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Better energy indicators for sustainable development

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The UN's Sustainable Development Goal 7 aims to deliver affordable, reliable, sustainable and modern energy for all. Tracking progress towards the targets under this goal can spur better energy statistics and data gathering capacity and will require new indicators that also consider the interplay with other goals.

Indicators can have an important role in communicating energy issues related to sustainable development to policymakers and the public. Energy indicators are not merely data, but rather they often combine detailed energy statistics with other information (such as a measure of the activity in a sector, for example the gross domestic product of the economy, the floor area of households or the tonnes of steel produced by industry) to provide a deeper understanding of the social, environmental and economic challenges posed by energy supply and use and to highlight important relations that otherwise would not be evident.

Indicators can help improve understanding of an issue, increase its visibility and promote further action to tackle a problem but, as with many tools, they can also be misused, particularly as they are necessarily often embedded within political processes. Consequently, politics can be key to the way in which indicators are interpreted and used by policymakers and inappropriate or missing indicators can, wilfully or not, lead to politically unfavourable issues being misrepresented or ignored. Thus, while this Comment focuses on the technical aspects of developing energy indicators to track sustainable development, we also recognise that it is important to have broad scrutiny of the processes by which indicators are chosen,

the way in which they are constructed, how they are used and who gets to decide these matters.

Indicators and statistics to measure trends in sustainable development have a long history of use by the United Nations (UN), stretching back to the 1987 Brundtland Report.[1] More recently, indicators were used to track progress against the Millennium Development Goals (MDGs) adopted in 2000, although energy was not included as a specific goal. In 2015, the UN General Assembly adopted a comprehensive 2030 Agenda for Sustainable Development with 17 Sustainable Development Goals (SDGs), including one on affordable and clean energy for all (SDG7), and agreed to develop indicators to measure progress against them. SDG7 comprises five targets: ensuring universal access to energy services; increasing the share of renewable energy; doubling the global rate of improvement in energy efficiency; cooperating internationally on research and development; and expanding infrastructure and upgrading technologies. While some of these targets are clearly relevant as global objectives, policy decisions at the national level will be crucial to meeting many of them. Appropriate national level indicators are therefore key for understanding the complexities involved and for measuring progress.

The inclusion of energy as an SDG can act as a catalyst for countries and international organisations to redouble their efforts to collect statistics and develop indicators to track progress towards achieving affordable and clean energy for all. Key challenges include further capacity building to embed the core SDG7 indicators and the underlying data collection into national statistical programmes, improvements to current indicator methodologies and the adoption by countries of a broader set of indicators to reflect better the complexities of national energy contexts, and the development of new indicators to track the nexus between SDG7 and the other SDGs.

Improving the availability of statistics

The construction of reliable energy indicators for tracking progress on sustainable development is only possible if the appropriate statistics are available at the national level. At the moment the picture is rather mixed. Increasing numbers of countries are recognising the importance of a sound statistical evidence base to help inform energy policy-making. Many have made considerable progress in recent years by improving both the quality and breadth of the data collected, often assisted by regional and global efforts (Box 1). However, it is also true that many national statistical offices (or equivalent institutions) are overstretched, there is often a lack of co-ordination across different ministries that hold relevant data, and resources for the collection of energy and related statistics have to compete with other equally important data collection needs. As a result many countries only have the data to construct a relatively aggregate energy balance, which often lacks sectoral detail on the demand-side. Other data needed for constructing energy indicators, such as

measures of activity, also may not be easily available – particularly for more detailed sectoral indicators.

Recognising this need, SDG17 is about monitoring and accountability and includes two targets: to enhance capacity-building to increase the availability of high-quality, timely and reliable data and to support statistical capacity-building in developing countries. There are a number of international initiatives involved in such work, including the Partnership in Statistics for Development in the 21st Century and the Global Partnership on Sustainable Development Data. Specifically on energy, the Intersecretariat Working Group on Energy Statistics brings together more than 20 international organisations to work on improving the availability and quality of international energy statistics, including for use in indicators. The G20 have also recently launched an initiative on energy efficiency, which identifies energy end-use data and energy efficiency metrics as a key area for collaboration.[2]

More can be done. Based on the MDGs, a recent report highlighted a number of lessons learned and key remaining challenges, including better alignment of international monitoring with national data, dealing with conflicting data sources and statistics, and further closing the gap between data needs and supply.[3] Some have argued that official datasets will never deliver all the statistics necessary to track sustainability due to a lack of both resources and political motivations. Rather, they advocate the much greater involvement of citizen scientists, independent watchdogs, private sector companies and third-party organisations.[4] While such data sources may well play an increasing role in a "smart data" future, our view is that for reasons of coverage, comparability and legitimacy[5], this will need to be done in partnership with official statistics providers who will have a crucial co-ordinating role if these sources are not to compound what the OECD describes as "the cacophony of data discrepancies".[3]

Clearly, building official statistical capacity will require additional resources, but experience also shows that there are a number of things which countries can do, supported by the international community, that are relatively low cost. These include: identifying strategies for raising the profile of statistics and getting support at the political level; sharing knowledge on good practice in data collection and institutional arrangements; incorporating energy-related questions (for example, on energy access) into existing household surveys; and enhancing the capacity of countries to communicate and share data across public institutions (bringing together both data providers and data users). In addition, the international community can help to reduce the burden on countries by avoiding multiple data requests and by harmonising definitions and methodologies. Evidence from the MDGs shows that, with sufficient political will, countries are able to rise to the data challenge: data availability for the majority of MDG indicators improved across 174 developing countries, with the number of countries with trend data for between 16 and 22 indicator series increasing from 2% in 2003 to 83% in 2012.[6]

Improving the accuracy of indicators

Even when the necessary statistics are available, important choices must be made about which kinds of energy indicators are most appropriate to measure progress against sustainable development objectives. Many different criteria have been developed to help with this selection and the inevitable trade-offs that are involved (for example scientific accuracy versus ease of implementation).[7,8,9] For instance, the UN Statistics Division (UNSD) recommends that indicators should be relevant, methodologically sound, measurable, easy to communicate and access, limited in number and outcome focused.[10]

A discussion of whether the proposed SDG7 indicators meet these requirements, or how they were agreed, is beyond the scope of this Comment. Rather, we believe that the inclusion of an energy goal within the SDGs is a major step forward in recognising the important role that energy plays in sustainable development. Consequently, the short-term priority should be to ensure that countries have robust and reliable metrics for monitoring progress towards the five targets under SDG7. Work on this is being co-ordinated by the Inter-agency Expert Group on SDG Indicators and an initial set of indicators has been proposed (Table 1). Progress against some of these targets, such as on the share of renewable energy, requires relatively simple indicators and can be constructed using data found in a standard national energy balance (although improvements are still possible). However, other targets, such as those on energy access, would ideally use more complex and detailed indicators. The current formulation of the energy access indicator is binary - a household either does or does not have access to electricity. Yet, in many parts of the world, having an electricity connection (whether it be to the national grid, a local mini-grid or to a standalone source of power, such as a solar photovoltaic system) does not guarantee that the electricity supply is of adequate quality and reliability, or is affordable. The World Bank is working on a multi-tiered approach to categorising energy access which is intended to capture these reliability and affordability aspects[11] and which the UN anticipates will allow a more refined measure of progress towards the energy access target. Improvements to the other energy SDG indicators should also be considered over time, with that for measuring progress on energy efficiency being among the most urgent (see Table 1).

The targets proposed under SDG7 clearly address some of the key aspects of energy that are relevant to sustainable development and so should be the focus of globally comparable indicators. However, other issues may be equally important in some countries, but not in others. For instance, reducing air pollution from electricity generation or from cooking may be a key sustainable development goal for a particular country, while in another it may be reducing energy import dependency. Additional, country-specific energy indicators therefore will be needed to track those issues which are national priorities. Countries should be encouraged and supported to interpret the goal of affordable and clean energy within their national context and

then select appropriate indicators (for example, as identified by the UN EISD[19]) that are updated on a regular basis, relevant to national priorities and used to inform the policy-making process.

Developing nexus indicators

Given the complex and multi-faceted nature of sustainable development it is also important that policy-makers and other energy decision makers do not ignore the potential for synergies and conflicts between SDG7 and the other SDGs.[13] There is currently much research into the relationship between energy and issues such as food and water. However, the links from energy extend much further than this, including to the SDGs on health, education, gender, economic growth, industry, cities and climate.

It is vital that countries try to understand these interdependencies. Computer models exist that can quantify many of these interlinkages and a wide variety of composite indicators have been suggested to combine different sustainable development goals.[14,15,16] However, many of these techniques - while promising in the longer term – are relatively complex and have significant data needs and so are not necessarily the best short-term option to get a hold on the issues. As a starting point, significant information about some of the key linkages between sustainable development issues can be obtained by using relatively simple approaches, such as disaggregating energy indicators down to particular categories (for example, tracking energy access by schools, hospitals, and so on), calculating energy access rates by the gender of the head of household and by combining existing datasets to create new indicators, such as water use per kWh of electricity generated from different types of power plants. Some of these indicators may need to be elaborated at the sub-national level to highlight variations within a country, such as those differences that often exist between urban and rural areas.

The 2015 SE4All tracking report discusses the need for nexus indicators[17], but it is clear that much more thinking is needed about what kinds of indicators are desirable from a policy perspective and what is currently possible, given the availability of data.

The way forward

The inclusion of SDG7 within the 2030 Agenda for Sustainable Development is recognition that energy is central to nearly every major challenge that countries face today. Tracking progress against the SDG7 targets will require reliable energy statistics and indicators that are both relevant at a national level and comparable across countries. While the data challenges posed by the construction of these indicators are substantial, the experience from the MDGs is encouraging.

The political focus provided by SDG7 can offer a similar catalyst for action on energy. Indeed, there are examples where this is already happening, including the

work of the G20 and the SE4ALL initiative. While there is no single solution that will lead to better energy statistics, by combining traditional and new data sources and by drawing on best practice, countries – with support from the international community – can rise to the challenge of providing reliable, timely and comparable data.

While the priority in the short term should be on developing appropriate indicators to track progress against the SDG7 targets and building the required statistical capacity to collect data, such indicators should only be a starting point. Updating and expanding the EISD work, while also drawing on the experience of other indicator initiatives, could solve the dilemma of developing indicators that are methodologically sound, measurable and relevant at the global level while being useful for national-level decision-makers.

However, there is a danger that having multiple goals and indicators can encourage a piecemeal approach to sustainable development, rather than a more holistic perspective. It is therefore vital that the policy, statistics and research communities work together to go beyond current energy indicators to develop a hierarchy of next generation indicators to help understand the nexus between energy and other SDGs.

Finally, we acknowledge that, while goals and indicators can be very useful tools to support both government policy-making and to assist the public in holding those governments to account, they are just that – tools – and their blind pursuit should not become an end in itself.

Box 1: Using energy indicators to track sustainable development

The UN has long-recognised the need for better indicators to track sustainable development. In 1995 it began a process to develop Indicators of Sustainable Development, with input from a wide range of governments, organisations and experts.[18] While energy was included, its complexity and importance in achieving sustainable development required further elaboration. Therefore, a group of international organisations, led by the International Atomic Energy Agency, developed a set of Energy Indicators for Sustainable Development (EISD)[12], which were subsequently piloted at the national level by a number of countries.[19]

Several other international organisations and their member countries have programmes to produce methodological guidelines and construct detailed energy indicators of various types. Notable examples include those by the International Energy Agency (IEA)[20] and the European Commission (through Eurostat[21], the Joint Research Centre[22] and the ODYSSEE-MURE project). While few of these programmes have a specific sustainable development focus, many of the indicators they have developed – such as those that track energy efficiency, renewables penetration and the environmental impacts of energy use – are clearly relevant. A number of country-level initiatives also exist, including in Canada, the United Kingdom and the United States.

More recently, some regional programmes involving developing countries have started, including in Latin America[23] and Africa[24,25] while national initiatives are also starting to emerge.[26,27,28,29] These typically focus on developing indicators that try to mirror those found for IEA and EU countries, within the constraints of data availability. There are fewer efforts that are tailored specifically to the needs of poorer developing countries, for example, on the SDG7 targets on energy access and financing issues. Exceptions include work led by the IEA and the World Bank under the UN Sustainable Energy for All (SE4All) initiative, which has developed a Global Tracking Framework, and the Poor People's Energy Outlook from Practical Action.

Table 1: Current and improved indicators for tracking Sustainable Development Goal 7

SDG 7 Target (for 2030)	Current (initial) indicators to track targets	Examples of more detailed potential indicators	Areas for further improvement
7.1 Ensure universal access to affordable, reliable and modern energy services	7.1.1 Proportion of population with access to electricity 7.1.2 Proportion of population with primary reliance on clean fuels and technology	Disaggregation of access to electricity by rural and urban populations	The World Bank is working on a Multi-Tier Framework for Measuring Energy Access to improve on the binary nature of the current indicator.
7.2 Increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption	Disaggregation of the share of renewable energy in electricity production, heating and transport fuels.	The current indicator does not distinguish whether renewable energy is sustainably produced. Data on solid biomass is highly uncertain in many countries and information on off-grid renewables is limited in many official energy balances.
7.3 Double the global rate of improvement in energy efficiency	7.3.1 Energy intensity measured in terms of primary energy and gross domestic product (GDP)	Disaggregation of energy intensity by main sector: households, industry, commercial and services, transport.	Energy intensity is an imperfect proxy for energy efficiency and can be affected by a number of factors (such as climate, structure of the economy, nature of economic activities, and so on) that are not necessarily linked to pure efficiency. Work by a number of organisations has suggested improved metrics, including the use of physically based indicators for some sectors (for example, energy use per tonne of output).

Notes: The first two columns are based on definitions developed by the United Nations (see Targets & Indicators at https://sustainabledevelopment.un.org/sdg7). Work on indicators for targets 7a (enhancing international co-operation on clean energy) and 7b (expanding infrastructure and upgrading technology), which are not shown in this table, is on-going, with a number of improvements currently being discussed by the Inter-agency and Expert Group on Sustainable Development Goal Indicators.

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