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Problems of the Environment
of ICSU



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Indicators of sustainability Reliable tools for DECISION MAKING

Ecological and Earth Sciences in UNESCO



Measuring progress towards sustainability

News headlines remind us daily of the growing pressures on the planet and its climate. We are increasingly vulnerable to the effects of droughts, floods and epidemics. Our expanding population and rising demand mean a growing risk of shortages of water, energy, food and other basic requirements.

Inequity, insecurity, population displacements, economic shifts and instabilities are increasing. How can we adapt our governance and management to these complex and rapidly changing conditions and define a clear way forward?

Dealing with each problem in isolation is no longer sufficient. We live in an increasingly integrated world system where trade-offs between different goals and solutions are often required. The international community has responded to this challenge by developing the concept of 'sustainability', preparing action plans, including Agenda 21, and adopting targets such as those in the Millennium Development Goals.

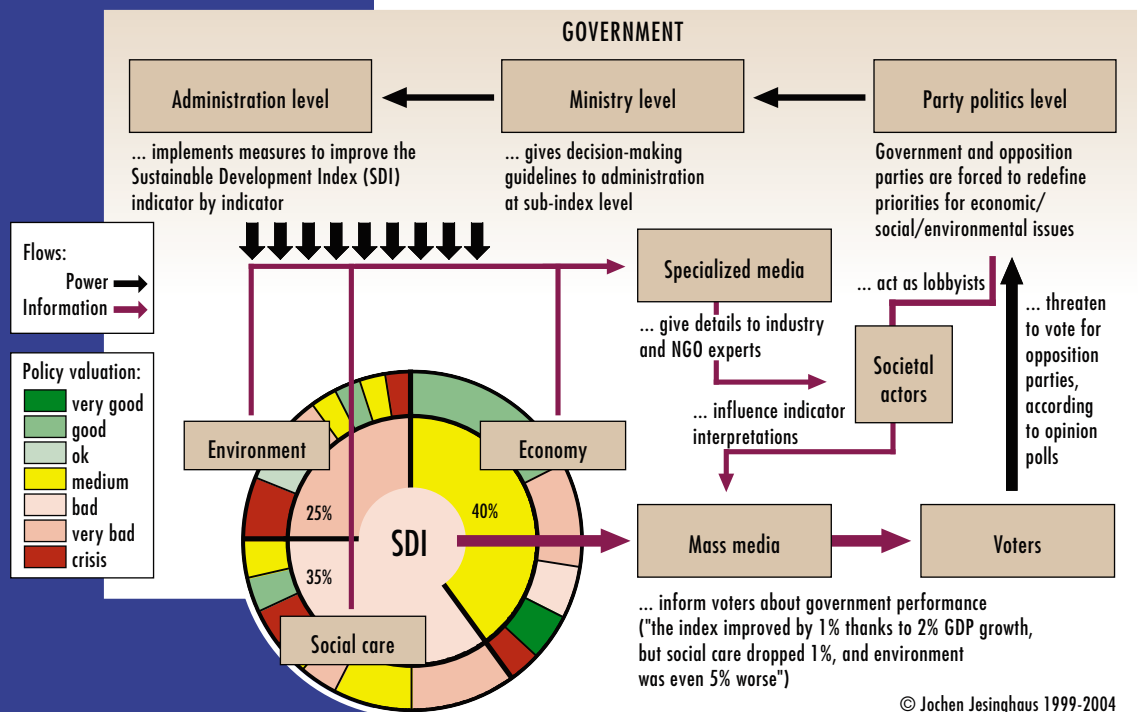
Making decisions without reliable indicators is like driving without road signs.

Indicators

Even when goals have been set, policy-makers need to prioritize and allocate resources in the face of conflicting requirements if they are to meet short-term political goals, economic growth, social progress and environmental sustainability. Wrong decisions can have serious consequences, increase human suffering, and even precipitate crises. Improving the basis for sound decision-making, integrating many complex issues and providing simple signals that a busy decision-maker can understand are thus high priorities. At a time when modern information technologies increase the flow of information but not necessarily our ability to absorb it, we need information tools that condense and digest information for rapid assimilation. This is a key role for indicators.

Making decisions without reliable indicators is like driving without road signs. Thus, for managing an economy, economic statistics and indicators like GDP and the unemployment rate have been developed. The drive towards sustainability also requires adequate indicators across all economic, social and environmental dimensions. Indicators can both directly inform decision-makers, and indirectly influence public opinion through their use by the media and civil society. This can result in pressures on political processes and governments, and build support for implementation.

The policy cycle in the media society.



The CSD and indicators of sustainable development

After Agenda 21 was adopted at the Rio Earth Summit in 1992, the UN Commission on Sustainable Development (CSD) took on the challenge of developing sustainability indicators. A first compilation of 134 indicators in 1996 was tested by over 20 countries, and a revised set of 58 core indicators was published in 2001 and recommended for national application.

SCOPE and indicators

The Scientific Committee on Problems of the Environment (SCOPE) of the International Council for Science has been providing independent scientific advice to the international community since 1969. When the CSD and the UN system began considering indicators of sustainable development, SCOPE organized a project on sustainability indicators, carried out in close collaboration with governments, the CSD and the UN. In 1997, SCOPE published a first report that summarized the state-of-the-art on indicators and suggested ways forward. SCOPE, together with UNEP, EEA and IHDP, has just completed a second assessment of indicators, *Measuring Progress Towards Sustainability*, prepared by 60 international experts.

Example of an eco-efficiency indicator: Total energy consumption and Gross domestic product, EU-25.

Source: Eurostat reproduced by EEA.

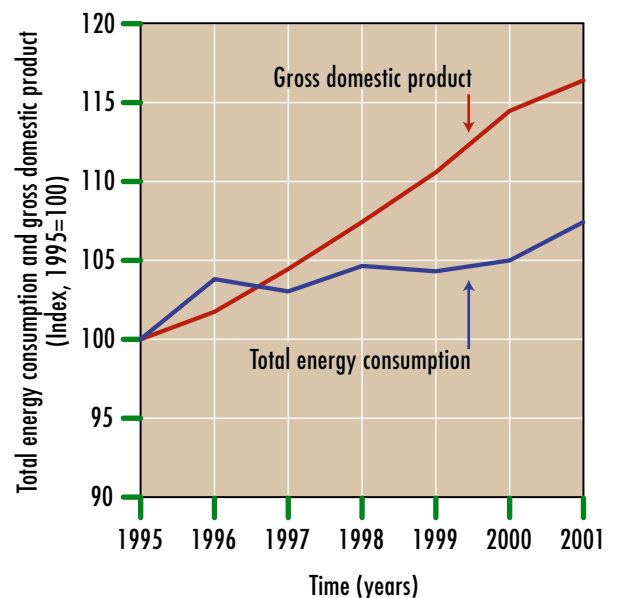
Recent progress

The first sets of sustainability indicators simply compiled a large number of existing measurements in various sustainability frameworks, for example as reflected in Agenda 21. Subsets of indicators were then developed to address various key policy issues. Indicators can be found at various levels, from those developed for specific issues to small numbers of indicators of high policy relevance. More recently, new indicators have been derived for some of the essential system processes and inter-relationships such as materials flows and energy efficiency.

SUSTAINABLE DEVELOPMENT				
Normative concepts	Environment	Social	Economic	
Headline Issues (+/-10)	Biodiversity Air quality Water use and quality Land use Energy Resource use Climate change	Health and security Knowledge and education Perception of well-being Institutional capacities	Material and energy flows/intensities Income distribution Economic growth Debt servicing	Indices and Composite Indicators
Component Issues (+/-100)	Mean global temperature Tropospheric ozone Deposition of N and S River chemistry Areas of forests Fish stock status etc.	Healthy life expectancy Disability losses Crime rate Participatory institutions School enrollment Literacy etc.	Gini coefficient Losses to natural disasters Waste intensities etc.	Aggregated Indicators
Base Data	Land cover etc.	Population etc.	Economic structure etc.	Variables

Hierarchy and scales - from sustainable development to base data. Source : SCOPE.

These provide a more integrated assessment of steps towards sustainability. A number of composite and aggregate indicators have also been developed (e.g. Human Development Index HDI, Environmental Sustainability Index ESI, Ecological Footprint, etc.). Initially, these indicators simply compared the relative progress of countries, but recently some indicators (e.g. Environmental Vulnerability Index EVI, Environmental Performance Index EPI) have begun to rate progress against sustainability thresholds and targets, and to generate national profiles that pinpoint strengths and weaknesses. As such, they can be used as tools to direct policy action.



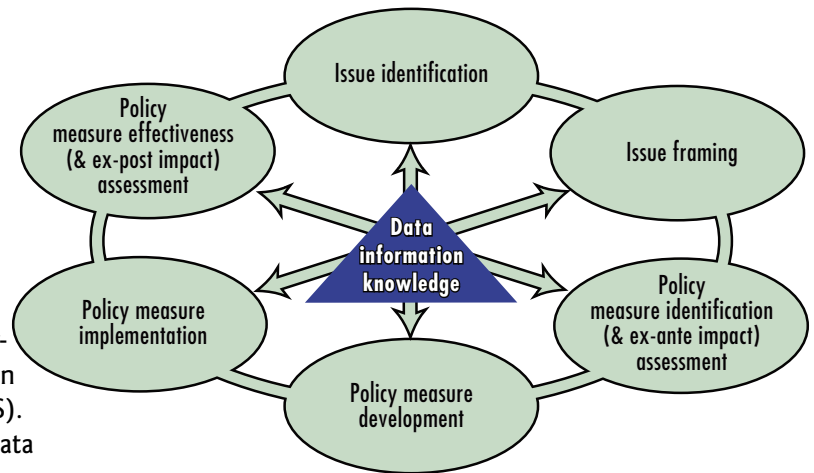
Data and observations

Inadequacies in the available data have hindered progress with many indicators. Developing countries often lack basic statistical data, and even in the most advanced countries many critical kinds of observations are still not systematically made. Where data series exist, there may be variations in methodology that make indicator comparisons unreliable. There is a notable lack of good time series data on the environment necessary for credible composite indicators. A major effort is still required to provide adequate information to support decision-making, especially for social and environmental issues.

One area where major progress is being made is in global observations of the environment. New technologies including satellite remote sensing are steadily improving our ability to collect globally coherent data sets, guided by the Integrated Global Observing Strategy (IGOS) Partnership and the intergovernmental Group on Earth Observations (GEO) coordinating the 10-year implementation plan for the Global Earth Observation System of Systems (GEOSS). However, major investments are still needed to assemble data sets and to interpret them in ways useful for decision-makers. The development of indicators based on these new flows of information is an important priority.

Policy relevance

For indicators to be effective in the political arena, they need to be credible, legitimate and relevant to policy priorities. Achieving this requires processes which are inclusive and where the divergent views of users and stakeholders are aired and explored. Since most of the legitimacy of indicators comes from their framing and conceptualization, stakeholders must be involved from the outset. Indicators play different roles in

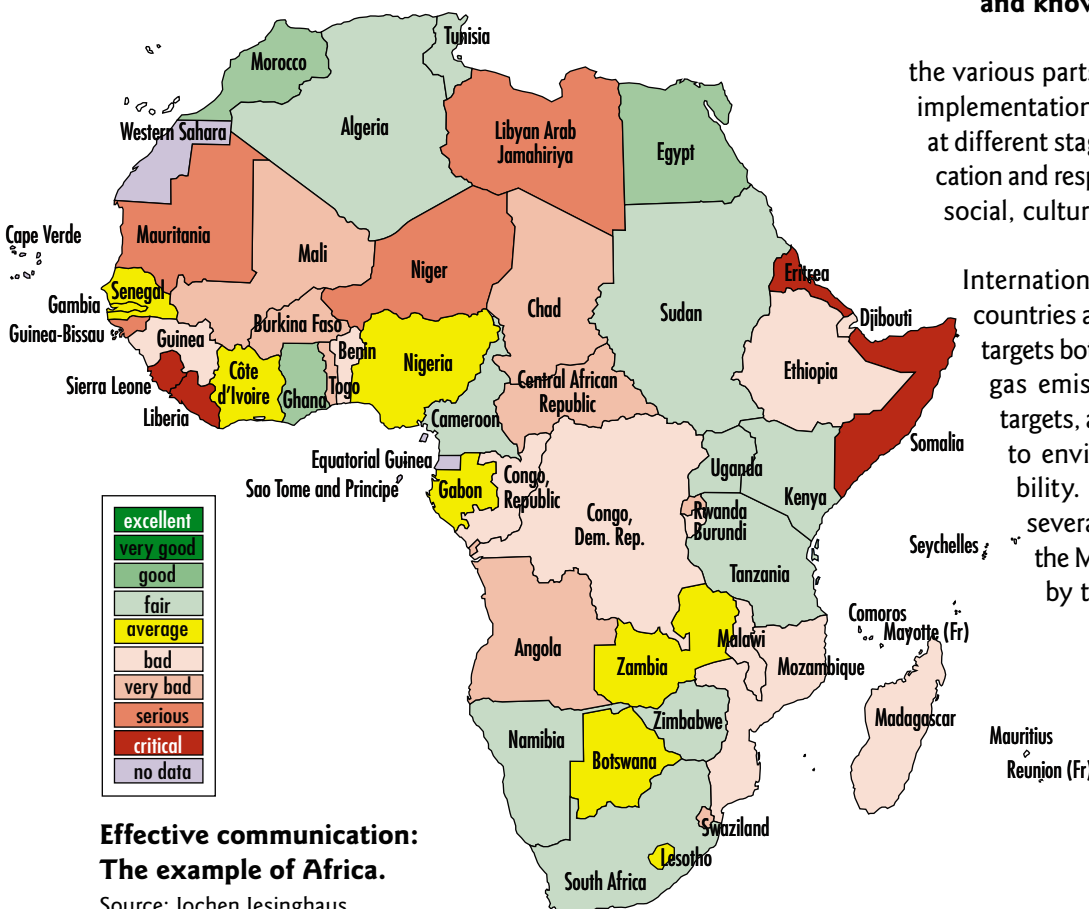


Main stages in the policy life-cycle, supported by data, information and knowledge. Source: EEA.

the various parts of the policy cycle of development, implementation and evaluation. Their roles also vary at different stages in the process of problem identification and response, and for different environmental, social, cultural and developmental situations.

Internationally, indicators can show how well countries are performing on global sustainability targets both in a specific area such as greenhouse gas emissions in relation to Kyoto Protocol targets, and in more general terms with respect to environmental sustainability or vulnerability. Indicators have now been used for several years to measure progress towards the Millennium Development Goals adopted by the Millennium Summit in 2000.

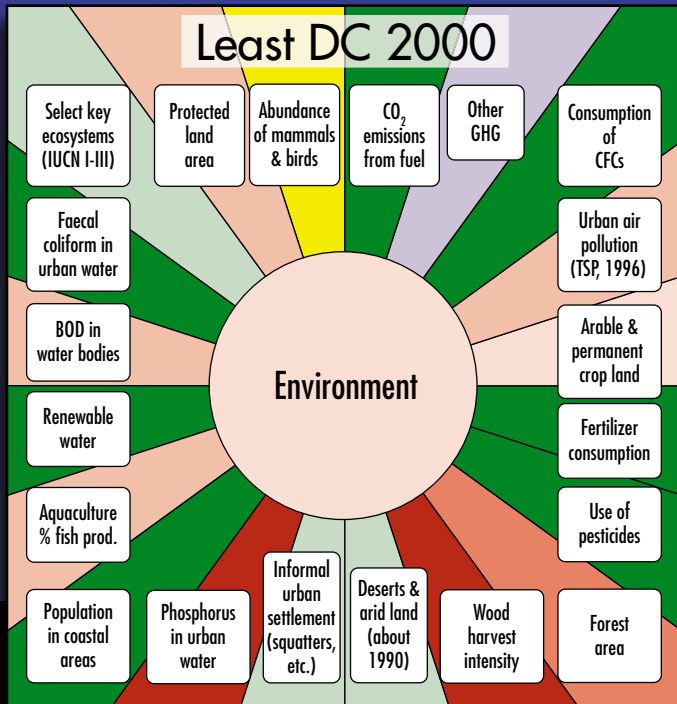
Many indicators are now ready to be applied at national level.



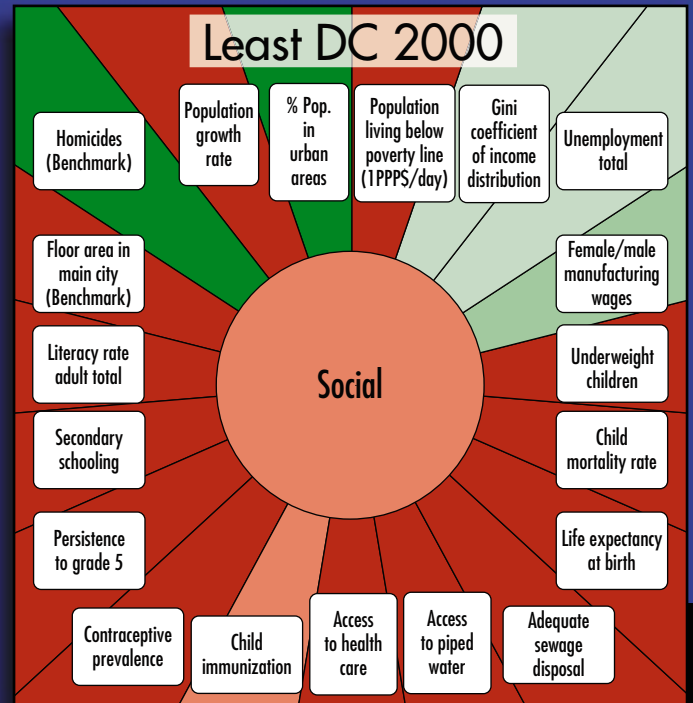
Effective communication: The example of Africa.

Source: Jochen Jesinghaus.

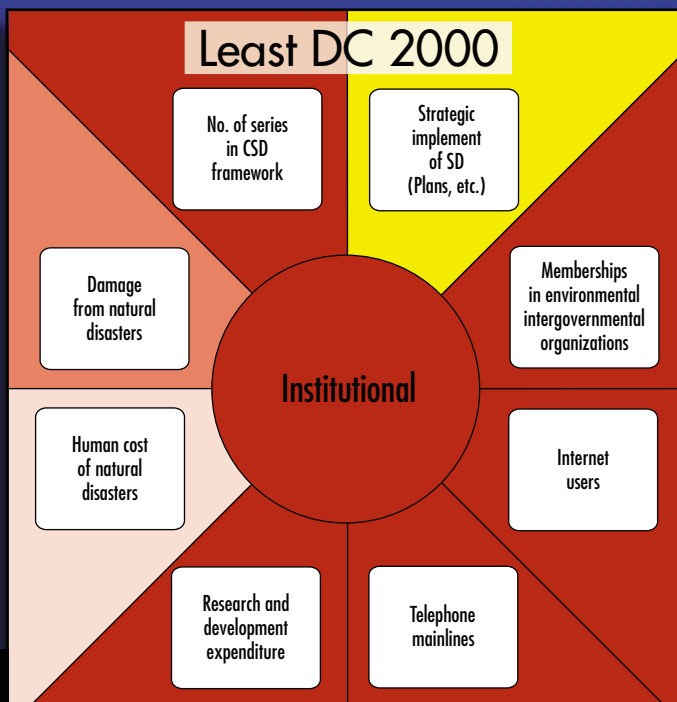
Dashboard of Sustainability: This tool developed at the European Commission's Joint Research Centre provides a simple graphic interface that can be used to present and compare sets of sustainability indicators. It can communicate a quick impression and point to areas where indicators show particular successes or problems.



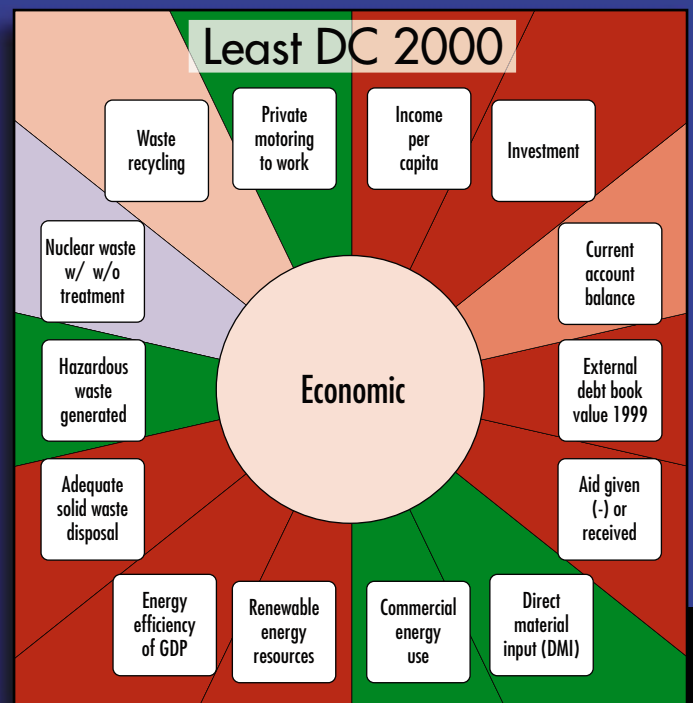
The environmental pillar of Sustainable Development.



The social pillar of Sustainable Development.



The institutional pillar of Sustainable Development.



The economic pillar of Sustainable Development.

Conclusions

While there is always room for improvement, this latest review assessing development of sustainability indicators shows that many indicators are now ready to be applied at national level. They can also provide international comparisons in support of sustainability goals and targets.

Every country can now design and implement its own national indicator programme for sustainability, extending far beyond traditional economic and social statistics. This programme can be adapted and customized to the country's own needs. The priority is to increase the use of information for policy, planning and management.

Developing indicators and using them to support decision-making is one of the most cost-effective ways of doing this. Improvements here can help secure a more equitable and sustainable society for our children and future generations.

The designations employed and the presentation of material throughout this publication do not imply the expression of any opinion whatsoever on the part of UNESCO and SCOPE concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

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Useful links

UN Division for Sustainable Development, Indicators of Sustainable Development:
<http://www.un.org/esa/sustdev/natlinfo/indicators/isd.htm>

UN, 2001. Indicators of Sustainable Development: Guidelines and Methodologies :
<http://www.un.org/esa/sustdev/natlinfo/indicators/indisd/indisd-mg2001.pdf>

UN System-wide Earthwatch: <http://earthwatch.unep.net/indicators/index.php>

UNESCO, Division of Ecological and Earth Sciences:
<http://unesco.org/mab/>

IISD Compendium of Sustainable Development Indicator Initiatives and Publications:
<http://www.iisd.org/measure/compendium/>

JRC Dashboard of Sustainability:
<http://esl.jrc.it/envind/dashbrds.htm>

IGOS Partnership: <http://www.igospartners.org/>
Group on Earth Observations:
<http://earthobservations.org/>

Scientific Committee on Problems of the Environment (SCOPE): <http://www.icsu-scope.org/>

European Environment Agency's Core Set of Indicators: <http://themes.eea.eu.int/IMS/CSI>

International Human Dimensions Programme on Global Environmental Change (IHDP):
<http://www.ihdp.org>

OECD Fact Book of 100 Indicators: <http://thesius.sourceoecd.org/vl=1430267/cl=18/nw=1/rpsv/factbook/>

Composite indicators

Human Development Index HDI: http://hdr.undp.org/statistics/indices/about_hdi.cfm

Environmental Sustainability Index ESI:
<http://sedac.ciesin.columbia.edu/es/esi/>

Ecological Footprint:
<http://www.footprintnetwork.org/>

Environmental Vulnerability Index EVI:
<http://www.vulnerabilityindex.net/>

Environmental Performance Index EPI:
<http://beta.sedac.ciesin.columbia.edu/es/epi/>

Information Server on Composite Indicators:
<http://farmweb.jrc.cec.eu.int/CI/>

MDG Dashboard: http://esl.jrc.it/dc/mdg8/index_ia.htm