" – for this problem as there was in the case of ozone depleting substances in the form of development and production of alternative, presumably "ozone-friendly" synthetic gases.



After lengthy scientific preparations and discussions within various international organisations, the Brundtland report revealed the rapid loss of biodiversity as one of the major global environmental hazards and in the early 1990s intergovernmental negotiations were launched on possible coordinated action to deal with this problem. The Convention on Biological Diversity was adopted in 1992 with the general objective of conserving the Earth's biodiversity. In spite of the universality of the Convention and the variety of action, the loss of biodiversity continued to gain pace and eventually the Parties agreed to set a firmer target with a view to tackling the risk of further losses.

The controversy surrounding the interpretation and/or reality of this aim was clearly echoed in the discussions at the 2002 World Summit on Sustainable Development (WSSD). As a result, "only" the following wording could be agreed: "… the achievement by 2010 of a significant reduction in the current rate of loss of biological diversity will require the provision of new and additional financial and technical resources to developing countries, and includes actions at all levels …" Various intergovernmental organisations, including the EU and international non-governmental organisations, took a much stronger stand on halting any further loss of biodiversity. One key component of their holistic approach is to stop the decline in natural habitats. Obviously, setting specific measurable targets is a sign of a much more transparent political commitment based on the increasing scientific evidence and the potential of science-based response policies. Later this target was included in the "Countdown 2010" Declaration signed by a number

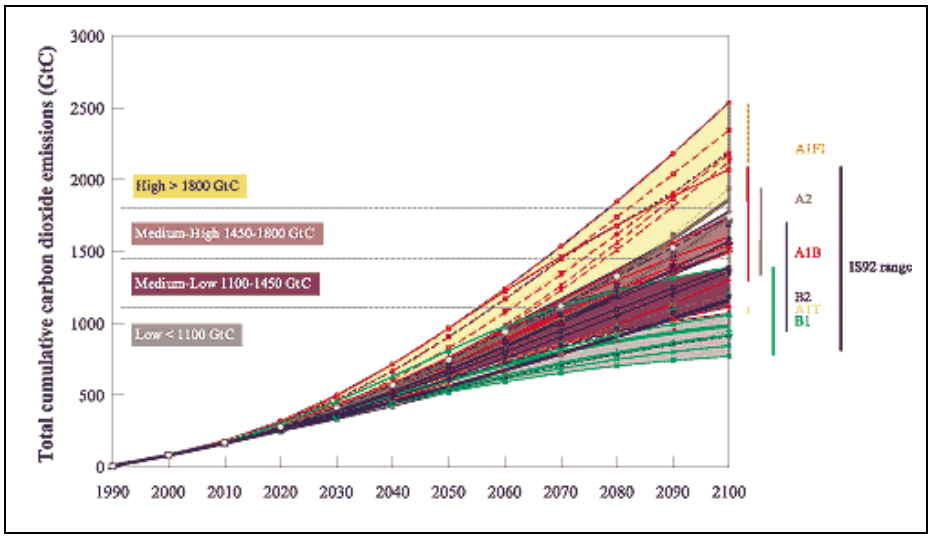
of national governments and many organisations. Within the EU, for instance, such instruments offer an effective basis for implementing the two relevant nature conservation directives (the Habitats and Wild Birds Directives).

Again, a dedicated general monitoring instrument together with a series of different measuring tools (indicators) can be used to keep track of environmental globalisation and also of the efforts to cope with this complex global environmental process.

5. Emissions of greenhouse gases and mitigation efforts

As a consequence of combustion of fossil fuels and other human activities, carbon dioxide and other greenhouse gases are emitted. These gases have accumulated in the atmosphere where the present concentration of CO2, for instance, is about 36% higher than it was before the industrial revolution. The subsequent risk of global climate change and its wide range of potential adverse impacts were assessed by the scientific community, whose "messages" finally reached the high-level policy-makers in the 1980s. Despite the considerable uncertainty about the possible long-term consequences of these emissions on the Earth's complex environmental system and the socio-economic impact, in the late 1980s universal political agreement was reached that international negotiations should be launched to find ways and means to tackle this emerging hazard.

The Framework Convention on Climate Change was adopted in 1992 under the auspices of the UN. At that stage no firm quantified global target could be agreed upon due to the continuing scientific uncertainty and lack of preparedness for a radical change towards sustainable consumption and production patterns. Nevertheless, the guiding principles of precaution and common but differentiated responsibility were accepted and the industrialised countries committed themselves to stabilising their emissions by 2000. Later, in the Kyoto Protocol, the same countries also agreed to an average five per cent reduction in emissions by 2008-2012 compared with their 1990 emission levels.



Later the European Community suggested another global objective, which was that the overall global annual mean surface temperature increase should not exceed 2°C above preindustrial levels. Based on researchers' models, setting out from this objective, firm numeric targets could be derived, such as ceilings on the atmospheric concentrations of greenhouse gases and, in turn, requirements for global emission reductions. This objective would call for a substantial reduction in global emissions, by as much as 50% by 2050 compared with the 1990 levels, combined with a 60% to 80% "contribution" by the group of developed countries.

There is an "individual" emission limit and/or reduction commitment for each developed country/party to the Kyoto Protocol. The contribution by any particular country/party to the average common target and progressive implementation of the provisions in the Protocol are measured primarily by the same indicator, namely the relative change in its national emissions. The details of measuring national emissions – the greenhouse gas emissions statistics (inventories) – have also come to be of utmost importance.

The same approach is expected to be in the spotlight in the further negotiations about a new global post-2012 agreement that would include firm medium-term and long-term global emission ceilings and related global reduction targets within which the developed countries continue to take the lead.

6. Conclusions

Tackling global environmental problems requires global statistical data. Policy-makers need information on features of the state of the Earth's environment on the one hand and key indicators of human influence on the global environment on the other.

The key indicators of human influence are not only used for monitoring the extent of and changes in these anthropogenic factors but also serve as instruments for setting global targets and checking the effectiveness of response policies implemented to achieve them.

These quantified targets are usually derived from complex scientific models. However, there are many other critical factors governing the international negotiations on adoption of such common targets and particularly the contribution by the individual countries and stakeholders towards achieving the global targets. Adopting more specific and measurable targets means a stronger political commitment and a higher level of transparency.

In this respect, the set of quantified global environmental targets are an example of essential instruments linking the scientific and the policy-making community.

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