Chapter | 8

Sustainability and Energy

CHAPTER 8
Sustainability and Energy

Sustainability

The United Nations (UN) General Assembly, in its 70th Session held on 25th September 2015, adopted the document titled "Transforming our World: The 2030 Agenda for Sustainable Development" consisting of 17 Sustainable Development Goals (SDGs) and associated 169 targets. The SDGs are a comprehensive list of global goals integrating social, economic and environmental dimensions of development.

Realizing that Energy is critical for people deprived of the opportunity of access to sustainable energy, Goal 7 with the aim to ensure access to affordable, reliable, sustainable and modern energy to all was adopted as one of the 17 SDGs. The goal also stresses more focused attention to improve access to clean and safe cooking fuels and technologies, improve energy efficiency, increase use of renewable sources and promotion of sustainable and modern energy for all. Energy from renewable resources – wind, water, solar, biomass and geothermal energy – is inexhaustible and clean.

The targets adopted as a part of the Goal 7 of SDGs 2030 Agenda are as follows:

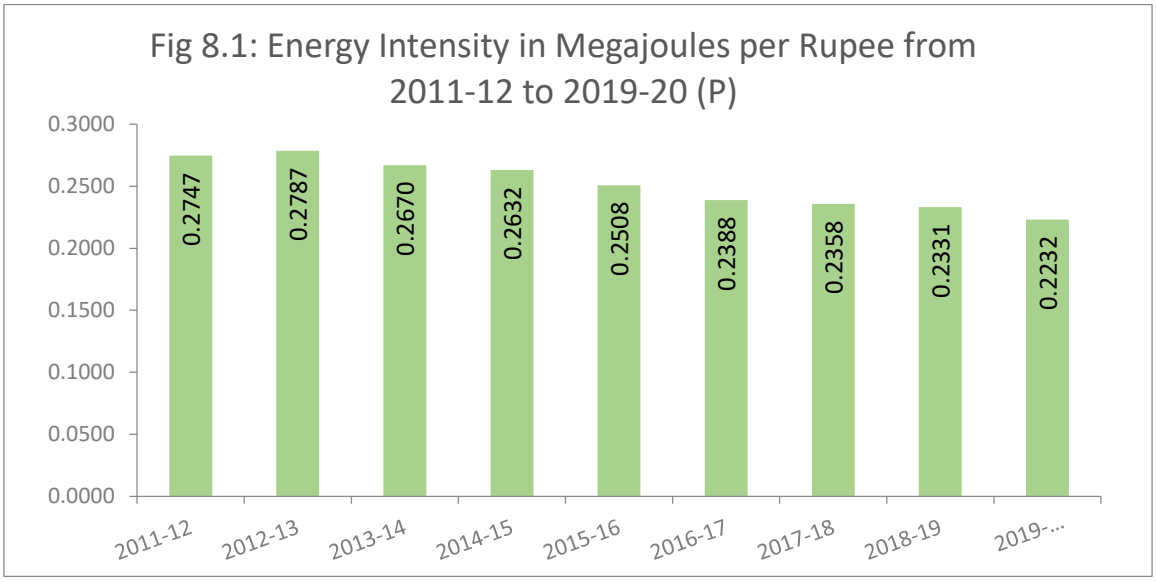
I. By 2030, ensure universal access to affordable, reliable and modern energy services.
II. By 2030, increase substantially the share of renewable energy in the global energy mix.
III. By 2030, double the global rate of improvement in energy efficiency.
IV. By 2030, enhance international co-operation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.
V. By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing states and land-locked developing countries, in accordance with their respective programmes of support.

This Chapter presents some of the concepts related to sustainable energy systems in continuation of the data presented earlier on renewable energy resources in the earlier chapters.

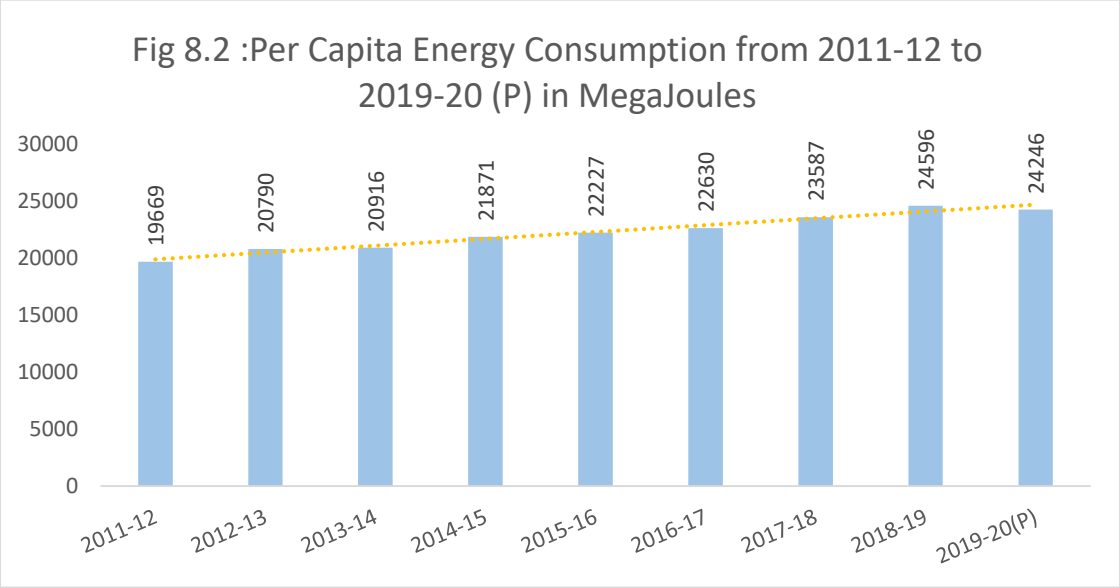
Further, "Energy Indicators for Sustainable Development: Guidelines and Methodology, 2005" by the International Atomic Energy Agency, United Nations Department of Economic And Social Affairs, International Energy Agency, Eurostat And European Environment Agency, has identified a core set of energy indicators, also called Energy Indicators for Sustainable Development, which are designed to provide information on current energy related trends in a format that aids decision making at the national level in order to help countries assess effective energy policies for action on sustainable development. While the importance of these various indicators is recognized and since Social and Environmental indicators require additional levels of detail than that are presented in Energy Statistics this report is restricted to the economic dimension only and presents some of these indicators in this chapter. The details of the indicators – theme, definition, purpose and measurement method etc. are provided in the Annexures.

Highlights

- One of the Targets identified by the Sustainable Development Goals focuses on making affordable, reliable and modern energy accessible to all people universally. To ensure the same, India has been focusing on availability of electricity to all citizens of the country.
- State-wise number of villages electrified as on 31.03.2020 (P) has reached 100% coverage (relative to 2011 census figures for total number of villages in the country). (Table 8.1).
- Sustainable energy systems also focus on increasing energy efficiency in the long run by improving energy intensity besides shifting to cleaner technologies, improving share of renewable energy in a countries energy mix etc.
- Energy Intensity is defined as the amount of energy consumed for generating one unit of Gross Domestic Product (at constant prices). Along with Energy Intensity, the indicator ''Per Capita Energy Consumption (PEC)'' is the most used policy indicator, both at national and international levels for this purpose. Per-capita Energy Consumption during a year is computed as the ratio of the estimate of total energy consumption during the year to the mid-year population of that year. In the absence of data on consumption of non-conventional energy from various sources, particularly in rural areas, these two indicators are generally computed on the basis of consumption of conventional energy (Table 8.2).
- The Energy Intensity (at 2011-12 prices) decreased from 0.2747 Mega joules per rupee in 2011-12 to 0.2232 Mega Joules in 2019-20 (P).



- Similarly, Per-capita Energy Consumption increased from 19,669 Mega joules in 2011-12 to 23,889 Mega joules in 2019-20(P).



- Further, India's Total Emissions from the Energy Sector have increased from 1651928 GgCO2 Equivalent in 2011 to 2129428 GgCO2 Equivalent in 2016 as per the latest estimates by MoEFCC, February 2021. The major sector contributing to total emissions remains Energy Industries with its share increasing marginally from 55.95% in 2011 to 56.66 in 2016 (Table 8.3).

Table 8.1 : State-wise Number of Villages Electrified

Sl. No.	States/ UTs	No. of villages as per 2011 Census	Villages Electrified as on 31.3.2019	Villages Electrified as on 31.03.2020 (P)
1	Andhra Pradesh	16158	All Villages Electrified	
2	Arunachal Pradesh	5258		
3	Assam	25372		
4	Bihar	39073		
5	Chhatisgarh	19567		
6	Goa	320		
7	Gujarat	17843		
8	Haryana	6642		
9	Himachal Pradesh	17882		
10	Jammu & Kashmir	6337		
11	Jharkhand	29492		
12	Karnataka	27397		
13	Kerala	1017		
14	Madhya Pradesh	51929		
15	Maharashtra	40956		
16	Manipur	2379		
17	Meghalaya	6459		
18	Mizoram	704		
19	Nagaland	1400		
20	Odisha	47677		
21	Punjab	12168		
22	Rajasthan	43264		
23	Sikkim	425		
24	Tamil Nadu	15049		
25	Telangana	10128		
26	Tripura	863		
27	Uttar Pradesh	97813		
28	Uttarakhand	15745		
29	West Bengal	37463		
30	Andaman & Nicobar	396		
31	Chandigarh	5		
32	Dadar & Nagar Haveli	65		
33	Daman & Diu	19		
34	Delhi	103		
35	Lakshwadeep	6		
36	Puducherry	90		
Total		**597464**		

Source: Central Electricity Authority

Table 8.2: Per-Capita Energy Consumption and Energy Intensity

Year	Energy Consumption in petajoules *	Mid year population (in Million) **	GDP at 2011-12 prices (Rs. crore) **	Per Capita Energy Consumption (in Megajoules)	Energy Intensity (Megajoules per rupee)
2011-12	23996	1220	8736329	19669	0.2747
2012-13	25676	1235	9213017	20790	0.2787
2013-14	26166	1251	9801370	20916	0.2670
2014-15	27710	1267	10527674	21871	0.2632
2015-16	28517	1283	11369493	22227	0.2508
2016-17	29397	1299	1,23,08,193	22630	0.2388
2017-18	30993	1314	1,31,44,582	23587	0.2358
2018-19	32639	1327	1,40,03,316	24596	0.2331
2019-20(P)	32514	1341	1,45,69,268	24246	0.2232
Growth rate of 2019-20 (P) over 2018-19 (%)	**-0.38**	**1.06**	**4.04**	**-1.42**	**-4.25**
CAGR 2011-12 to 2019-20((P) (%)	**3.87**	**1.19**	**6.60**	**2.65**	**-2.56**

(P): Provisional

Energy Intensity=Amount of energy consumed for producing one unit of Gross Domestic Product.

** GDP estimates are at base 2011-12 price as per the National Accounts Divisions's, NSO, MoSPI First Revised Estimates released on 29.01.2021

Mid-Year (as on 1st October) population has been taken from population projections for India and states 2011 – 2036; Report of the Technical Group On Population Projections, November, 2019, National Commission On Population Ministry Of Health & Family Welfare

Table 8.3 India's Total Emissions related to Energy Sector

(GgCO2 Equivalent)

GHG sources and removals	2011	2012	2013	2014	2015	2016
A. Fuel Combustion activities	**16,04,503**	**17,04,639**	**17,74,788**	**18,71,709**	**20,55,017**	**20,92,250**
1. Energy Industries	9,24,258	10,05,813	10,53,981	11,40,983	11,97,123	12,06,587
2. Manufacturing industries & construction	3,38,816	3,43,603	3,56,771	3,51,910	3,94,092	3,97,739
3. Transport	2,21,202	2,36,020	2,41,253	2,50,173	2,61,517	2,74,434
4. Other sectors	1,20,228	1,19,202	1,22,783	1,28,643	2,02,286	2,13,490
B. Fugitive emission from fuels	**47,426**	**43,047**	**38,771**	**38,057**	**37,084**	**37,179**
1. Solid fuels	16,388	16,086	15,568	16,547	16,614	17,121
2. Oil and natural gas	31,037	26,961	23,203	21,511	20,470	20,058
Total Energy (A+B)	**16,51,928**	**17,47,686**	**18,13,559**	**19,09,766**	**20,92,102**	**21,29,428**

Source: India Third Biennial Update Report to The United Nations Framework Convention on Climate Change, Ministry of Environment, Forest and Climate Change, February 2021

*GgCO2 Equivalent : Gigagrams of carbon dioxide equivalent

Table 8.4 Energy Indicators for Sustainability

Theme	Sub-theme	Indicator	Category	Unit	2019-20 (P)
Use and Production Pattern	Overall Use	Energy use per capita	TPES	toe/person	0.7055
			TFC	toe/person	0.4380
			Electricity	Kwh/person	963.0826
	Overall Productivity	Energy use per unit of GDP	TPES	toe/000'rupees	0.0065
			TFC	toe/000'rupees	0.0040
			Electricity	Kwh/000'rupees	8.8645
	Supply Efficiency	Efficiency of energy conversion and distribution	All	%	19.27
	Production	Reserves-to-production ratio	All	years	187
			coal	years	224
			lignite	years	161
		Resources-to-production ratio	All	years	412
			Crude oil	years	19
			Natural Gas	years	44
			Coal	years	471
			Lignite	years	1093
	End Use	Sectoral Energy Intensities	Industry	toe/000'rupees	0.00904
			Agriculture	toe/000'rupees	0.00104
			Transport	toe/000'rupees	0.00938
		Sectoral Electricity Intensities	Industry	Kwh/000'rupees	15.201
			Agriculture	Kwh/000'rupees	11.591
			Transport	Kwh/000'rupees	3.060
	Diversification (Fuel Mix)	Fuel shares in TPES	Crude Oil	%	27.99
			Natural Gas	%	6.33
			Coal	%	64.20
			RE &Others	%	3.99
		Fuel share in TFC	Oil Products	%	37.65
			Natural Gas	%	5.23
			Coal	%	38.21
			Electricity	%	18.91
		Fuel share in electricity	Thermal	%	78.43
			Nuclear	%	2.91
			Hydro	%	9.76
			RE (other than Hydro)	%	8.90
Security	Imports	Net energy import dependency	Overall	%	41.63
			Crude Oil	%	87.59
			Natural gas	%	52.08
			Coal	%	26.48
			Electricity	%	0.39
	Strategic Fuel Stocks	Stocks of critical fuels per corresponding fuel consumption	Coal	%	8.6387

Note: Import Dependency on Crude oil and Natural Gas for 2019-20(P) as released by Ministry of Pteroleum and Natural Gas is 85.02% and 52.83% respectively.
The difference in the figures computed by MoPNG and MoSPI arises due to methodolgical differences - MoSPI using data from supply side and MoPNG using consumption side.