



One of five key areas to sustainable development where progress is possible with the resources and technologies at our disposal today.

Indicators for Sustainable Energy Development

Energy is essential to economic and social development and improved quality of life. However, much of the world's energy is currently produced and used in ways that may not be sustainable in the long term. In order to assess progress towards a sustainable energy future, energy indicators that can measure and monitor important changes will be needed.

the August 2002 World Summit on Sustainable Development (WSSD), calls on countries at the national level and international governmental and non-governmental organizations at the international level to develop the concept of indicators of sustainable development in order to identify such indicators.

Agenda 21, which was agreed to at the 1992 Earth Summit in Rio de Janeiro and is a central focus of

Despite some progress, no comprehensive set of indicators for sustainable energy development exists.

Energy expenses often take the biggest bite out of the budgets of the poor

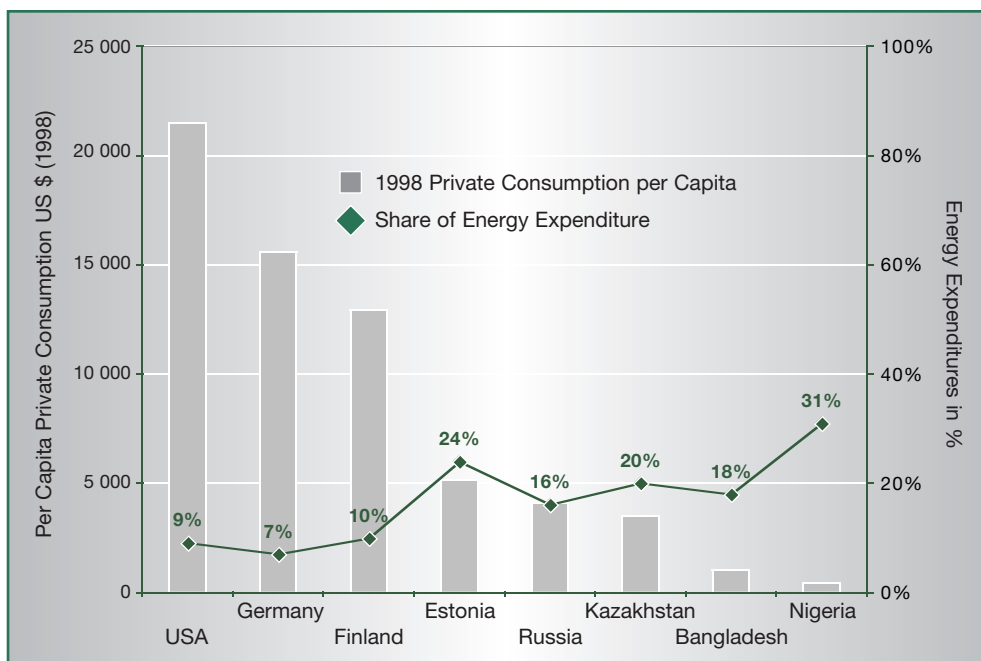


Fig. 1. Energy expenditures as share of consumption per capita (Source: World Bank 2000).

In 1999, the International Atomic Energy Agency (IAEA) brought together representatives from seven international organizations and eight countries to review existing relevant indicators and develop a provisional set of indicators for sustainable energy development. These indicators were informally field tested in 15 countries (including Argentina, China, Cuba, Indonesia, Mexico, Pakistan, Turkey, countries in Eastern and Western Europe, the Russian Federation, and the USA) to assess data quality and availability. A final set of 41 indicators was then defined incorporating both the test results and criteria

used by the United Nations' ongoing Work Programme on Indicators of Sustainable Development

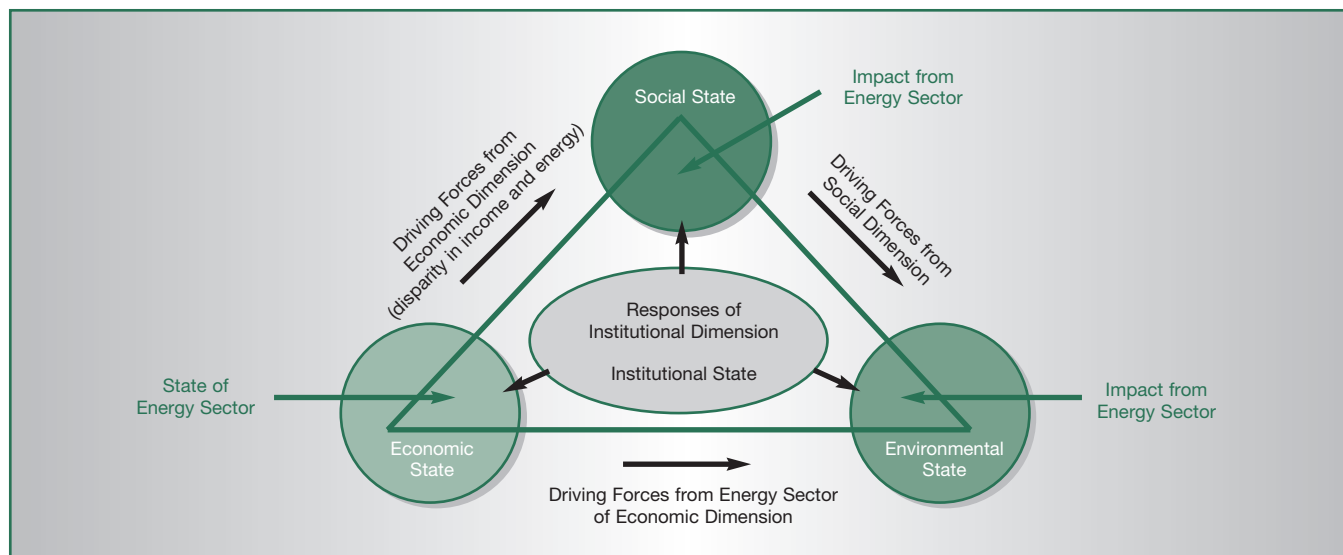


Fig. 2. Interrelations between sustainability dimensions of the energy system.

(WPISD). An interim report describing this stage of the project was presented at the Ninth Session of the Commission for Sustainable Development (CSD9) in April 2001.

The set of 41 indicators in the interim report started from the Driving Force/ State/Response (DSR) framework devised by the United Nation's WPISD and now widely applied for indicators. The DSR framework was extended to be better tuned to the energy sector

and to make good use of energy related environmental models developed by the Organization for Economic Co-operation and Development (OECD), the European Commission (EC) and the International Energy Agency (IEA) of the OECD. The extended framework incorporates three pillars of sustainable development — social, economic, and environmental — together with institutional considerations. It provides a systematic scheme for identifying the cross linkages among different indicators.

In some developing countries, the share of non-commercial energy use (e.g., fuelwood, agricultural residues) continues to increase

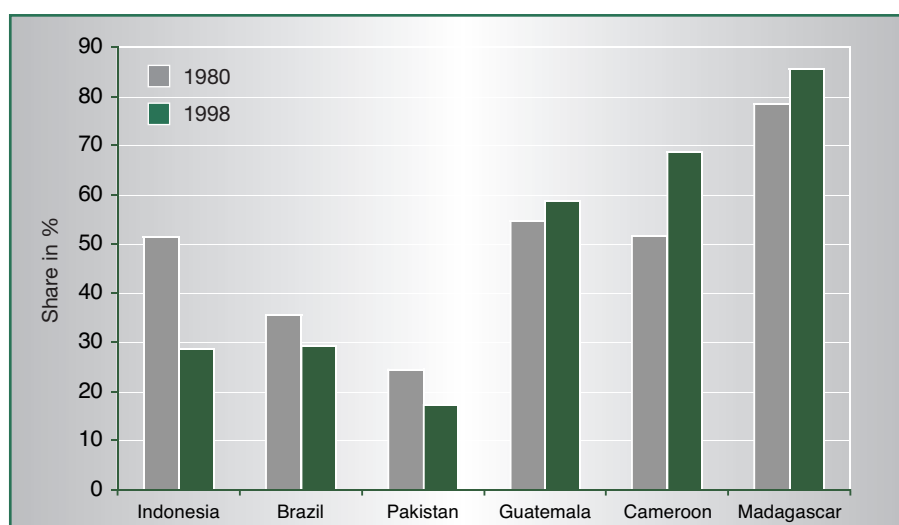


Fig. 3. Share of non-commercial fuel in total primary energy mix, 1980–1998.

The 41 resulting indicators are listed in Box 1. Those in bold (a total of 23) were identified as “core indicators”, meaning that they are either specific to energy or especially important, given the interest in working with the most compact, but still meaningful, number of indicators possible. The annotations indicate overlap with existing indicator sets. Overlap means that, although no existing indicator set covers all the ground necessary for energy indicators, there is a substantial existing foundation for this partnership initiative to build on.

The IAEA has officially registered a “Type 2” Partnership Initiative on Indicators for Sustainable Energy Development (ISED) at the World Summit on Sustainable Development (WSSD).

Box 1. List of ISED — Compact Form

(core ISED are in bold font,

ISED which correspond to ISD in the UN-CSD Working list/Core list are in green font)

1. Population: total, urban
2. GDP per capita
3. **End-use energy prices with and without tax/subsidy**
4. Shares of sectors in GDP value added
5. Distance travelled per capita: total, by urban public transport mode
6. Freight transport activity: total, by mode
7. Floor area per capita
8. Manufacturing value added by selected energy intensive industries
9. **Energy intensity: manufacturing, transportation, agriculture, commercial and public services, residential sector**
10. Final energy intensity of selected energy intensive products
11. **Energy mix: final energy, electricity generation, primary energy supply**
12. **Energy supply efficiency: fossil fuel efficiency for electricity generation**
13. Status of deployment of pollution abatement technologies: extent of use, average performance
14. **Energy use per unit of GDP**
15. **Expenditure on energy sector: total investments, environmental control, hydrocarbon exploration and development, RD&D, net energy import expenses**
16. **Energy consumption per capita**
17. **Indigenous energy production**
18. **Net energy import dependence**
19. **Income inequality**
20. Ratio of daily disposable income/private consumption per capita of 20% poorest population to the prices of electricity and major household fuels
21. **Fraction of disposable income/private consumption spent on fuel and electricity by: average population; group of 20% poorest population**
22. **Fraction of households: heavily dependent on non-commercial energy; without electricity**
23. **Quantities of air pollutant emissions (SO₂, NO_x, particulates, CO, VOC)**
24. **Ambient concentration of pollutants in urban areas: SO₂, NO_x, suspended particulates, CO, ozone**
25. Land area where acidification exceeds critical load
26. **Quantities of greenhouse gas emissions**
27. Radionuclides in atmospheric radioactive discharges
28. Discharges into water basins : waste/storm water, radionuclides, oil into coastal waters
29. **Generation of solid waste**
30. **Accumulated quantity of solid wastes to be managed**
31. **Generation of radioactive waste**
32. **Accumulated quantity of radioactive wastes awaiting disposal**
33. **Land area taken up by energy facilities and infrastructure**
34. **Fatalities due to accidents with breakdown by fuel chains**
35. **Fraction of technically exploitable capability of hydropower currently in use**
36. **Proven recoverable fossil fuel reserves**
37. Life time of proven fossil fuel reserves
38. Proven uranium reserves
39. Life time of proven uranium reserves
40. **Intensity of use of forest resources as fuelwood**
41. Rate of deforestation

The Partnership Initiative

The overall objective is to develop a set of indicators that can guide necessary modifications to relevant databases and energy planning/evaluation models (and then be incorporated into those databases and models) to make them more responsive to sustainable energy development issues. For the IAEA, which provides assistance to Member States — particularly developing countries — in formulating coherent forward-looking energy strategies, an additional objective is capacity building in these Member States in the tools and techniques of planning for sustainable energy development.

More specific targets are the inclusion of the ISED system in national databases and in on-going energy analysis and the effective use of the ISED system in assessing energy priority issues, in evaluating current policies and programmes, in formulating energy policies to ensure progress towards sustainable energy development, and in helping countries to monitor their progress. The project is currently planned for three years, although there is the possibility of a three-year extension to continue monitoring progress and to add additional countries that might be interested in the partnership.

The current initiative is led by the IAEA with governmental partners from Brazil, Cuba, Lithuania, Mexico, the Russian Federation and Slovakia, and inter-governmental organization partners from the IEA, Eurostat, the Economic Commission for Europe (ECE) and the Department of Economic and Social Affairs (DESA) of the UN Division for Sustainable Development and Statistics Division. Other supporting

groups include the International Center for Theoretical Physics (Italy), the Center for Energy Policy (Russian Federation), and the Center for Energy-Environment Research & Development (Thailand).

The partnership initiative takes the form of an IAEA “Co-ordinated Research Project” (CRP) entitled “Historical Evolution of Indicators of Sustainable Energy Development (ISED) and the Use of this Information for Designing Guidelines for Future Energy Strategies in Conformity with the Objectives of Sustainable Development.” This CRP formally began in May 2002 with a first training workshop and research co-ordination meeting that brought together the key potential users of ISED in statistical offices and institutions within each participating country. Three further workshops will be conducted in the next three years. Further sources are being sought for additional countries to join the project and be incorporated into the process.

The immediate tasks are to compile historical data on ISED in participating countries, to further refine the indicator set to reflect experience gained in compiling data, and to demonstrate the utility of ISED in energy policy assessment. Ultimately, these countries will benefit by using ISED to formulate sustainable energy strategies and monitor their progress towards their national energy objectives.

Information about the initiative and other activities in energy indicators for sustainable development is also available on the IAEA website:

<http://www.iaea.org/worldatom/Programmes/Energy/pess/ISED.shtml>

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