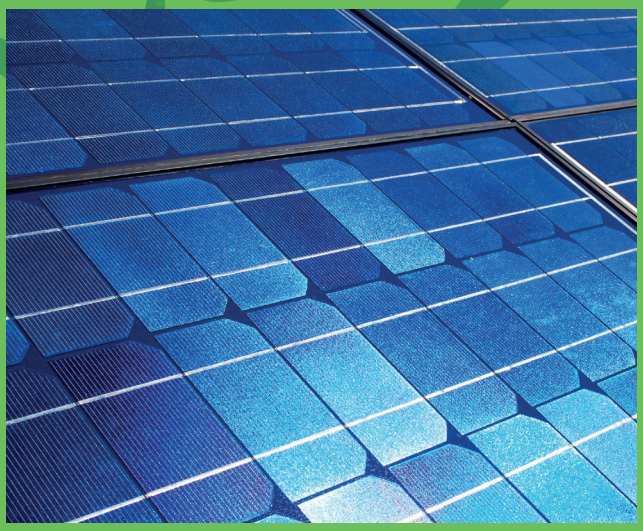

Sustainable Energy

Discussion Paper

This discussion paper examines the state of data availability at the global and national and sub-national level in the framework of the energy related goal as proposed by the United Nations Open Working Group on Sustainable Development. The aim is to understand sustainable energy interventions at the global level and in India.

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The discussion paper is an output of a project on energy and environment goals under DFID-TERI Partnership for Clean Energy Access and Improved Policies for Sustainable Development.

This paper will also be available as a chapter in TERI Energy & Environment Data Diary and Yearbook (TEDDY) 2014-15.

SUSTAINABLE ENERGY

Sustainable development goals and sustainable energy

One of the main outcomes of the United Nations Conference on Sustainable Development (UNCSD), popularly known as Rio+20, in June 2012 was the agreement by the Member States to launch a process to develop a set of Sustainable Development Goals (SDGs). The Open Working Group (OWG), which was established as an intergovernmental process by decision 67/555 of the General Assembly of the United Nations, proposed a set of 17 SDGs on 19 July 2014.[1] The 17 goals have 169 targets covering a broad range of sustainable development issues, including ending poverty and hunger, improving health and education, making cities more sustainable, combating climate change, and protecting oceans and forests. The UN Secretary-General endorsed the goals in December 2014 in the synthesis report *The Road to Dignity by 2030*.

One of the notable additions to the Millennium Development Goals (MDGs) is a dedicated goal on sustainable energy. Goal 7 on energy aims at "ensuring access to affordable, reliable, sustainable, and modern energy for all". The three sub-goals listed under energy include:

- Goal 7.1: By 2030 ensure universal access to affordable, reliable, and modern energy services.
- Goal 7.2: Increase substantially the share of renewable energy in the global energy mix by 2030.
- Goal 7.3: Double the global rate of improvement in energy efficiency by 2030.

Achieving these goals would require considerable efforts in the form of clean energy investments and technology transfer. The following enabling measures have been further proposed for the achievement of the energy sub-goals:

- By 2030 enhance international cooperation to facilitate access to clean energy research and technologies, including renewable energy, energy efficiency, and advanced and cleaner fossil fuel technologies, and promote investment in energy infrastructure and clean energy technologies.
- By 2030 expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, particularly for least developed countries (LDCs) and small island developing states (SIDS).

Modern energy services are crucial to human well-being and for a country's economic development. Access to modern energy is essential for the provision of clean water, sanitation and health care, and for the provision of reliable and efficient lighting, heating, food, cooking, transport, and telecommunication services. On the other hand, environmental and resource management considerations make it necessary to minimize the use of energy from conventional sources by improving energy efficiency and increasing the share of renewable sources in the production and use of energy (UNSD 2014).

The chapter aims at reporting and analysing the existing data from various agencies at the global, national (India), and state levels (in India) for the three energy sub-goals.

Global and national reporting and monitoring frameworks will have an important role in fostering knowledge sharing, reciprocal learning, and peer review across countries. Global reporting requires a harmonized and universal set of indicators. Also, it is a vital complement to national monitoring and reporting. Global monitoring is discussed to ensure

[1] Details available at <https://sustainabledevelopment.un.org/topics/sustainabledevelopmentgoals>

global coordination, support strategies to manage global public goods, and indicate which countries and thematic areas are in need of greatest assistance (SDSN 2015).

National reporting is a very significant level of reporting and relies heavily on the work of national statistical offices. Given the breadth of the SDG agenda, it is important to strengthen national reporting systems as well as foster broad, multi-stakeholder participation in national reporting. National and sub-national reporting are important for responding to priorities and needs within a country. This chapter aims at understanding the existing indicators at global, national, and sub-national levels. The chapter discusses sustainable energy interventions in India with a view of developing complimentary metrics for tracking progress in the country.

Indicators on universal access to affordable, reliable, and modern energy services

Global

While there is no single internationally adopted definition of modern energy access, yet all international agencies understand it as consisting of similar parameters. The International Energy Agency (IEA) specifies these variables of modern energy access as follows:

- Household access to a minimum level of electricity.
- Household access to safer and more sustainable (that is, minimum harmful effects on health and the environment as possible) cooking and heating fuels and stoves.
- Access to modern energy that enables productive economic activity, for example, mechanical power for agriculture, textile, and other industries.
- Access to modern energy for public services, for example, electricity for health facilities, schools, and street lighting.

In this section, access to electricity is discussed as one of the indicators that is reflective of "access to modern energy services". Additionally, the section discusses the indicators around access to clean cooking fuels.

In its annual report World Energy Outlook (WEO), the IEA reports the data on the percentage of population with access to electricity. Figure 1 shows the global electricity access for 2000 and 2012. As can be seen, the percentage of population with electricity access has increased from 72.8% in 2000 to 82% in 2012.

In absolute terms, approximately 1285 million people are reported to be without electricity at the global level in 2012. It is noteworthy that a majority of 1283 million people come mainly from the developing countries. The African region accounts for a population of about 622 million without access to electricity in 2012, of which 621 million reside in Sub-Saharan Africa.

Figure 2 illustrates the electrification rates in India, China, European Union (EU),[2] the USA, and Japan for 2000 and 2012. In terms of electrification rate, the EU, USA, and Japan are at 100% for the specified period, while China joined the league in 2012. The electrification rate of India has improved by 32% from 2000 to 2012.

Regarding the indicators on modern energy access, the IEA reports data on the percentage of population relying on the traditional use of biomass. In WEO 2002, the IEA reported that about 2.4 billion people relied on traditional biomass—wood, agricultural residues, and dung—for cooking and heating in 2000, which was about 39.38% of the total world population. The WEO 2014 reports that about 2.7 billion people relied on traditional biomass for cooking in 2012,

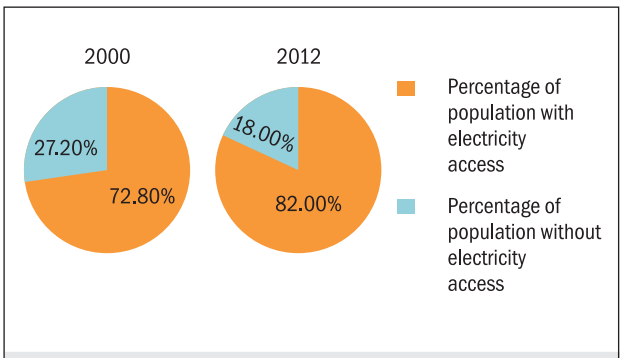

Figure 1 Global electricity access for 2000 and 2012
Source IEA (2002, 2014a)

[2] The European Union, in this chapter, refers to the 28 countries of the EU-28 country group: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom.

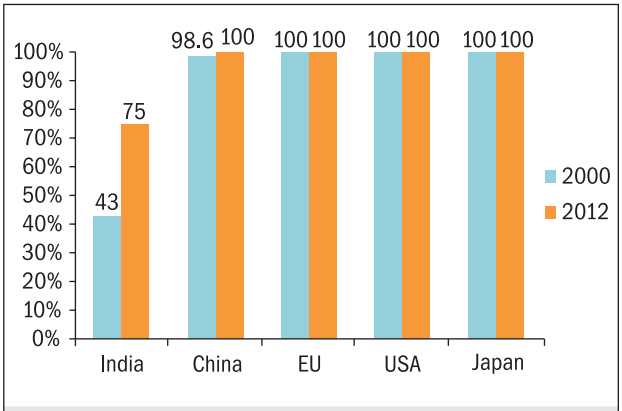

Figure 2 Electrification rate of select countries/country groups for 2000 and 2012
Source IEA (2002, 2014a)

which in essence is more than one-third of the total world population.[3]

It has been seen that the traditional use of biomass is mostly prevalent in the developing countries, and hence out of the 2.7 billion people reported for the world, in WEO 2014 the majority of people are from the developing countries. According to WEO 2014, about 815 million people in India and 448 million people in China rely on traditional biomass for cooking, which is approximately 66% and 33% of the total population of the respective countries. In the African region, about 728 million people were dependent on traditional biomass for cooking in 2012 of which the majority are from Sub-Saharan Africa.

The Global Health Observatory of the World Health Organization (WHO) reports data on the population using solid fuels. The WHO defines solid fuel use as household combustion of coal or biomass (such as cow dung, charcoal, wood, or crop residues). Table 1 indicates the estimates of the percentage of population in India, China, EU, USA, and Japan using solid fuel in 2012. As can be drawn from the table, India and China have the highest percentage of population relying on solid fuel among the countries which have been considered here.

Table 1 Percentage of population of select countries/country groups using solid fuel in 2012

Country/country groups	Population using solid fuels (%)
India	63
China	45
EU	2
US	0
Japan	0

Source WHO (2013)

With 98%, Burundi, Ethiopia, Guinea-Bissau, Lao People's Democratic Republic, Liberia, Madagascar, Mali, Rwanda, and Sierra Leone have the highest percentage of population relying on solid fuels as reported in 2012 (WHO 2013).

Other agencies, including the International Institute for Applied Systems Analysis (IIASA),[4] United Nations Development Programme (UNDP),[5] and Intergovernmental Panel on Climate Change (IPCC),[6] also report data on access to modern energy services. The Energy Development Index (EDI) developed by the IEA includes data for the share of modern fuels in residential spaces to report "access to clean cooking facilities indicator".

National/state

The data on access to clean energy for lighting and cooking needs can be sourced from the Census of India. Census is a survey conducted every decade in India by the office of the Registrar General and Census Commissioner. The Census of India organization is responsible for generating data on population statistics, including vital statistics and population census by ensuring coverage of the entire area in a territory and enumerating each individual. It attempts to collect information on various socio-economic characteristics of the entire population.[7]

[3] It is to be noted that the indicator of traditional use of biomass accounts for both cooking and heating in 2000, while it accounts for only cooking in 2012.
[4] The Global Energy Access (GEA) Scenario Database of the IIASA reports energy access data for the regions Africa, Pacific-Asian, and South Asian Seas in the GEA-Mix scenario. Details available at <www.iiasa.ac.at/web-apps/ene/geadb/dsd?Action=htmlpage&page=countries>
[5] Access to cooking fuel is accounted in the reporting of the variable of "living standards" under UNDP's Multidimensional Poverty Index (MPI). Details available at <http://hdr.undp.org/en/data>
[6] In its baseline socio-economic data, the IPCC also presents data on traditional fuel consumption. The IPCC sources this data from the Food and Agriculture Organization (FAO) of the United Nations. The estimates are prepared after an assessment of the available consumption data. Data are collected using answers to questionnaires or comes from official publications. Details available at <http://sedac.ipcc-data.org/ddc/baseline/index.html>
[7] Details available at <http://censusindia.gov.in/Data_Products/Library/Indian_perceptive_link/Census_Operation_link/censusoperation.htm>

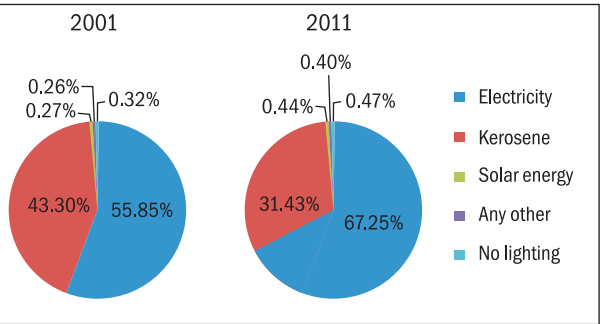

Figure 3 Share of various sources of energy in 2001 and 2011 for lighting
Source Census of India (2001a, 2011a)

Figure 3 compares the various sources of lighting at the national level for 2001 and 2011. In 2001, 55.85% of the population had access to electricity for lighting, which increased to 67.25% in 2011. Dependence on kerosene for lighting reduced to 31.43% in 2011 from 43.3 % in 2001.

Figure 4 gives the state-wise distribution of households based on sources of energy for lighting for 2011. In Goa, 96.9% of households were dependent on electricity, which is the highest among all the states, and Jharkhand had the least percentage of households having access to electricity, only 45.8% in 2011.

As per the latest census (Census of India 2011a), 55.3% of rural households in India were dependent on electricity as energy source for lighting. Himachal Pradesh had the highest percentage among all the 28 states where 96.6% of rural households had access to electricity. Bihar had the lowest percentage with only 10.4%.

In urban India, 92.7% of households had access to electricity and the rest 7.3% were dependent on traditional fuel sources for lighting in 2011. Sikkim had the highest percentage with 98.7% of households having access to electricity, and Bihar had the lowest percentage with only 66.7%.

Cooking is the major household activity in India requiring energy. Fuelwood, kerosene, and liquefied petroleum gas (LPG) are the major energy sources for cooking. However, there is a gradual shift from fuelwood and kerosene to LPG for cooking (Census of India 2011b).

Figure 5 compares the various sources for cooking at the national level for 2001 and 2011.[8] In 2001, 17.5% of the population had access to LPG for cooking, which increased to 28.55% in 2011. Dependence on firewood reduced to 48.98% in 2011 from 52.53% in 2001.

Figure 6 gives the state-wise distribution of households based on sources of energy for cooking in 2011. In India, only 28.6% of households depend on LPG (clean source) for cooking. A state-wise analysis indicates that Punjab has the highest percentage of households (59.5%) using LPG for cooking and Bihar has the least percentage with only 8.1%.

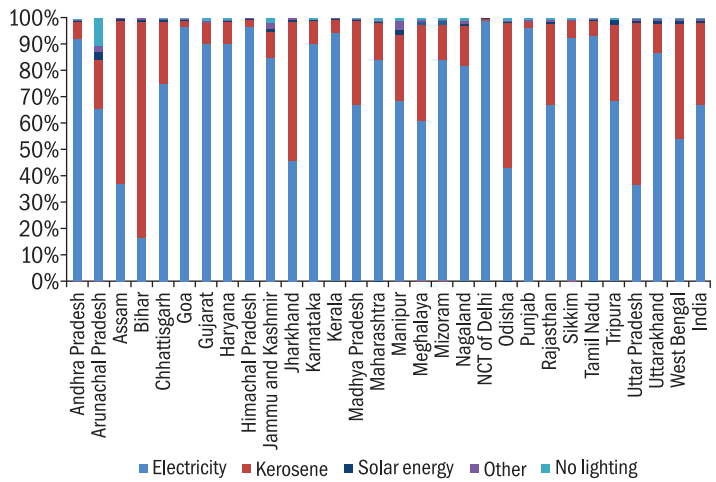

Figure 4 State-wise distribution of households based on various sources of energy for lighting
Source Census of India (2011a)

[8] Any other includes electricity, biogas, and other fuels.

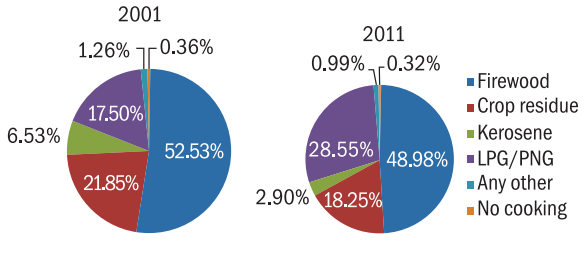

Figure 5 Share of various sources of energy in 2001 and 2011 for cooking
Source Census of India (2001b, 2011b)

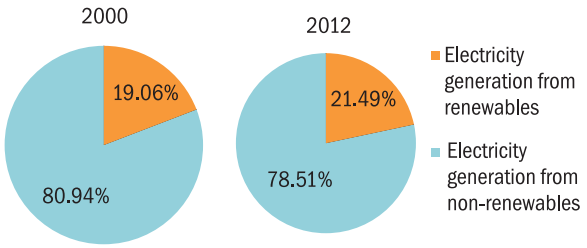

Figure 7 Share of renewables in electricity generation at the global level
Source IEA (2014b)

Every two years, the National Sample Survey Organisation (NSSO) provides sample data on the consumption and expenditure at the household level with a disaggregation of rural and urban population. But since Census of India updates data once in a decade, the NSSO data would be relied upon to present the latest analysis and information in the subsequent editions of this chapter and *TEDDY*.

Indicators on the share of renewable energy in the global energy mix

Global

This section benefits from the data processed from the IEA that reports on renewable energy. Figure 7 shows the share of renewables in electricity generation at the global level for 2000 and 2012. Here the renewable sources comprise biofuels, waste, hydro (including production from pumped storage plants), geothermal, solar photovoltaic (SPV), wind, and tide. Correspondingly, the non-renewable sources comprise coal, oil, gas, nuclear, and other sources (including fuel cells). As can be observed, the share of renewables in the total electricity generation went up from 19.06% in 2000 to 21.49% in 2012. It is seen that the reliance on renewables for electricity generation is growing in many industrialized nations, which is mainly attributed to the supportive government policies. While most emerging nations still depend largely on fossil fuels, a progressive shift to renewable sources has been observed in some of them (IEA 2014a). This explains the gradual increase in the global renewable-based electricity from 2000 to 2012.

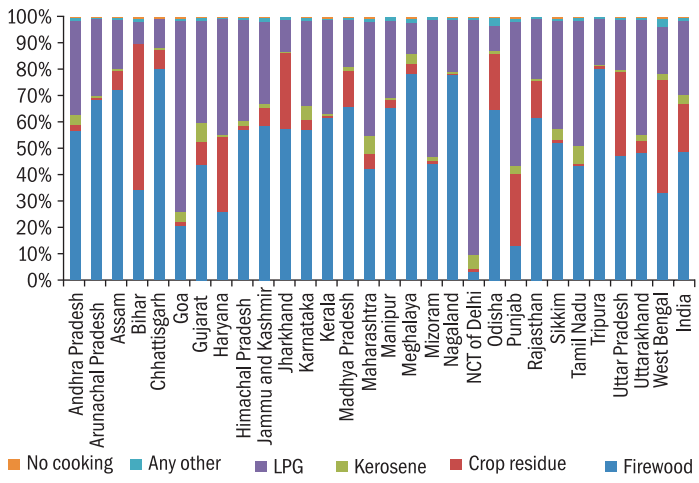

Figure 6 State-wise distribution of households based on various sources of energy for cooking
Source Census of India (2011b)

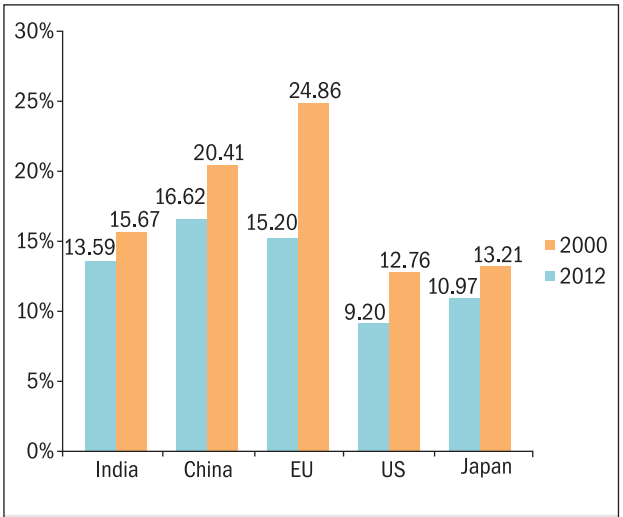

Figure 8 Share of renewables in total electricity generation of select countries/country groups for 2000 and 2012
Source IEA (2014b)

Figure 8 exhibits the share of renewables in the total electricity generation in countries and country groups, namely, India, China, EU, USA, and Japan, for 2000 and 2012, as reported by the IEA.

As can be inferred from the graph, the share of renewables in the total electricity generation has grown in all the countries/country groups.

The report on Global Trends in Renewable Energy Investment by Bloomberg New Energy Finance (BNEF) gives data on new investments in renewable energy. The BNEF adjusts the re-invested equity for calculating the volume of new investments. China had the highest compound annual growth rate (CAGR) of 42% in the new investment sector for renewable energy, which grew from $2.4 billion to $6.1 billion during 2004–13. China is followed by the USA with a CAGR of 23%, with its new investments expanding from $5.5 billion in 2004 to $35.8 billion in 2013. India's new investments grew from $2.5 billion in 2004 to $6.1 billion in 2013 with a CAGR of 10% (BNEF 2014).

National/state

The Ministry of New and Renewable Energy (MNRE) is the nodal agency of the Government of India that monitors data on renewable energy. According to it, renewable energy technologies mainly include grid-interactive power and off-grid/captive power. Grid-interactive includes power from wind, small hydro, biomass and gasification, bagasse cogeneration, solar, and waste-to-energy. Off-grid/captive power comprises biomass (non-bagasse) cogeneration, SPV systems, aerogenerators/hybrid systems, water mills, biogas-based energy systems, waste-to-energy, and biomass gasification in rural and industrial areas for captive use. Other renewable energy technologies include family biogas plants and solar water heating solutions.

The percentage of renewables in the total installed capacity for power generation in India was 12.3% in 2012/13. The target for deployment of grid-based renewable power was 4125 MW, and the achievement was 1352.68 MW in 2012/13 (MNRE 2014).

Figure 9 gives the share of various sources of energy in the installed capacity for power in India in 2000 and 2012. As can be inferred from the figure, the share of renewables has increased from 1.46% in 2000 to 19.95% in 2012. The share of thermal energy (coal, gas, and diesel) has declined from 75.06% in 2000 to 65.02% in 2012.

Figure 10 gives the share of various sources of grid-based renewable energy in India in the total installed capacity of renewable energy from 2007/08 to 2011/12. Wind energy contributes 70% in the total installed capacity of grid-based renewable energy, and its share is almost constant in the five-year period.

Figure 11 shows the target and achievement of grid-based renewable energy in India for 2013/14. As can be inferred from the graph, only 808 MW of wind power was installed against a target of 2500 MW for 2013/14. Solar energy had achieved 35% of the target, and 395 MW of solar energy was deployed against the target of 1100 MW.

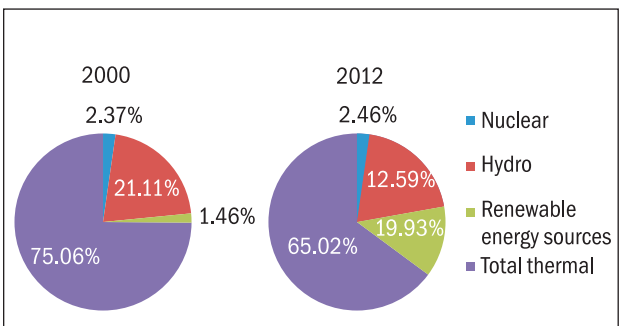

Figure 9 Share of different sources of energy in installed capacity of power in 2000 and 2012
Source CEA (various years)

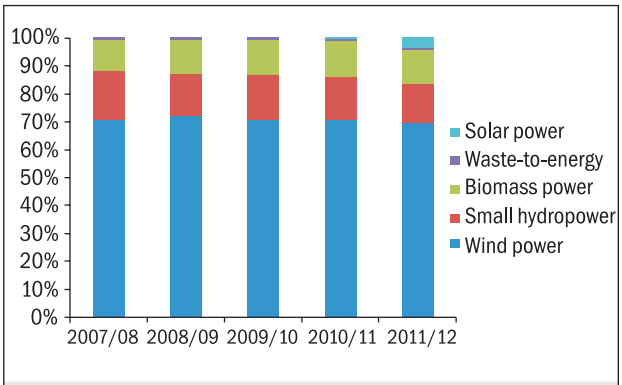

Figure 10 Disaggregation of various sources of renewable energy in the total installed capacity of renewables at an all-India level
Source MNRE (2013)

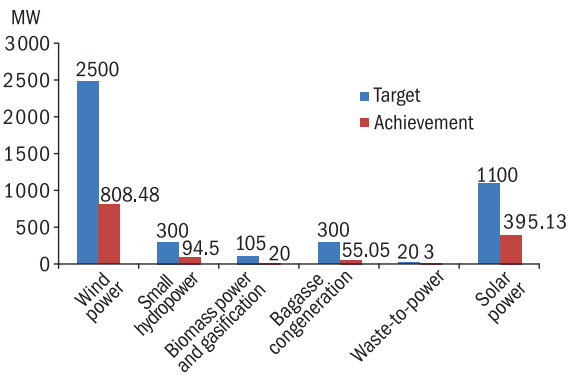

Figure 11 Target versus achievement of grid-based renewable energy in India
Source MNRE (2014)

The National Solar Mission aims at increasing the share of solar-based installed capacity of power generation to 100 000 MW by 2022.[9] As on 31 December 2014, the capacity for solar power is 3062.68 MW, and Gujarat has the highest installed capacity of 824 MW in India (MNRE 2014).

Figure 12 gives the source-wise target and achievement of off-grid renewable energy in India. By adding all the sources of off-grid renewable power, the total target comes out to be 145 MW, against which only 38.78 MW was deployed, that is, only 26.74% of the target could be achieved at the all-India level in 2013/14. Biomass gasifiers installed for industrial use achieved 52.67% of the target.

To increase the penetration of renewable energy in India, the MNRE has devised Renewable Purchase

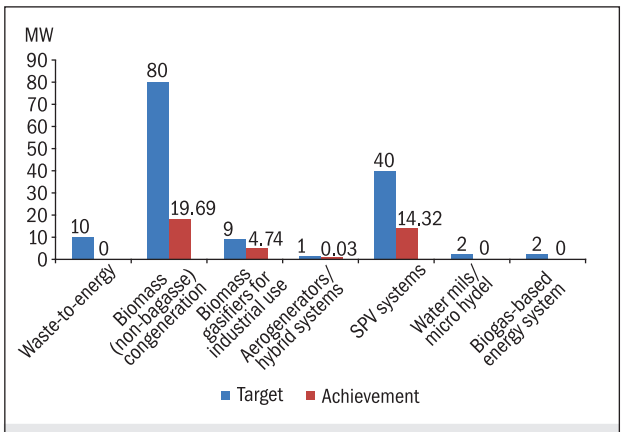

Figure 12 Source-wise target and achievement of off-grid renewable energy in India
Source MNRE (2014)

Obligations (RPO) to encourage generation of electricity from eligible renewable sources. Figure 13 gives the target and achievement with respect to RPO in India.[10] Target denotes the capacity required for meeting solar RPO, and achievement represents the installed capacity as on 9 March 2013. The target deployed for 2012/13 was 2474.6 MW. Almost 90% of the target was achieved, and the total capacity tied up as on 9 March 2013 was 2207.07 MW.

Figure 14 gives the aggregate capacity of small hydro projects (up to 25 MW) with respect to total potential, projects installed, and projects under implementation as on 31 March 2013. Of the total estimated potential of 19 749.44 MW, only 19.2% of the projects have been installed, that is, 3803 MW of

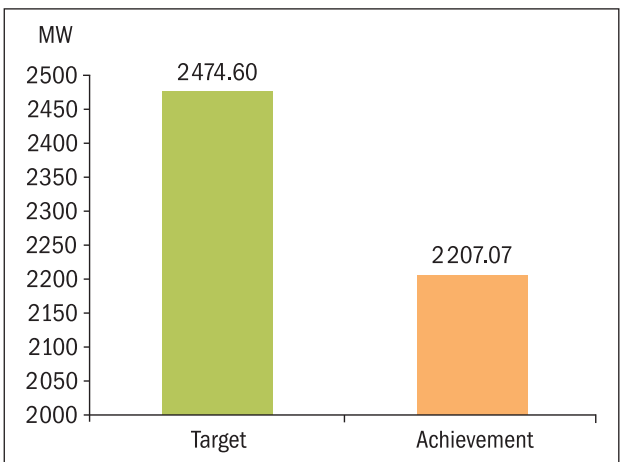

Figure 13 Solar RPO gap to be fulfilled in 2012/13
Source MNRE (2014)

[9] Details available at <http://pib.nic.in/newsite/PrintRelease.aspx?relid=114436>
[10] Arunachal Pradesh and Sikkim have not issued regulations for RPO by the Power Department.

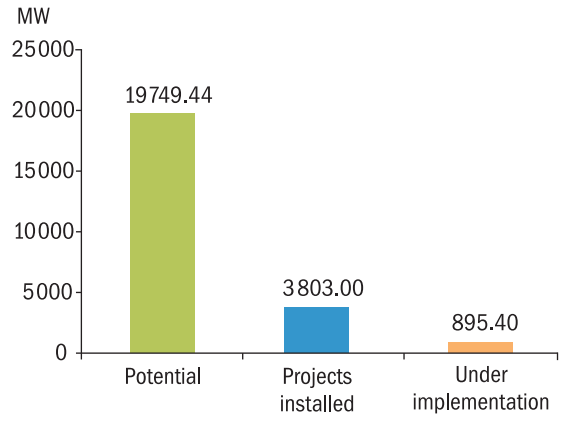

Figure 14 Status of small hydropower projects in 2012/13
Source MNRE (2014)

small hydropower plants have been installed as on 31 March 2014 and only 895.4 MW are under the implementation stage.

For the promotion of biogas plants based on cattle dung and other organic wastes, the National Biogas and Manure Management Programme (NBMMP) was implemented in 1981/82. The NBMMP mainly caters to setting up of family-type biogas plants that provide energy for cooking and other purposes in rural areas along with making enriched biofertilizer for farmers. Figure 15 depicts the potential and achievements of biogas plants under the NBMMP.

Figure 16 shows the allocation towards renewable energy as a percentage of total energy for all states in India. The total outlay on renewables as a percentage of total energy outlay is highest in Maharashtra.

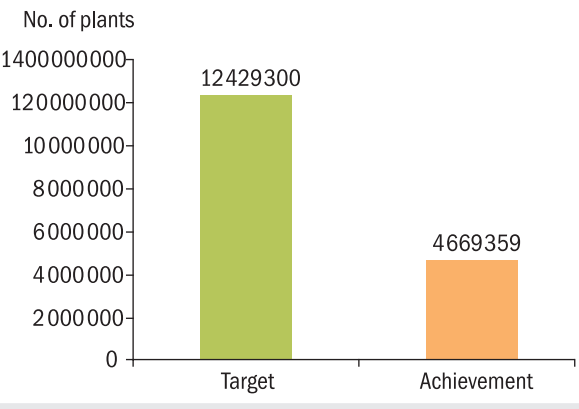

Figure 15 Current status of the total number of biogas plants under NBMMP for 2012/13
Source MNRE (2013)

Goal 7.3: Indicators on the rate of improvement in energy efficiency

Global

Energy intensity refers to the amount of energy consumed in producing a given level of output or activity. It is measured by the quantity of energy required to perform a particular activity divided by the total output of the activity. The indicator of energy intensity is often used as a proxy to explain the changes in energy efficiency since efficiency improvements in processes and equipment contribute to changes in energy intensity (TERI 2006).

The IEA reports energy intensity as the amount of energy [total primary energy supply (TPES), in tonnes of oil equivalent (TOE)][11] a country needs to generate a unit of gross domestic product (GDP) and is represented in units of TOE/thousand 2005 USD (IEA 2014c). Figure 17 depicts the energy intensities (in TOE/thousand 2005 USD) for 2000 and 2012 for India, China, EU, USA, Japan, and the world. The maximum decline in the energy intensity has been for India, followed by China, USA, EU, and Japan. Over the 10-year period, for the world, the average value of energy intensity has remained approximately the same, and this can be inferred from the graph. Energy intensity values have greatly differed between 2000 and 2012 for emerging economies such as India and China, while it has not changed very drastically for industrialized economies such as USA, EU, and Japan. The Global Tracking Framework report says that the fastest improvements in energy intensity have been achieved by countries that began with high levels of energy intensity and where energy efficiency gains were rather easier to attain (World Bank-IEA 2014).

National/state

Considering the vast potential of energy savings and benefits of energy efficiency, the Indian Government enacted the Energy Conservation (EC) Act, 2001. The Act provides for the legal framework, institutional arrangement, and a regulatory mechanism at the central and state levels to embark upon energy efficiency drive in the country. Five major provisions of the EC Act relate to designated consumers, standard and labelling of appliances, energy conservation

[11] The total primary energy supply is accounted to be made up of production + imports − exports − international marine bunkers − international aviation bunkers ± stock changes.

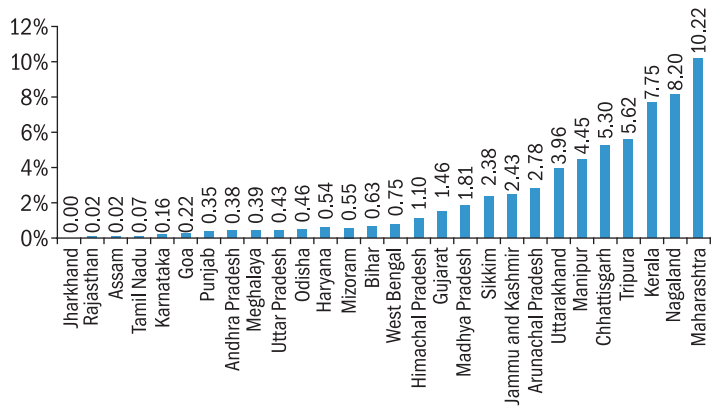

Figure 16 State-wise renewable energy outlay as a percentage of total energy outlay in 2011/12
Source Planning Commission (2013)

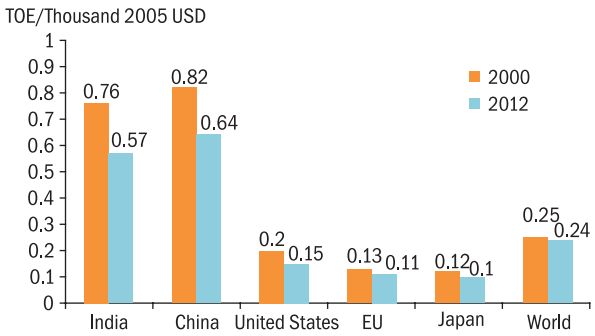

Figure 17 Energy intensity (TOE/thousand 2005 USD) for select countries/country groups and the world for 2000 and 2012
Source IEA (2014b)

building codes, creation of institutional set-up (BEE), and establishment of an energy conservation fund.

Figure 18 gives the energy intensities of all the states in India for 2011/12. Energy intensity (measured in KTOE/₹ billion) has been estimated by summing up the consumption of fuels such as coal, petroleum products, natural gas, and electricity (only nuclear and renewables) and dividing by the gross state domestic product (GSDP) at constant (2004/05) prices.

The data have been compiled from agencies such as Planning Commission, Coal Directory of India, Indian Petroleum and Natural Gas Statistics, and All India Electricity Statistics. In the absence of a single measure that represents the energy intensity of the states, energy consumption has been estimated by summing fuel-wise final energy consumption

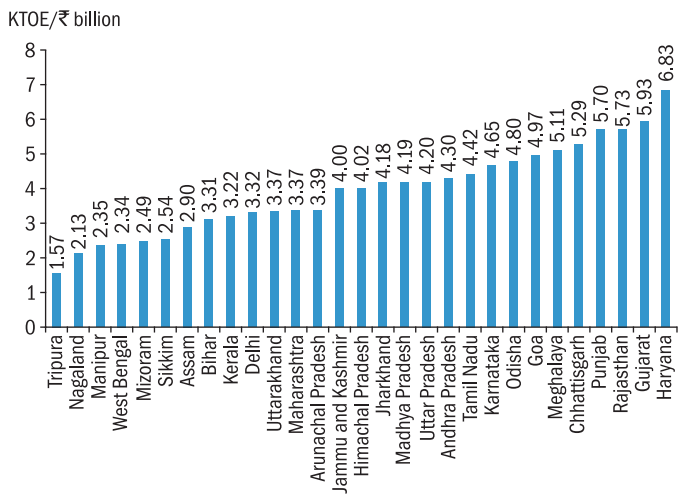

Figure 18 State-wise energy intensity (KTOE/₹ billion) for 2011/12
Source Author's own estimation

across all the sectors and dividing the result by GSDP at constant (2004/05) prices. Table 2 gives the publication agency and the data referred to from various statistics for computing energy intensity.

Energy losses occur in the process of supplying electricity to consumers due to technical and commercial issues. The two main sources of leakage in the power system are as follows:

- Aggregate technical and commercial (AT&C) losses
- Transmission and distribution (T&D) losses

The AT&C losses have two components: technical losses and commercial losses. The technical losses occur due to the dissipation of energy in the conductors and equipment used for transmission, transformation, sub-transmission, and distribution of power. The commercial losses are caused by pilferage, defective meters, and errors in meter reading and in estimating unmetered supply of energy (TERI 2002). Figure 19 gives the state-wise AT&C losses as a percentage of the total energy available in 2011/12.

The T&D losses occur during transmission between the source of supply and the point of distribution and during distribution to consumers. The T&D losses also occur due to pilferage. Figure 20 gives the state-wise T&D losses as a percentage of the total energy available.

Ways forward

Table 3 compares the availability of information at the global and national levels with respect to key indicators for the three energy sub-goals proposed by the United Nations' OWG.

The implementation of SDGs depends on a global partnership for sustainable development with the active engagement of governments, business and industry, civil society, research and academia, and the United Nations' system. A robust mechanism is

Table 2 Data used for estimating state-wise energy intensity for 2011/12

Publication/database name	Publisher	Data used
Socio-economic indicators	Planning Commission	Gross state domestic product at 2004/05 constant prices
Coal Directory of India	Coal Controller's Organization, Ministry of Coal	Coal consumption in different sectors
Indian Petroleum and Natural Gas Statistics	Ministry of Petroleum and Natural Gas	Consumption of petroleum products
All India Electricity Statistics	Central Electricity Authority	Electricity consumption

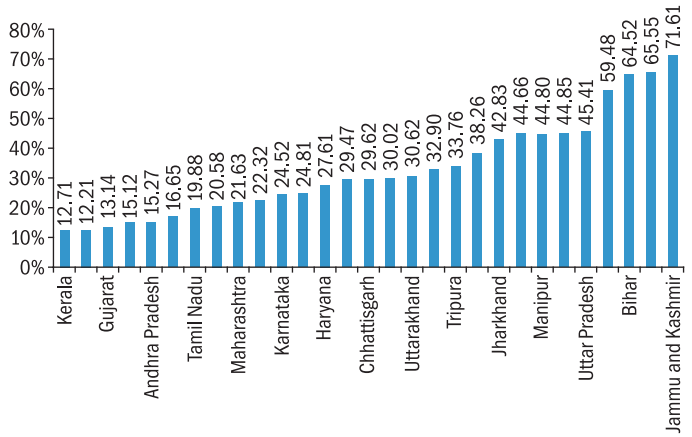

Figure 19 State-wise AT&C losses as a percentage of the total energy available in 2011/12
Source CEA (2013)

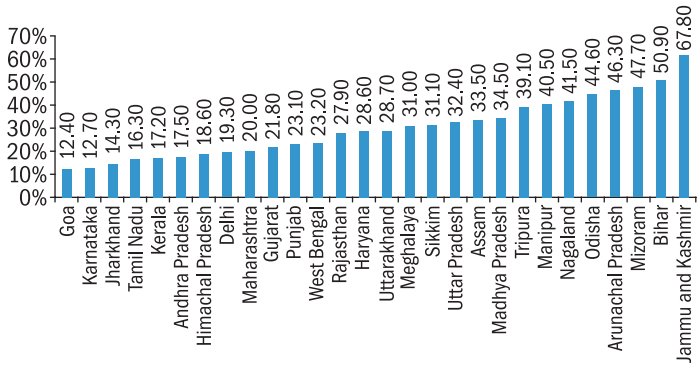

Figure 20 State-wise T&D losses as a percentage of total energy available in 2011/12

Source CEA (2013)

Table 3 Snapshot of the indicators covered under the three energy sub-goals

	Global				National			
	Indicator name	Database/ publication name	Publishing agency	Frequency of data reporting	Indicator name	Database/ publication name	Publishing agency	Frequency of data reporting
Goal 7.1: By 2030 ensure universal access to affordable, reliable, and modern energy services	Percentage population with electricity access	World Energy Outlook	International Energy Agency	Annual	Percentage population with electricity access	Census Dashboard[12]	Census of India	Once in a decade
	Percentage population with clean fuel access	Global Health Observatory Data Repository	World Health Organization	Annual	Percentage population with clean fuel access	Census Dashboard	Census of India	Once in a decade
Goal 7.2: Increase substantially the share of renewable energy in the global energy mix by 2030	Renewable energy-based electricity generation as a percentage of total electricity	International Energy Agency Statistics	International Energy Agency	Annual	Renewable energy -based electricity generation as a percentage of total electricity	–	Ministry of New and Renewable Energy	Annual
Goal 7.3: Double the global rate of improvement in energy efficiency by 2030	Energy intensity	International Energy Agency Statistics	International Energy Agency	Annual	Energy intensity	Coal Directory of India, Indian Petroleum and Natural Gas Statistics, and All India Electricity Statistics	Coal Controller's Organization, Ministry of Petroleum and Natural Gas, Central Electricity Authority, and Planning Commission	Annual

[12] The NSSO provides sample data every two years at the household level that pertain to the consumption and expenditure of households with a disaggregation of rural and urban population. Census data are used here because the entire population is covered in the census survey. Since Census of India updates data once in a decade, the NSSO data would be relied upon to present the latest analysis and information in the subsequent editions of this chapter and in *TEDDY*.

essential for the success of SDGs. The key enablers that can facilitate the achievement of energy goals are as follows:

- Enhancing international cooperation to facilitate access to clean energy research and technologies, including renewable energy, energy efficiency, and advanced and cleaner fossil fuel technologies, and to promote investment in energy infrastructure and clean energy technologies.
- Expanding infrastructure and upgrading technology for supplying modern and sustainable energy services for all in developing countries, particularly for LDCs and SIDS.

Well-crafted SDGs will mobilize governments, businesses, and civil society organizations around a shared set of goals to achieve sustainable development. Developing countries such as India need to develop additional capabilities to achieve sustainable development outcomes. There is a need for significant mobilization of resources from a variety of sources and the effective use of financing to promote sustainable development. Rio+20 affirms the commitment to reinvigorating global partnership and mobilizing necessary resources for sustainable development.

This chapter aimed to examine the state of data available for tracking energy goals at the global and national levels. Looking ahead, significant efforts are needed to improve data collection methodologies, bridge identified data gaps, and implement statistical standards. For the SDGs to be successful, much greater investments in building national statistical capacities and strengthening standards are necessary. Since SDGs are applicable to all countries, every country needs to design a framework according to its national policies and targets to track progress on SDGs.

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Sustainable Energy:
A Discussion Paper

The discussion paper is an output of a project on energy and environment indices under DFID-TERI Partnership for Clean Energy Access and Improved Policies for Sustainable Development. The objective of the project on energy and environment goals is to support policy development and build capacity of TERI's annual flagship publication, TEDDY (TERI Energy & Environment Data Diary and Yearbook) through new policy relevant content.

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