

# Energy indicators for sustainable development

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## Abstract

Energy is an essential factor in overall efforts to achieve sustainable development. Countries striving to this end are seeking to reassess their energy systems with a view toward planning energy programmes and strategies in line with sustainable development goals and objectives. This paper summarizes the outcome of an international partnership initiative on indicators for sustainable energy development that aims to provide an analytical tool for assessing current energy production and use patterns at a national level. The proposed set of energy indicators represents a first step of a consensus reached on this subject by five international agencies—two from the United Nations system (the Department of Economic and Social Affairs and the International Atomic Energy Agency), two from the European Union (Eurostat and the European Environment Agency) and one from the Organization for Economic Cooperation and Development (the International Energy Agency). Energy and environmental experts including statisticians, analysts, policy makers and academics have started to implement general guidelines and methodologies in the development of national energy indicators for use in their efforts to monitor the effects of energy policies on the social, economic and environmental dimensions of sustainable development. © 2006 Published by Elsevier Ltd.

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## 1. Energy and sustainable development

The provision of adequate and reliable energy services at affordable costs, in a secure and environmentally benign manner, and in conformity with social and economic development needs, is an essential element of sustainable development. Energy is vital for eradicating poverty, improving human welfare and raising living standards. However, most current patterns of energy supply and use are unsustainable [1]. Many areas of the world have no reliable and secure energy supplies, which limits economic development, while in other areas environmental degradation from energy use inhibits sustainable development. About one-third of the world's population still relies on the use of animal power and non-commercial fuels. Some 1.7 billion people have no access to electricity. This lack of access to modern energy services severely limits socioeconomic development—an integral part of sustainable development. Nonetheless, because of improved technology and an increased understanding of

the effects and impacts of energy and energy systems, a developing country today can make the transition from an agricultural to an industrial economy with much lower costs and with less environmental damage than today's developed countries were subjected to during their transition.

In 1997, the United Nations (UN) General Assembly formally recognized the need for more sustainable energy use patterns, and for the first time, an intergovernmental process was created to elaborate a common approach to the sustainable energy development agenda. The 2000 World Energy Assessment publication [2] thoroughly analyses the relationships among energy, social issues, health, and the environment; addresses issues of energy security, resource availability, end-use efficiency, renewable and advanced supply technologies; pays special attention to the fundamental problem of rural energy in developing countries and to the role of energy in economic prosperity; and depicts energy scenarios for the 21st century. In April 2001, the Ninth Session of the Commission on Sustainable Development (CSD-9) recognized the need for more sustainable patterns of production, distribution and use of energy.

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Energy was discussed in 2002 at the World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa [3]. At the WSSD, the international community reconfirmed that access to energy is important for the Millennium Development Goal of halving the proportion of people living in poverty by 2015 [4]. The summit also called for changes in unsustainable patterns of energy production and use. The agreement reached at WSSD, the Johannesburg Plan of Implementation (JPOI), places energy firmly on the agenda of sustainable development as vital for both the eradication of poverty and changing consumption and production patterns.

## 2. Need for energy indicators

The 1992 Earth Summit recognized the important role that indicators can play in helping countries to make informed decisions concerning sustainable development. This recognition is articulated in Chapter 40 of Agenda 21, which calls on countries at the national level, as well as international, governmental and non-governmental organizations, to develop indicators of sustainable development. It was in light of the growing prominence of energy in the international debate and the importance of energy in efforts to implement the WSSD agreement at the national level, that a number of international and regional organizations continued to work on the development of sets of indicators that could be used by countries, especially developing countries, to measure progress on energy and sustainable development at the national level.

Energy indicators are not merely energy statistics; rather, they extend beyond basic statistics to provide a deeper understanding of causal relationships in the energy–environment–economics nexus, and to highlight linkages that may not be evident from simple statistics. Taken together, indicators can give a picture of the whole energy system, including interlinkages and trade-offs among various dimensions of sustainable development, as well as the longer-term implications of current decisions and behaviour. Changes in the indicator values over time mark progress or lack of progress towards sustainable development.

Policymakers need ways to measure and assess the current and future effects of energy use on health, society, air, soil and water. They need to know their country's current status concerning energy and economic sustainability, what needs to be improved and how these improvements can be achieved. Therefore, it is important for policymakers to understand the implications of selected energy, environmental and economic programmes, policies and plans, and their impacts on the shaping of development and on the feasibility of making this development sustainable.

Indicators are useful for monitoring progress towards specific country goals. For example, to monitor success in limiting emissions from the energy sector, it would be sensible to analyse indicators related to energy use and

efficiency, and population and economic growth, and to identify the factors most responsive to policy changes. Progress is then more easily monitored and policies are often more easily implemented by using these indicators rather than focusing solely on the goal.

Indicators are thus useful tools for communicating energy issues related to sustainable development to policymakers and to the public, and for promoting institutional dialogue.

## 3. An international partnership initiative

In response to decisions taken by the United Nations Commission on Sustainable Development (CSD) and to Chapter 40 of Agenda 21, in 1995 United Nations Department of Economic and Social Affairs (UNDESA) began working to produce an overall set of indicators for sustainable development (ISD). This effort concluded with a package of 58 ISD, of which only three were energy related—annual energy consumption per capita, intensity of energy use and share of consumption of renewable energy resources [5].

In order to complement the effort of the CSD, the International Atomic Energy Agency (IAEA) started a long-term programme on Indicators for Sustainable Energy Development (ISED) in 1999 in cooperation with various international organizations and some Member States of the IAEA. This international effort had two major objectives: (1) to complement the overall UN Work Programme on Indicators of Sustainable Development and (2) to foster energy and statistical capacity building needed to induce energy sustainability. The project was presented at the CSD-9 in April 2001 [6].

In 2002, the indicators project led by the IAEA classified as an official partnership initiative of the WSSD. The partnership was considered an effective initiative of international scope aimed at supporting the practical implementation of Agenda 21 and of sustainable development activities at a country level and of particular interest to developing countries. Furthermore, the partnership represented an example of a project with specific outcomes based on a series of tasks and action-oriented activities that would contribute in translating political commitments into actions and consequently into tangible benefits.

The international partnership initiative on ISED was conducted by the IAEA in cooperation with UNDESA, the International Energy Agency (IEA), the Statistical Office of the European Communities (Eurostat) and the European Environment Agency (EEA). These organizations, which are recognized as world leaders in statistical analysis and in the development of energy and environmental indicators, are actively involved in fostering the implementation of principles of sustainable development at national and regional levels. This harmonized endeavour was pursued to eliminate duplication of efforts by international organizations and to provide users with a single set of energy indicators applicable worldwide.

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