

Indicators for sustainable development

Proposals by: European Environmental Bureau, Friends of Nature International, Friends of the Earth Europe, October 4, 2001

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1. The EU Strategy for Sustainable Development: after the Goteborg Summit

In June 2001 the European Council agreed on a strategy for sustainable development with four priority areas: *climate change, transport, public health and natural resources*. These issues are to complement the social and economic aspects of sustainable development, which are being dealt with in the so-called “Lisbon process” of Spring Summits.

The Goteborg European Council asked the Commission to evaluate the implementation of the Sustainable Development Strategy (SDS) in its *annual synthesis report*, on the basis of a number of headline indicators, to be agreed by the Council in time for use for the European Summit in Barcelona in March 2002.

In the framework of the Lisbon process, started in 2000, the Commission had already produced 35 so-called ‘*Structural Indicators*’ for use in synthesis reports. These cover the issues of *employment, innovation, economic reform and social cohesion* with each 7 indicators. 7 other indicators are of a more general economic character. One of these is an indicator for the *energy-intensity of the economy*. The others bear no relationship to environmental issues. Almost each indicator consists of a subset of sometimes up to 7 different ‘sub-indicators’. It is questionable whether these 35 indicators really relate to social and economic sustainability. “Lisbon” took a rather short term horizon and some goals are rather specific¹.

The additional indicators have to be prepared for approval by the December 2001 Laeken Summit. If the Environment Council wants to play a real role in its formulation, it needs to have a proposal on the table at its October 29, 2001.

2. Indicators: situation October 2001

2.a. Indicator development from 1999 on:

¹ . The full list of the Lisbon socio-economic indicators can be found at the Eurostat website: <http://europa.eu.int/comm/eurostat/Public/datashop/print-product/EN?catalogue=Eurostat&product=1-structur-EN&mode=download>

Since 1999, the European Commission, the European Environment Agency, Eurostat and the EPRG (Environmental Policy Review Group, composed of senior officials of EU Environment Ministries and DG Environment) work together on so-called *headline indicators*. The Commission presented a working document ‘Report on Environment and Integration Indicators’² to the Helsinki Summit in December 1999. But progress has been slow so far, and a first set of 10 indicators lacks final agreement so far and is therefore still not officially published. However, most of these indicators can be found in chapter 8 of the EEA “Environmental Signals Report 2001”.

End of 1999, the European Environment Bureau (EEB) published the position paper *“Ten Benchmarks for environmental policy integration”* which presents and defends a choice for a limited set of indicators, connected to targets and timetables.

On the 9th July 2001, the EEB and the Belgian Presidency organised a conference to discuss the steps to take after the Goteborg Summit. In his speech at the this conference, EEA's Director Jimenez Beltran presented the work of his organisation on 11 environmental headline indicators (see table below), having great resemblance to the ones the EEB as well as the Commission had proposed. The set up is adapted to better match the 6th EAP. Programme (6EAP).

Environmental Headline Indicators

Keys

- ☺ Good progress towards meeting objective, improvement
- ☹ No significant change, static
- ☹ Movement away from objective, declining
- ? Insufficient data

Issue	Indicator	
CLIMATE CHANGE		
1. Climate Change	Emissions of greenhouse gases	☹
NATURE & BIODIVERSITY		
2. Nature & Biodiversity	Designated “Special Protection Areas”	☹
3. Air Quality	Air pollution - acidifying pollutants	☺
ENVIRONMENT & HUMAN HEALTH		
4. Air Quality	Air pollution - ground level ozone precursors	☺
5. Urban Air Quality	Emissions of air pollutants in urban areas	☹
6. Water Quality	Water pollution - concentrations of nitrate-nitrogen and phosphorus in large rivers	☹
7. Chemicals	Production of hazardous chemicals	☹
WASTE & RESOURCES		
8. Waste	Municipal and hazardous waste	☹
9. Resource Use	Energy Consumption	☹
10. Water Quantity	European water abstraction	☹
11. Land Use	Land use - arable land, permanent grassland, permanent crops, forest land, built up areas, length of road network	☹



² SEC(1999)1942 final

The "Cardiff process" on environmental policy integration, requires indicators on sectoral integration, which could be used as well. However, so far only for transport a system is in place and functioning (TERM).

Eurostat has just published for the EU the 59 indicators for sustainable development that have been agreed in the UN³. They should be considered for use as well, even though they have been developed for a different policy context.

Currently, the Commission as well as the Belgian Presidency are working on a list of indicators to propose to the Laeken summit. We as environmental organisations are concerned that the Commission's proposal will not bring real balance between the existing social and economic dimensions on the one hand and the environmental dimension on the other. About the Presidency proposals we are not informed so far.

2.b. Relevant Political Processes

The intelligent selection of indicators requires a linkage with political objectives, the ability to monitor pressures, impacts or even the resulting situation for the main areas of concern, as well as to assess policy efficiency. For guidance we will look at the political priorities set by the Goteborg European Council and the 6EAP.

2.b.1 Goteborg conclusions:

27 result oriented objectives can be found in the Goteborg Council Conclusions, most of which inspired by the Commission Communication on the EU Sustainable Development Strategy (SDS):

General objectives

- industry sectors (e.g. energy and transport sectors): development and wider use of new environmentally friendly technologies
- decoupling economic growth from resource use
- getting prices right, reflecting true costs and provide incentive for consumers and producers
- Due account of energy, transport and environment in the 6th Framework Pr. R&D
- Sustainable Development as objective in bilateral development cooperation, international organisations and agencies
- Trade and environment policies to be mutually supportive
- the 0.7% GDP target for development assistance

Climate

- ratify Kyoto by end of 2001
- deliver Kyoto targets (8% red. 2008-2012)
- climate objective 6 EAP (70% red. long term)
- 12 % renewable energy by 2010

Transport

- sustainable transport policy in place
- tackle rising traffic volumes and congestion, noise and pollution

³ "Measuring progress towards a more sustainable Europe – proposed indicators for sustainable development, Eurostat, 2001

- encourage use of environmentally friendly modes
- full internalisation of social and environmental costs, first measures in place by 2004
- significant decoupling of transport growth and GDP
- shift from road to rail, water and public passenger transport

Public Health

- chemicals policy in place by 2004
- no significant impact on health and environment by chemicals within one generation (OSPAR and European Commission say 2020)
- Action against outbreaks of infectious diseases and resistance to antibiotics
- European Food Authority and Food Law Regulation in place

Natural resources

- sustainable use of natural resources
- sustainable levels of waste
- CAP to encourage : = healthy high quality products = env. sust. Production methods = organic production = renewable raw materials = protection of biodiversity
- Fisheries policy to adapt to level of available resources
- IPP aimed at reducing resource use and environmental impact of waste
- Halt biodiversity decline by 2010

2.b.2 6th Environmental Action Programme

The 6EAP identifies four priority areas:

- Climate Change
- Nature and Biodiversity
- Environment and Health, Quality of Life
- Natural Resources and Waste

The Programme stipulates that environmental objectives should be achieved within ten years. Seven strategies are to be developed by the Commission in order to establish further quantifiable and time-bound targets. These strategies cover:

- air quality
- marine environment
- resource use
- pesticides
- waste recovery
- soil protection
- urban environment⁴

The proposed objectives in the 6EAP are phrased in a very general way, leaving the choice of more precise targets to the thematic strategies. (See Annex 1 for further information).

In short, the most important objectives of the 6EAP are:

- reduction of greenhouse gas emissions
- halting the loss of biodiversity inside and outside Europe

⁴ added by Council and EP in first reading, June 2001

- no harmful effects of pollution on human health and the environment
- sustainable urban development
- increase resource efficiency, decoupling resource use from economic growth

The headings of the main areas of the SDS are slightly different from the 6EAP. Notably, biodiversity is grouped under natural resources in the SDS while this is a separate area in the 6EAP. Health is a separate area in the SDS and not so much in the 6EAP. A combination of these headings will be used further on to compare and describe the various objectives and indicators.

3. EEB, FNI and FOE's comments and proposals for Barcelona and after

3.a. General comments

The Goteborg Summit simply assumed that the conversion from the Lisbon process to monitoring the Sustainable Development Strategy can be done by adding environmental (and health) indicators to the existing social and economic ones, despite the fact even that the social and economic ones had been chosen for somewhat different reasons and different time horizons.

On the other hand, the European Council also asked the Council(s) “*to examine the proposals in the Commission Communication, in particular its proposals for headline objectives and measures, as well as the 6th EAP and the sector strategies for environmental integration*”.

This means that objectives and measures have yet to be decided while the indicators are already being chosen. As objectives and indicators (benchmarks) are ideally closely linked and there is the time constraint for the Barcelona Summit, the indicator set agreed in the coming months is going to be a provisional one. It at best will end up as a mixture of already available good environmental indicators for sustainable development and some interim indicators where there are no data available for better-suited ones.

3.b. Choice of the main areas

Comparing the objectives from the Goteborg Conclusions on Sustainable Development and the 6EAP to the main areas of concern chosen earlier by the EEB in its *Ten Benchmarks*, one can conclude that:

- a) the political guidelines match very well with the benchmarks proposed by the EEB.
- b) the natural resources items in the SDS as well as in the 6EAP are covered, although land use is still in an early stage of recognition as an area of concern, with varying approaches (spatial planning and transport, as well as land take).
- c) the only items which are not explicitly included in the SDS are air and water quality.

We believe that air and water quality, even though not mentioned in the SDS or 6EAP, relate directly to health, biodiversity and the protection of natural resources. As maintenance of their good quality is a crucial pre-condition for a healthy biosphere, they should be included explicitly. Especially air quality relates directly to human health, with more and more evidence coming forward of the amount of European victims of air pollution.

We support that in the SDS, chemicals and food quality and safety have been included under health, but we find it surprising that the SDS does neither have a general health objective nor at least a specific reference to air quality and health. For a SDS that should appeal to the public, the health chapter is too meagre in this respect. One should note that in the UN Sustainable Development indicator system, a specific set of health indicators is put as a sub-category of the social dimension (subthemes: nutrition, illness, mortality, sanitation, and healthcare delivery). We conclude that this aspect, which has also been omitted in the present social and economic set of the EU indicators, deserves separate attention. Experts from the European Public Health Association suggested us a general indicator for health, to be included in the social dimension: *'life expectancy without any disability'*. In addition, more specific aspects of health, some of which are linked to environmental quality, need to be monitored as well, for instance with respect to respiratory diseases. In any case, the health issue in a broad sense needs separate attention and elaboration as an important chapter in the social dimension of sustainable development. It will do justice to the concept of sustainable development and help build public support.

3.c. Proposals for Barcelona

As EEB, FNI and FOE, we want to bring in a set of indicators that are inspired by the beforementioned EEB position paper *'Ten benchmarks for environmental policy integration'*. Each indicator is linked to an objective and a timetable.

The *Ten Benchmarks* describe and compare the actual and the desirable situations, in order to evaluate the effectiveness of strategies and policies. In this case, both long-term targets that describe the sustainable situation as well as specific policy targets for the short term are required. For some of the issues policy objectives have already been decided, but even where this is not so, one can still measure progress on the basis of sustainability objectives proposed by scientists or NGOs.

Generally speaking, the headline indicators should describe the sum of the pressures, impacts or the resulting situation for the main areas of concern. In addition, for the sectors with the biggest overall impact – energy, transport and agriculture - we propose to select for each a dominating aspect as headline indicator that shows some of their potential impact on health and environment.

We are absolutely aware of the different constraints imposed on the *headline indicator* selection, knowingly political priorities to be followed, data availability, indicator methodology and time pressure. Therefore we propose for each of the issues the ideal indicator that we consider most appropriate to be chosen, and in case of temporary technical problems an *interim* indicator marked in italics, which we consider being a good alternative for this moment. However data collection and development of methodology for the 'ideal' indicator should start as soon as possible.

Data should be presented for the EU as well as for individual countries and also be presented in per capita numbers where applicable, for better comparison between countries and regions.

EEB, FNI, FOEs 10 headline indicators for sustainable development:

INDICATOR	TIMETABLE	FINAL TARGET
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CLIMATE

Climate change

Total CO ₂ and five other greenhouse gas emissions (CH ₄ , N ₂ O, HFCs, PFCs, SF ₆) <i>Interim indicator: CO₂ and two other greenhouse gas emissions (CH₄, N₂O).</i>	Short term: full implementation of “Kyoto” ^{+))} Medium term: 30% to 40 % reduction should be reached by 2020, compared to 1990 levels.	By 2030 more than 70% reduction of current greenhouse gas emissions. (As indicated in 6 th EAP)
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Energy sector

% of green energy in total energy consumption	12% by 2010 (agreed EU target)	75% or more depending on remaining greenhouse gas emissions by 2030
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TRANSPORT

Transport sector

Total passenger- and ton-kilometres travelled, related to: - GDP - Total energy use by transport sector	Short term: the necessary pre-conditions to reverse the current trends need to be in place by 2004, decoupling transport growth from GDP growth.	Within 30 years stabilisation of total distances (pkm/tkm) travelled and halving of total energy consumption (level 2000)
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PUBLIC HEALTH

Chemicals

An index of used	Medium term: halve	By 2020 no human made releases
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<p>hazardous substances weighted according to human and eco toxicity (has yet to be developed)</p> <p><i>Interim indicator: % of the OSPAR chemicals still on the European market for unknown or open system application.</i></p>	<p>consumption by 2010 compared to 1995.</p>	<p>(existing obligation under OSPAR and HELCOM)</p>
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Air quality

<p>Emissions of 5 pollutants (SOx, NOx, NH3, VOCs, PM)</p> <p><i>Interim indicator: emissions of 4 pollutants (as long as data for PM are incomplete)</i></p>	<p>Medium term: reductions of 84% for SO₂, 55% for NOx, 29% for NH₃ and 60% for VOC compared to 1990 levels by 2010. PM: more research needed; current knowledge indicates a 80% reduction of PM 2.5 by 2010.</p>	<p>Good air quality within 30 years. The critical loads for pollutants and the WHO standards for air pollutants with respect to human health should not be exceeded any more.</p>
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NATURAL RESOURCES

Biodiversity

<p>Biodiversity index based on genetic and habitat variety (has yet to be developed)</p> <p><i>Interim indicator: % of original indigenous species extinct or under threat</i></p>	<p>Immediate Effective implementation of the EU Biodiversity Strategy</p>	<p>A halt to habitat decline and the extinction of species in the EU by 2010 (agreed by Gothenburg summit)</p>
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Agricultural sector

<p>Pesticides usage (active ingredients weighted according to human and eco toxicity)</p> <p><i>Interim indicator: treatment frequency excluding those</i></p>	<p>Short term: 40 % reduction in the treatment frequency of pesticides within 10 years</p>	<p>No use of pesticides that are not allowed for organic farming by 2020</p>
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<i>pesticides agreed for organic farming methods</i>		
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Land use

Amount of built-up areas compared to total area. (Including total area used by the EU outside EU)	See final target	Net stabilisation of non built-up areas by 2005 allowing for some mitigation and exchange between different areas
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Material use

Total material use (Total Material Requirement) and waste production incl. percentage of reused or recycled material. <i>Interim indicator: waste production with recycling percentages.</i>	Short term: stabilisation of waste generation at 1985 levels (an actual reduction) (existing 5 th EAP objective)	Within 30 years a Factor 10 lower primary non-renewable material use, with material recycling and re-use above 95%, resulting in untreated waste going to landfill towards 0.
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Water quality

Percentage of all water bodies reaching the good/high status or in the case of heavily modified or artificial water bodies good/maximum ecological potential and good chemical status as defined in the Water Framework Directive	Immediate compliance with and enforcement of the Water Framework Directive, including immediate enforcement of the non-deterioration principle.	All water bodies reaching the good/high status or in the case of heavily modified water bodies good/maximum ecological potential and good chemicals status as defined in the Water Framework Directive by 2015
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EXPLANATIONS:

1. **Greenhouse gases:** there seems to be general agreement on the relevance of this environmental indicator. Data for the 3 additional greenhouse gases can be available quite soon.

2. **Energy sector.** This sectoral indicator is not indispensable, as greenhouse gas emissions will reflect this issue to some extent. However, 12 % renewables by 2010 is one of the few concrete EU targets. The choice of this indicator is also in line with the principle to include crucial sectors in the headline indicator system.
3. **Transport sector.** Volume of transport is a major driving force for the many environmental and quality of life problems that are caused by the transport sector. The relation to economic growth and energy use adds additional information, relevant in relation to EU policy objectives.
4. **Chemicals.** Tens of thousands of chemical substances are being used in Europe. We believe that this is an issue of high importance, especially when considering bio-accumulation, the delays in visible effects, and the complexity of interactions of cumulated products and metabolites in the environment and living organisms. For the large majority of chemical substances basic data on volumes, hazards for humans and nature are lacking. It will take one or two decades before this knowledge is collected, which is partly because of inadequate policies slowing down appropriate toxicological studies. Within the next years, increased efforts should be made to fill the data gaps required for an 'ideal' indicator that is combining usage figures with a weighted factor for harmfulness. For the interim period, we propose as indicator the use of the 400 hazardous substances, which have been listed under the OSPAR convention for phasing out by 2020.
5. **Air quality and emissions.** This is an important indicator for environment and health. Particulate matter (PM) is an issue of growing concern for human health and should be included as soon as possible. Regulation on air emissions is a typical EU policy domain where some but not yet sufficient progress has been made.
6. **Biodiversity.** As scientific knowledge has not progressed enough to permit an estimation of the biological diversity and its characteristics, we propose as an interim solution to use the *% of original indigenous species extinct or under threat*. Species relate most directly to biodiversity, appeal to the public and are vulnerable to all sorts of influences that are and can be changed by EU policies (site protection, species protection, land use, air, water, agricultural practices, etc).
7. **Agricultural sector.** We believe that the pesticide use in agriculture would be a good choice to represent the trend towards a more sustainable agriculture in the EU. As regards pesticides we are confronted with the same problems as already mentioned in the previous comment on chemicals- i.e. complexity of the issue and limited scientific knowledge. As the variability in harmfulness per kg of active ingredient is large, use in kilograms as such is not the best indicator. Therefore, pesticide risk indicators, based on the best pesticide use evaluation, and on acute and long term toxicity and eco-toxicity, need to be developed at EU level, based on OECD work, and to be continuously revised according to scientific progress.
As an interim indicator, we propose monitoring treatment frequency. Literature shows that this indicator reflects the environmental pressures better than simple usage in kilograms of active ingredients, whereas the necessary data are available. The indicator should apply to pesticides that are not explicitly allowed in organic farming.
8. **Land use.** Natural areas and fertile soils are basic natural resources, and construction activities diminish these resources with an alarming speed. In the light of the EU's

international objectives for Sustainable Development and the 6EAP, making a specific reference to the global carrying capacity, this indicator could be extended to account for all kinds of European land use, including the area of land used outside Europe but serving the European economy. First target of this extended land use indicator is to analyse the potential impact of the EU on the global carrying capacity (including biodiversity) and investigate potential policy measures.

9. **Material Use.** A key aim of sustainable development in Europe must be to produce the same amount of well being with less resources. The throughput of materials is at the core of most environmental problems. A decrease of resource flows will reduce environmental pressures and lead to higher efficiency (factor 4 and 10). The total amount of materials used is therefore one of the key indicators for sustainable development.

We propose to use '*Total Material Requirement*' as a headline indicator. TMR measures economic activity in physical terms. It was developed in order to monitor material flows on the national level and has been calculated by several EU member states already. It is currently considered by the OECD Environment Policy Committee as a key indicator in their waste prevention strategy (for details see annex II). TMR is a quantitative measurement of the total resources used and therefore of course lacks a qualitative component. This does however not speak against it, since qualitative aspects are covered by other indicators, such as indicators on hazardous substances (see our proposal for an indicator on chemicals). TMR will allow us to understand how efficient we are using major resources such as oil, coal, steel, aluminum, wood etc. and such fulfils an important function in measuring the sustainability of our economy and society.

10. **Water quality.** This proposal reflects the new Water Framework Directive which has entered into force recently, and takes a comprehensive approach as water life will reflect the overall result of good water quality and quantity policies.

Further comments:

1. **Carrying capacity/Ecological Footprint.** The 6EAP and the SDS include general objectives with respect to global sustainable development and carrying capacity. To this regard, the European Parliament has proposed to use the ecological footprint as an indicator for the SDS. We have not included the footprint as such in our present proposals but wish to underline that the indicators for greenhouse gas emissions, material use and land use can reflect these concerns. Also for that reason, an important addition is the use of per capita figures where applicable, as this enables comparison with other countries and appeals to a wider public. We will need all figures for the EU total as well as for separate countries.
2. **Sectoral Headline Indicators.** In our proposal, we have 7 environmental indicators and 3 sectoral ones. In fact, the 3 sectoral headline indicators should be covered under economic headline indicators and should certainly not limit the number of indicators that refer to the environmental dimension. In the UN system the indicators for energy use, material use, waste generation, renewable energy sources and distances travelled are part of the economic dimension.

3.d. After Barcelona

As already mentioned previously, for the environmental dimension we propose for each important issue one representative headline indicator. In case of technical difficulties as data availability or lack of scientific knowledge we suggest an interim indicator which we believe to be appropriate to cover the issue on a temporary basis.

As regards the social and economic indicators adopted at the Goteborg Council it is necessary to evaluate these with respect to their relevance for sustainable social and economic development, as they have not been developed for being sustainable development indicators, and being in some cases too specific and short term oriented. Moreover the issue of health indicators will still need to be developed further.

We need a basic set of social, economic and environmental headline indicators that is sufficiently comprehensive and balanced and does justice to the international understanding of sustainable development as described in the Rio Declaration and Agenda 21. In this debate also attention should be paid to the question how to judge the total and how to evaluate possible opposite trends shown by different indicators

.
Last but not least the EEB, FoEE and NFI wish to underline the importance of clear policy objectives for the short and long term, as an appropriate set of indicators is not an end in itself but a tool for sustainable development.

ANNEX I

The proposed objectives in the 6th Env. Action Programme....

“The Programme aims at:

- emphasising climate change as an outstanding challenge of the next 10 years and beyond, and contributing to the long term objective of stabilising greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Thus a long term objective of a maximum global temperature change of 2° Celsius over pre-industrial levels and a CO₂ concentration below 550 ppm shall guide this Programme. In the longer term this is likely to require a global reduction in emissions of greenhouse gases by 70% as compared to 1990 as identified by the Intergovernmental panel on climate change;*
- protecting, conserving, restoring and developing the functioning of natural systems, natural habitats, wild flora and fauna with the aim of halting desertification and the loss of biodiversity, including diversity of genetic resources, both in the European Union and on a global scale;*
- contributing to a high level of quality of life and social well being for citizens by providing an environment where the level of pollution does not give rise to harmful effects on human health and the environment and by encouraging a sustainable urban development.*
- better resource efficiency and resource and waste management thereby decoupling the use of resources and the generation of waste from the rate of economic growth and a shift to more sustainable production and consumption patterns aiming at significant gains in resource efficiency.”*

(...)

“The production of this information will be supported regular reports from the European Environment Agency and other relevant bodies. The information shall consist notably of:

- headline environmental indicators,*
- indicators on the state and trends of the environment,*
- integration indicators.”*

(...)

“The Commission shall evaluate the progress made in implementing the programme together with associated environmental trends and prospects in the fourth year of operation. This should be done on the basis of a comprehensive set of indicators. The Commission shall submit this mid-term report together with any proposal for amendment that it may consider appropriate to the European Parliament and the Council.”

ANNEX II

Total Material Requirements (TMR) and the Material Input Per Unit of Service (MIPS)

Traditional environmental politics has focused on regulating the output side of the economy, influencing the quality and quantity of the outputs our economy releases into the ecosphere with regulations usually aiming at qualitative characteristics like toxicity etc... Actually it is not the scarcity of resources that constitutes environmental problems, but their use, the physical throughput of our economies. Material flows are therefore a proxy for the totality of the unspecific environmental risks from human activities.

Material flows are best measured at the input side of the economy where their number as well as the number of entry gates is limited. Thus here regulation and economic incentives can work more efficiently and less bureaucratically than today. The number of materials entering our economic systems is limited to more or less to 50-100 abiotic substances, including energy carriers, output control has to handle about 100 000 substances from the chemical industry alone, each of which interacts in various ways with the ecosphere and the other substances emitted. Furthermore, for an economy as f.i. Germany, the entry gates to the anthroposphere are limited to 20000, the exits are beyond any control.

The core categories for the analysis are materials, energy and land, which each can be split up into environmentally relevant subcategories, such as air, water, soil, biotics and abiotics for materials; fossil, renewable and nuclear for energy; or built-up, pasture, and agricultural land for land use.

The material intensity of products and services can be expressed as **MIPS**, the material input per unit of service, and as **TMR**, the total material requirement on the macro level, an important element in physical input-output tables.

To become operational the quantitative targets set must be based on a standardized methodology, delivering meaningful, transparent and replicable information about the total material brought about by a certain product and service. For this purpose the resource efficiency measure MIPS was introduced. MIPS relate the material inputs necessary for the production, distribution, use, redistribution and disposal to the end-user service provided by any given good. This allows for comparisons among different yet functionally equivalent products. The TMR measures economic activity in physical terms, thus complementing economic information such as GDP by providing a more complete view of size and scope of an industrial economy. The TMR can also be considered an approximate indicator of the potential pressure exerted by an economy on the global environment, while further analysis will be required for this specific purpose.

In summary, material intensity and flow accounts are analytical tools to illustrate how much material and energy flows through the economic system at the sectoral, national, regional, and international levels. These tools are aimed at quantifying efficiency of economic operations, such as determining the material and energy flows per unit of service (MIPS); at addressing equity questions, such as on how much material and energy is used by whom and how it is distributed; and at illustrating global patterns in provenance and movement of material and energy.

Based on the MIPS concept, the indicator TMR (Total Material Requirement) was developed in order to monitor material flows on a regional and national level. On this basis joint international comparative studies have been undertaken by the World Resources Institute, the Wuppertal Institute, The Netherlands Ministry of Housing, and the Japanese National Institute for Environmental Planning (published in 1997).

Until today TMR has been calculated for several of the EU Member States (as Germany, the Netherlands, Austria), as well as for the USA and Japan. In the meantime, the TMR has been accepted by the UN DESA as one of the core indicators for consumption and production

patterns, to be integrated into the CSD indicator program, and the OECD Environment Policy Committee is considering to use it in their Waste Prevention Strategy.

As a conclusion one can say that TMR is neither the perfect indicator, while definitely a widely used one. It is a rough quantitative measurement of resources use in our economies, and lacks of course the qualitative component. This shall however not be a reason for deselecting it as a monitoring tool for resource use, as the qualitative aspects can be complemented through other specific indicators.

For an use on the European level there would be only the need to standardize the methodology, and complement the data which do already exist for a large range of currently used products.

Much of the text has been quoted from *Spangenberg, J.H., Hinterberger, F., Moll, S. and Schutz, H. (1999)* 'Material flow analysis, TMR and the MIPS concept: a contribution to the development of indicators for measuring changes in consumption and production patterns.' *Int.J.Sustainable Development, Vol.2, No 4,pp.491-505.*