SAVITARKA

An E-Magazine on Sustainable Development Issues

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Editorial

Savitarka *is a magazine to widely disseminate the outcome of research and action on sustainable development issues. It discusses technological, socio-economic and policy aspects of various development sectors including energy, environment, infrastructure, human development, agriculture, rural development, urbanization, water resources, irrigation, etc., in a comprehensible form.*

In general, people are not aware of the complex research articles written in scientific and technical journals. **Savitarka** *intends to generate mass awareness by sensitizing people with simple illustrations of complex research. It is a platform for identifying the issues; logical discussions on them and suggesting some possible remedial solutions through appropriate interventions.*

Savitarka *envisions enlightening people to adopt an ecofreindly way of life and contribute to sutainable development. For an increased visibility, articles published in this magazine can be written in any language.*

*This speccial Issue of "***Savitarka"** *is being published to celebrate World Environment Day - 2021.*

SAVITRAKA Celebrates, June 05, 2021

With this Special Issue in June, 2021

- Editorial Board of SAVITARKA

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Inter-dependence of SEED issues

*Sangeeta V. Sharma**

India's may become the world's most populous country by 2025, overtaking China. India is also the world's fastest emerging major economy and ranks sixth globally in terms of gross domestic product (GDP). While accelerated economic growth is necessary for meeting the demands of the growing population and alleviating poverty in India, its environmental implications, such as local pollutin and greenhouse gas (GHG) emissions are of serious concern. In terms of total GHG emissions, India is the world's third largest emitter after China and the United States. India is also extremely vulnerable to impacts of global warming due to rising levels of GHGs. India still has a very high share of traditional biomass fuels compared with other large GHG emitting countries. Therefore, it is imperative to balance our developmental process *vis-à-vis* the environment. Considering these challenges, the country has already pledged a huge (33%–35%) reduction in the 'emissions intensity' of its economy by 2030, compared with 2005 levels (Timperley, 2019). It is projected that country's energy consumption will grow the fastest amongst all major economies by 2040, with coal contributing most to meeting this demand, followed by renewable energy (RE) (BP, 2018).

NITI Aayog and IEE, Japan report projected the energy scenario for India up to 2047, which indicates that as India's energy demand is likely to grow at a compound annual growth rate of 3.7%–5.7% until 2047. Coal will remain the dominant source of India's future energy mix, with a share of 42%–50% even in 2047. The share of renewables in the energy mix will rise from 3% in 2012 to 7%–12% in 2047. The share of electricity in energy demand will increase from 16% to 25%–29% in 2047. The use of natural gas is projected to increase from 6.5% in 2015 to 15.0% by 2022. India's National Energy Policy focuses on short- (up to 2022) and medium-term (up to 2040) targets and covers countrywide energy systems (GoI, 2017). It envisages providing electricity to all at affordable prices by 2022, providing clean cooking technologies to all within a reasonable time, improving energy security by decreasing the share of imports in the primary energy supply (such as fossil fuels), diversifying the energy mix with more addition of renewable energy, achieving greater sustainability through decarbonisation and reducing climate change impacts, decreasing energy intensity and increasing energy efficiency, and securing competitive prices and growth in the energy sector and using it as a source for foreign investment (IEA, 2018). In view of the high levels of energy production from both conventional and renewable sources, and changed energy consumption patterns, India's GHG emissions are bound to increase. A possible increase in both CO_2 and non-CO_2 emissions will have various social, economic, and environmental impacts.

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A recent study conducted in Mumbai by Sharma et al., 2019 found that economic poverty is a dominant factor in inducing energy poverty in millions of Indian households. Energy poverty mainly depends on the consumption expenditure of a household and varies across income groups – being higher in lower-income households. Amongst other socio-economic factors, awareness of energy conservation measures is linked to a reduction in energy poverty, particularly in lower-income households. It was estimated that while economic growth (GDP per capita) is a significant determinant of CO_2 emissions, energy consumption and trade are also significant determinants. Major share of energy in India (above 63%, as mentioned earlier) is still generated using fossil fuels – contributing to the highest CO_2 emissions in the country. Thus, an increase in per capita GDP and per capita energy consumption might have led to an increase in per capita CO_2 emissions during 1970–2012. Further, this study establishes that CO_2 emissions, international trade, income, and energy consumption are all inter-dependent

Since India is a fast-growing emerging economy, increases in resource consumption and the production of waste are likely to exert strong pressure on the environment. As the levels of income increase, the consumption of energy and generation of CO_2 and other GHGs is bound to rise. An increase in income and affluence in the country, as measured by GDP per capita over the years, coupled with the increased population and the changing population structure, would increase CO_2 emissions through increased consumption and production activities. Higher economic growth, which leads to more affluent members of the population, stimulates energy demand in end-user sectors – industry, transport, commerce, households, and agriculture. Most of the commercial energy in India is generated using fossil fuels, which contribute to the highest share of CO_2 emissions in the country.

Thus, India faces the challenge of increased CO_2 and other GHG emissions from its rapid economic growth, rise in population, and increase in consumption. With about 63% of energy still being generated from fossil fuels, large emissions of CO_2 are inevitable and could be a more serious concern in the future. To reduce environmental pollution without negatively affecting trade volumes and incomes we need enhanced capacity and investment in renewable energy and restructuring of energy-saving efforts to curb excessive energy losses. In addition, the existing barriers to the promotion of renewable energy should be eliminated by working to improve coordination between authorities, providing adequate subsidies for developers, mitigating investment risks in renewable energy, and implementing renewable energy markets.

While increased per capita income will lead to an increased level of production, the resulting affluence of people may also increase per capita energy consumption. It is necessary to increase energy efficiency by closing the gap between end-user tariffs and the cost of supply. Thus, along with the provision of universal access to energy, steps should be taken to reduce losses from theft, non-billing, and non-payment; and energy losses in transmission and distribution of electricity (Sharma et al, 2019). Since India has committed to a substantial (33%–35%) reduction in the intensity of country's CO_2 emissions by 2030, compared with its

2005 levels, it is imperative that the country focuses on the sustainable production of energy by incentivising the energy sector. Incentives such as subsidies and investment in infrastructure in the renewable energy sector on the production side, and the rationalisation of tariffs and inculcating responsible behaviour amongst end users on the consumption side, will go a long way towards curbing the CO_2 emissions and promoting sustainable economic growth.

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Driving Sustainability in Indian Organizations through Monetary Evaluation of Environmental Impacts

Hemant Bherwani[1,2]*

1. Introduction

India's tremendous growth in terms of urbanization and industrialization over past few decades has resulted in some unpleasant consequences. While growth has been prioritized due to increased demands and population pressure, environmental concerns have often suffered in the wake of this expansion. The rise in the number of big cities is exacerbating the country's environmental challenges. Even after raising awareness about the need for and importance of natural resources, their degradation is rising rapidly. The greatest difficulty faced by policymakers today is maximizing the use of available natural resources in order to maintain sustainability. This has sparked concern about resource depletion and extinction as a result of human activity, which consequently will have negative influence on human well-being [1]. The economic evaluation is one such method that may be used to examine potential profit and loss in relation to expected environmental impacts from proposed industrial activity. Environmental economics emerged as a tool to raise awareness among governments, organizations and as well as to the wider community regarding the increase of pollution and its adverse repercussions.

Economic growth in general is increase in capital because of advanced consumption levels and as a result, countries generally intend to invest in cutting-edge technologies [2]. Environmental economics, as a relatively new field, focuses on two aspects: One is the depletion of natural resources, which has an impact on the valuation of the services that are being provided, and the other is pollution-related environmental harm. Pollution-related harm or damages are being quantified and valued in the recent past [3,4]. The pollution-related environmental damages have received significant attention in recent- years, because the environment is coming to the forefront in sustainability driven goals around the world. Environmental laws and policies may impose stricter and tougher constraints on businesses, making them unviable in the long run. This concern was also raised among business experts, as the environment and natural resources are critical to the sustainability of their existing firms. Hence, the phrase "natural capital" was coined to describe the functions of life support. Natural capital is the stock of natural assets around the world, which includes soil, water, air, geology and all the other living creatures [5]. Natural capital and the externalities therein have two aspects: First, the environmental damage caused by waste generation and pollutants discharged by present corporate activities and second, the harm to services provided by ecosystem, related to air, water and land as well as the resources contained within [6]. In general, negative effects of pollution were recognized long ago but there was a lack of studies on their economic evaluation. Assessment of goods and services of our ecosystem in monetrary terms will be a useful tool for policymakers as it may allow them to better allocate funding by identifying areas where conservation and restoration of resources are critical [7,8].

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Environmental Impact Assessment (EIA) and Life Cycle Assessment (LCA) are widely used tools for determining the environmental and economic consequences of any activity in the product manufacturing or process-driven industries. Such tools, sometimes known as midpoint analysis approaches, are used to describe the footprints associated with distinct steps in the process. They are limited to identifying potential environmental threats or impacts as a result of the implementation of permitted development projects and activities. Figure 1 describes the externalities embedded within the system.

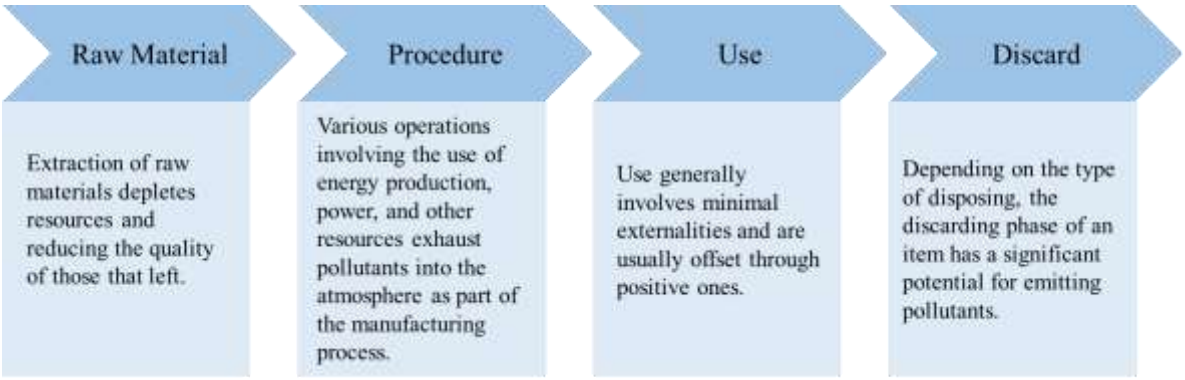

Figure 1. Negative externalities during cradle to grave cycle

Environmental consequences from cradle to grave activities are identified during the product cycle utilizing various impact analysis approaches, as shown in figure 1, but are rarely quantified in monetary terms. Due to a lack of transparency between the emission and its expected consequences, the ecosystem has been exploited beyond its capacity. Owing to this, the environmental attributes are now being valued monetarily in many ways.

2. Approach Towards Valuation of Environmental Attributes

Environmental economics as a field was strengthened through the initiation of ecosystem services valuation studies. The estimation of ecosystem services in monetary terms began with a policy stating that biodiversity and the services offered are no longer limitless and complementary. The term "ecosystem services" was coined to describe the societal worth of nature, and it encompassed ecosystem processes that occur in an ecological system but are not necessarily linked to humans. Ecosystem services began to be reflected in policy arenas as a result of decades of labor. One of the significant steps in this approach was the Millennium Ecosystem Assessment (MEA) framework. The establishment of The Economics of Ecosystems and Biodiversity (TEEB), following the above framework in 2007, was the most significant milestone in measuring the value of ecological services.

The Millennium Ecosystem Assessment was launched in the twenty-first century to assess changes in ecosystems as a result of human well-being and to recommend strategies to improve the likelihood of long-

term sustainability that contribute to human well-being. Ecosystem service providers are divided into four groups according to the MEA, namely, Provisioning, Regulating, Supporting and Cultural [9]. MEA has compiled a list of some of the key findings related to the management of the globe's ecosystems, which are causing considerable harm to people [10].

TEEB was a global effort created with the goal of recognizing the value of the ecosystem and its services in order to assist decision-makers in identifying the ecosystem's wide variety of benefits and demonstrating economic worth. TEEB used three key fundamental approaches: understanding the ecosystem's purpose, proving the ecosystem's value in terms of costs and benefits, and incorporating the values into decision-making in terms of environmental subsidy, waste-tax, and so on. TEEB is primarily concerned with determining the cost and benefit values of natural ecosystem services such as wetlands, desert ecosystems forests, river ecosystems, and so on. For valuation, TEEB used a three-tiered approach: identifying value (biodiversity and ecologies); indicating value (in terms of economics, to raise visibility, and instigating defense mechanisms); and utilizing value (in terms of decision making). According to TEEB, there are several methods for estimating economic values connected with ecosystems such as market price methods, contingent valuation method, avoided cost method and so on [11].

With the advent of TEEB, corporates such Kering Group (Puma) started understanding the meaning of ecosystem services and they assessed the footprint of various environmental attributes in their products and services. Thus, the term and domain of natural capital externalities started which measured the third-party impacts of environmental drivers in monetary terms. PWC later came up with a comprehensive methodology to conduct such studies. Presently Natural Capital Coalition (NCC) has come up with a protocol to properly evaluate natural capital aspects.

Parallelly focus is being made on implementing circular economy-related concepts as well. Circular economy is a method of economic development that benefits various businesses, society and the environment as a whole. A circular economy is by definition regenerative, with the goal of eventually decoupling growth from the use of finite resources [12].

3. Valuation as Toolkit for Sustainability

The world's economic expansion was mostly fueled by automation and systemization, and the same is valid for India, which saw rapid expansion in industries over decades [13]. The issue is not with the use of natural resources, but with the undiscerning and overutilization of ecosystems, or with the unmaintainable use of biodiversity that supports life. Industrial work mechanisms and processes keep forgetting that they are a part of the ecosystem, so if the environment is contaminated or damaged, humans will suffer as a result. Today's profit-driven corporations and communities must recognize that failing to recognize and internalize the value

the natural products and processes appropriately will cost them dearly in the long run. However, in order for corporations, governments, societies, and the general public to comprehend the genuine value of nature, it is important to demonstrate it, and so valuation is required [14]. The valuation of ecosystem services can be a tool for sustainability [15]. The valuation process is an invaluable method for policymakers, as it assists them in determining priorities and action steps that contribute to environmental protection. The value of environmental preservation is quickly growing in India and also introducing new tools such as circular economy can help protect the environment. Figure 2 indicates the way in which sustainability can be achieved using valuation as a toolkit.

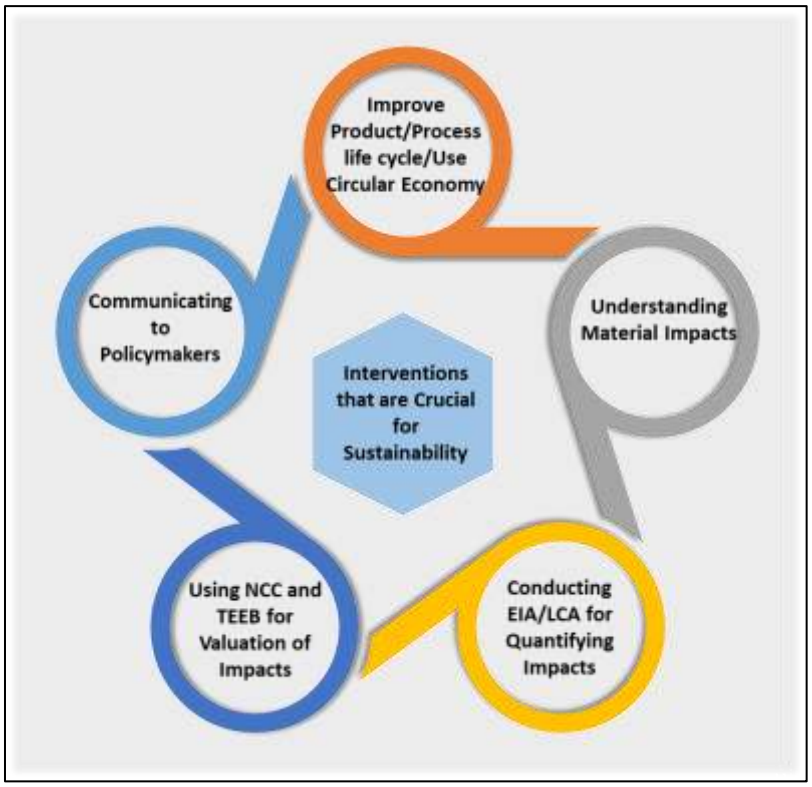

Figure 2: Interventions for Sustainability of Businesses

The above elements, along with the protocols which have been developed in the field of natural capital, can be utilized as a useful tool for betterment of industrial and business processes, guiding the policymakers for a better environment and a more sustainable society.

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Driving Contribution of Solar Energy: Targets, Commitments and Achievements in Indian Perspective

*Harish Kumar Khyani**

World Environment Day:

Every year, World Environment Day (WED) is observed on June 5. The main aim to celebrate this day is to raise the awareness among people to protect the environment. It is the United Nations' flagship day for promoting worldwide awareness and action for the environment. Theme of the WED 2021, hosted by Pakistan, is 'ecosystem restoration' and it will focus on resetting our relation with nature. It will also mark the formal launch of the UN Decade on Ecosystem Restoration 2021- 2030.

Background:

World Environment Day was established in 1972 by the United Nations General Assembly on the first day of the Stockholm Conference on the Human Environment that had resulted from discussions on the integration of human interactions and the environment. 119 countries participated in this conference. Two years later, in 1974 the first WED was held with the theme "Only One Earth". Even though WED celebrations have been held annually since 1974, in 1987 the idea for rotating the center of these activities through selecting different host countries began. Thus WED come annually with a new theme and hosted by a different country. On this day many action programs are organized to support and protect the environment. Over the years, it has grown to be the largest global platform for environmental public outreach and is celebrated by millions of people across the world.

India hosted the 45th WED under the theme "Beat Plastic Pollution" in 2018. Over 6,000 people gathered at Versova Beach in Mumbai to join UN Environment Champion of the Earth, Afroz Shah. By choosing this theme, it is hoped that people may strive to change their everyday lives to reduce the heavy burden of plastic pollution. The Indian government pledged to eliminate all single use of plastic in India by 2022. In 2019 the theme for WED was "Beat Air Pollution". The host nation was China. This theme was chosen as air pollution kills about 7 million people annually. The theme for 2020 WED was "Biodiversity ", and was hosted in Colombia in partnership with Germany. Colombia is one of the largest mega diverse countries in the world and holds close to 10% of the planet's biodiversity. Since it is part of the Amazon rainforest, Colombia ranks first in bird and orchid species diversity and second in plants, butterflies, freshwater fish, and amphibians.

Ecosystem restoration means recovery of ecosystems that have been degraded or destroyed, as well as conserving the ecosystems that are still intact. Healthier ecosystems, with richer biodiversity, yield greater benefits such as more fertile soils, bigger yields of timber and fish, and larger stores of greenhouse gases.

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The UN Decade on Ecosystem Restoration 2021 – 2030 is intended to massively scale up the restoration of degraded and destroyed ecosystems to fight the climate crisis, prevent the loss of a million species and enhance food security, water supply and livelihoods. Reviving natural carbon sinks – such as forests and wetlands – could help close the climate emissions gap by 25% by 2030. Due to COVID 19 pandemic the celebration is in virtual mode rather than physical mode.

Contribution of Solar Energy:

We have heard about the financial and practical benefits of a solar energy system. But, it can also contribute substantially to the wellness of the environment and even to public health as a whole. Hence while making the switch to solar power has financial benefits, the environmental benefits are equally as important because solar energy is a clean and sustainable way to generate electricity. As it does not contribute to any kind of pollution; therefore, it is clean energy. Thus preventing environmental catastrophes like global warming, greenhouse effect etc.

Solar energy's positive impact on the environment is undeniable. It also provides significant benefits to our health. One of the biggest benefits of solar energy is that it doesn't pollute the air we breathe every day. Solar power reduces the pollutants in the air and water, and it also helps reduce the risk of health issues on a larger scale. It also helps reduce the need for fossil fuel based energy resources that has negative impacts on environment.

By installing a solar power system, a typical two-person household can cut their carbon emissions by three to four tons annually. As more people install solar panels on their homes, offices or factories, demand for fossil fuels across the country will decrease, cutting carbon emissions substantially. By helping cut carbon emissions and fossil fuel burning, solar energy helps contribute to the improvement environment and public health. Unlike coal or nuclear plants, which may draw 20 to 60 gallons of water for every kilowatt-hour of electricity produced, solar energy requires no water to operate, only very less amount of water on periodic basis is required for the cleaning of solar panels. Therefore by shaking hands with solar, we can reduce the demand for fossil fuels, limit greenhouse gas emissions, shrink our carbon footprint, save water, decrease the risk of health issues etc.

Indian Solar Sector: Target, Commitments and Achievements

The implementation phase of the Paris Agreement which is formed to reduce the climate crises impacts by reducing greenhouse gas emissions enters a crucial phase in the end of 2020, where participating countries are required to submit their updated Nationally Determined Contributions (NDCs).

Target and Commitments:

India's Nationally Determined Contributions (NDC) under the Paris Agreement for the Period 2021- 2030 includes:

- To reduce the emissions intensity of its Gross domestic product (GDP) by 33 to 35 % by 2030 from the level of 2005; and
- To achieve about 40 % cumulative electric power installed capacity from Non-fossil fuel based energy resources i.e renewable energy capacity by 2030.

Keeping in view India's commitment for a environment healthy planet, it was decided during the year 2015 that 175 GW of renewable energy capacity will be installed by the year 2022 that includes 100 GW from solar, 60 GW from wind, 10 GW from biomass and the remaining 5 GW from small hydro power. Further, Hon'ble Prime Minister in his address at Climate Action Summit in 2019 has stated that India's renewable energy capacity would be increased to much beyond 175 GW and later till 450 GW.

Achievements:

India is well on its way to achieve these targets and has been making continuous progress in renewable power generation. From the year 2002 onwards, renewable energy capacity as a percentage of total capacity has increased by more than ten times. In April 2002, renewable energy based power generation installed capacity was 3497 MW, which was 3% of the total installed capacity in the country. Now in April 2021, it has reached 95,012.59 MW, which is about 25% of the total installed capacity of 3, 82,730.02 MW. In the figure of 95,012.59MW up to 30.04.2021 the share of solar power is 40500.77 MW which is about 43%.

As per target of 100 GW from solar that is to be achieved till 31st December 2022, we have reached 40.5 GW as on 30.04.2021and 36.03 GW solar power projects are under implementation and out of this the tendering of 23.87 GW has been done as per the report of standing committee on energy for the action plan for the achievement of 175 GW renewable energy target, presented Lok Sabha and Rajya Sabha on 19th March, 2021.

Various Initiatives towards Promotion to Solar Energy:

To ensure the achievement of physical target with respect to Solar Energy, the Ministry has

launched the following schemes for achieving the target in solar energy:

(i) Solar Park Scheme: 50 Solar Parks and Ultra Mega Solar Power Projects targeting over 40,000 MW of solar power.

(ii) Scheme for setting up of Grid-Connected Solar PV Power Projects by the Central Public Sector Undertakings (CPSUs) and the Government of India organizations with Viability Gap Funding (VGF).

(iii) VGF Scheme for setting up of 5000 MW of Grid Connected Solar PV Power Projects through Solar Energy Corporation of India Ltd. (SECI), which has a separate component of

1000 MW for North-East states.

(iv) Installation of Grid Connected Solar Rooftop Power Plants.

(v) Off-Grid Solar PV Scheme.

(vi) Pradhan Mantri Kisan Urja Suraksha Evam Utthan Mahabhiyan (PM KUSUM), Scheme to support farmers to set up small solar power projects and solar pumps for irrigation purpose.

Currently India stands in Top 10 for two consecutive year's i.e. 2020 and 2021 in Climate Change Performance Index (CCPI). In 2014 the CCPI rank of India was 31 and now India is in Top 10 that shows the tremendous work towards the commitment.

India has one of the highest rates of growth for renewable energy in the world. As per Global Trends in Renewable Energy Investment 2020 report, during the period 2014-2019, renewable energy programmes and projects in India attracted an investment of US$ 64.2 billion (Rs 4.7 lakh crore).

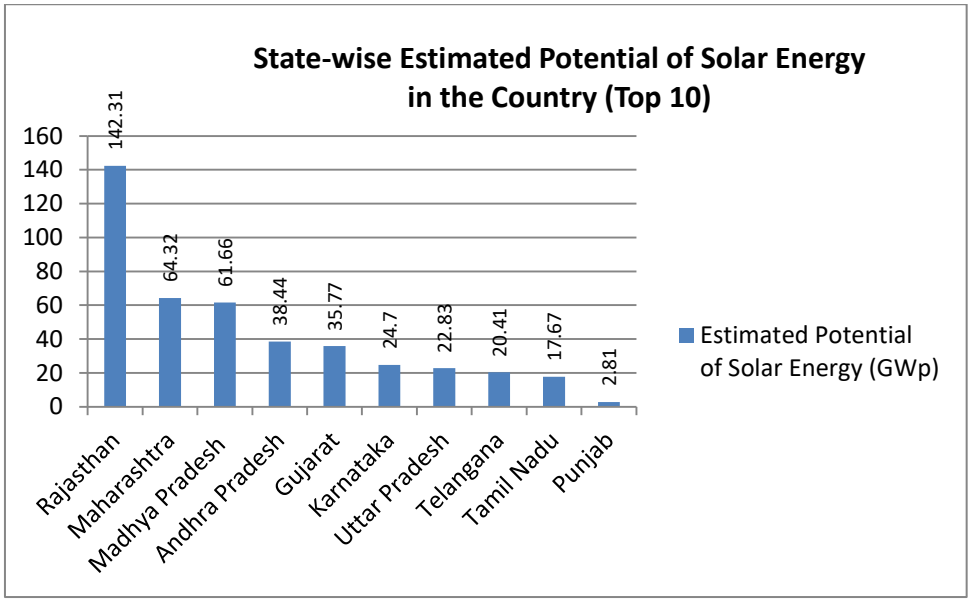
Potential of Solar Energy in the Country:

National Institute of Solar Energy (NISE), an autonomous institution of Ministry of New and Renewable Energy (MNRE) is the apex national R&D institution in the field Solar Energy. It has carried out an exercise of calculating the state wise solar potential in the country and it is totally found as around 750 GW. Table and Figure below show that Rajasthan has the highest potential for solar energy in the country.

Details of State-wise Estimated Potential of Solar Energy in the Country (Top 10):

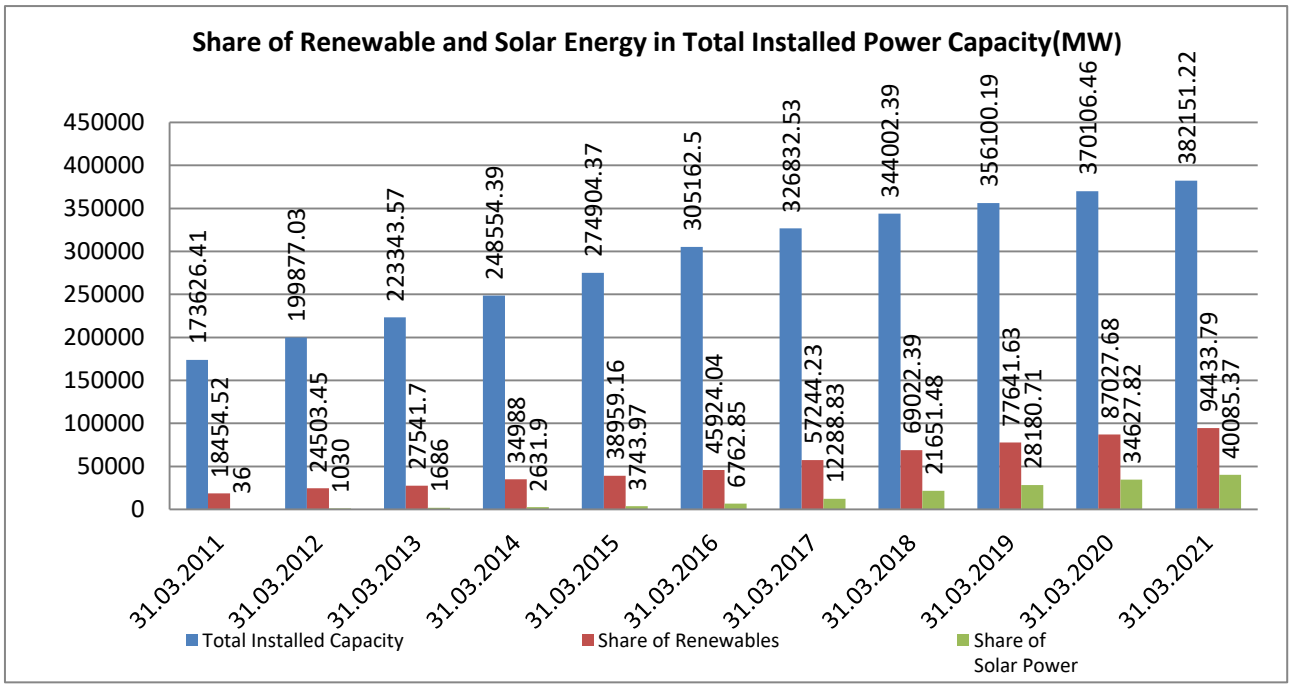
State-wise Estimated Potential of Solar Energy in the Country (Top 10)		
S. No.	State	Estimated Potential (GW)
1	Rajasthan	142.31
2	Maharashtra	64.32
3	Madhya Pradesh	61.66
4	Andhra Pradesh	38.44
5	Gujarat	35.77
6	Karnataka	24.7
7	Uttar Pradesh	22.83
8	Telangana	20.41
9	Tamil Nadu	17.67
10	Punjab	2.81

Details of State-wise Estimated Potential of Solar Energy in the Country (Top 10)



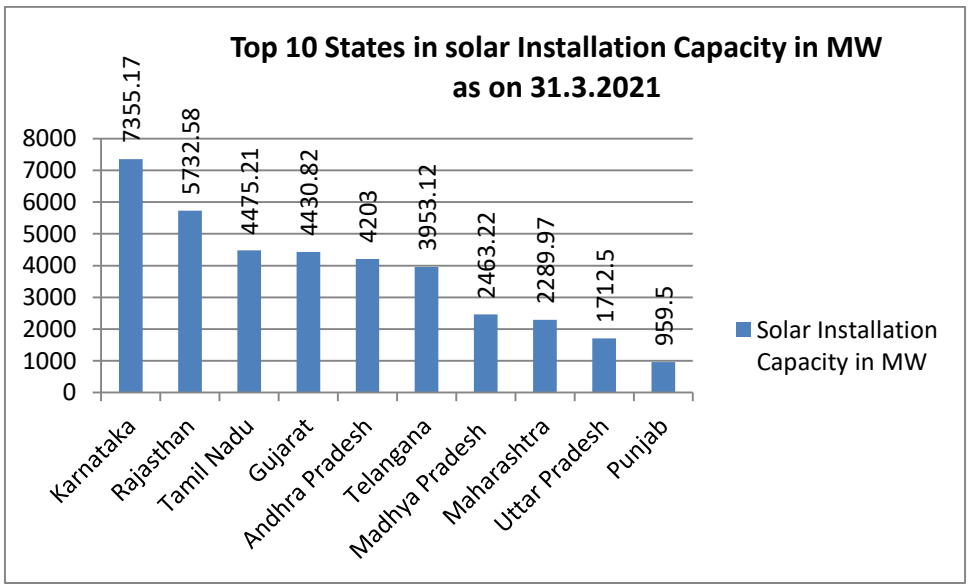
Progress of Renewable Energy (RE) and Solar Energy in Last 10 years:

During the period from 31.03.2011 to 31.03.2021, the installed renewable power generation capacity of India has increased by 5 times, and in the same period, the installed solar energy capacity has increased 1113 times. Globally, today India stands 4th in RE power capacity and 5th in Solar Power capacity. Form the above table it is also seen that in 2011 the share of solar energy in the total installed capacity was only 1.02% and now as on 31.03.2021 it has reached 10.49%. However, it may be noted that out of estaimted potential of 750 GW, we have achieved only 5.3%. Further, as per the target of 100 GW that is to be achieved till 31st December 2022, we have reached 40.5 GW i.e 40%.



Details of Top 10 States in Solar Installation Capacity in MW as on 31.3.2021

Top 10 States in Solar Installation Capacity in MW as on 31.3.2021		
S. No.	State	Solar Installation Capacity in MW
1	Karnataka	7355.17
2	Rajasthan	5732.58
3	Tamil Nadu	4475.21
4	Gujarat	4430.82
5	Andhra Pradesh	4203
6	Telangana	3953.12
7	Madhya Pradesh	2463.22
8	Maharashtra	2289.97
9	Uttar Pradesh	1712.5
10	Punjab	959.5



The nodal agencies working in these top 10 states are as follows:

Nodal agencies working in these top 10 states		
S. No.	State	Nodal agency
1	Karnataka	Karnataka Renewable Energy Development Agency Ltd. (KREDAL)
2	Rajasthan	Rajasthan Renewable Energy Corporation Ltd. (RRECL)
3	Tamil Nadu	Tamil Nadu Energy Development Agency(TEDA)
4	Gujarat	Gujarat Energy Development Agency (GEDA)
5	Andhra Pradesh	Non-Conventional Energy Development Corporation of Andhra Pradesh (NEDCAP) Ltd.
6	Telangana	Telangana State Renewable Energy Development Corporation Limited (TSREDCO)
7	Madhya Pradesh	MP Urja Vikas Nigam Ltd. (MPUVNL)
8	Maharashtra	Maharashtra Energy Development Agency (MEDA)
9	Uttar Pradesh	Non-conventional Energy Development Agency (NEDA)
10	Punjab	Punjab Energy Development Agency (PEDA)

Solar Power Current Position of Rajasthan (as on 31-02-21)

- Potential (142.31 GW) (Highest in the country)
- Current situation- Total commissioned capacity till 31-03-21: 5732.58 MW which is only 4% of the total available potential.

Further, as per the target of 5762 MW that is to be achieved till 31st December 2022, we have reached 99.5%.

Conclusion:

Looking to the commitment 2030 and dream 2030 of former president Dr. A. P. J. Abdul Kalam "India should achieve Energy Independence through solar power and other forms of renewable energy," at present solar energy is not the prime contributor to the electrical capacities but the pace at which advancement of technology and with the rising demand of cleaner source of energy, it will have a leading role in electricity generation in the coming time.

India's Targets of SDGs may be exceeded by balancing our SEE factors

*Vinod Kumar Sharma**

UN's Sustainable Development Goals (SDGs) ensure universal access to affordable, reliable, sustainable and modern energy for all by 2030. Presently, our progress on energy related SDG-7 indicates that our targets of Sustainable Energy for all (SE4ALL) in most respects, including share of renewable energy, decreasing energy intensity and increasing energy efficiency, are not upto the mark. In case of energy, four "As, i.e., - accessibility, availability, affordability and acceptability," are crucial for India in achieving sustainable energy (SE) for all (UN, 2018). Provision of SE4ALL in India will affect, several intersecting factors, both positively and negatively, which may exert pressure on our ecosystems. Therefore, energy policies that solely address economic growth may not be sustainable. It is prudent to balance the progress on social, economic and environmental (SEE) factors in framing our development policies. Despite having a large share in world's population, India's overall and per capita consumption is a very low, about one-third of the world's average. Thus, for achieving targets under SDG-7, we need to accelerate our energy production anf concumption. However, increased production and consumption of energy would affect our SEE factors.

Since SEE factors are closely linked with each other, giving more importance to one may adversely affect the other two. Therefore, a trade off may be required to maintain a balance among SEE considerations while developing and implementing policies for SE4ALL. Our National Energy Policy (NEP) is focusing on a significant share of Renewable Energy (RE). The increased share of RE in India's energy basket, in general, would help on social front by increasing the energy accessibility at affordable cost; on economic front by reducing fossil fuel imports; and on environmental front by reducing local air pollution and GHG emissions. Hoeevr, it may also have some negative impacts, *viz.*, a large land area requirement for growing energy crops for biomass energy and solar panel installations and wind farms, which may compete with land for agriculture, residential and industrial uses. Promotion of various forms of REs would necessitate subsidies, which might result in inefficient or wasteful consumption of energy and, in turn, enhance local and global pollution problems. Governemnt subsidies on energy are a burden on our fiscal budgets, and also on the environment as they increase GHG emissions due to more or wasteful consumption of energy. Subsidies also result in diversion of public funds from social welfare programs (IEA, 2015).

In 2018, the Govt. of India completed the task of electrifying all villages and, thus, electricity is now provided in all parts of the country. But millions of Indian households, due to poverty, still do not have an electricity connection within their premises. Hence, there is an urgent need to focus on our SEE factors for achieving targets of STG-7 and SE4ALL, as outlined in the following paragraphs:

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Social implications, such as achieving quality education, good health and general welfare of people, are the important aspects, which should be considered in framing and implementing policies for SE4ALL in India. Poor energy services adversely affect health of female members and children of a household as they are mainly responsible for collecting fuelwood for cooking and other household chores. Improving energy services may enhance the living standards of poor households and allow them to use better healthcare services and aid in education. Electricity is essential to operate healthcare facilities, utilize refrigeration for vaccination and medicine storage as well as equipment. Thus, an uninterrupted electricity supply may help in prevention and treatment of diseases and infections. Similarly education is negatively impacted if working of electric appliances such as TV, radio, computers, etc., is hampered due to lack of or poor electricity network thus depriving children their right to education. Lack of education and awareness may affect the employment opportunity of a people, which ultimately leads to economic poverty and further aggravates their energy poverty.

On economic front, it is to be noted that the lower income group households get worst affected by the excessive cost of energy supply, which, in turn, deteriorates their economic condition and worsens their living standard. According to Census 2011 in India, about 80.7 million households live without electricity and of these about 75 million households are in rural areas. In terms of population, this means that 44.7% of rural population does not have access to electricity and this figure for urban areas is 7.3% (CSE, 2015). In the absence of electricity, medical care, employment and income opportunities of household members gets adversely affected. The work days lost due to sickness and medical expenses add to their woes. These factors may be some of the catalysts for the government to provide subsidies on energy consumption so as to mitigate energy poverty among poor Indian households.

Environmental Implications of lack of SE4ALL are many as a large part of our population is still lacking access to electricity and clean fuels for cooking. Despite achieving country wide electrification, there are several households, which either are without electricity connection or do not get enough electricity supply, despite having a connetion. This forces a sizable number of poor households to rely on polluting biomass fuels such as wood, coal, agro-waste, etc., for cooking and other routine chores. It has been reported that in India poor indoor air quality is the second largest killer with 1.3 million deaths each year (HUFFPOST, 2017; Kanti, 2017). Based on WHO data, India is home to 22 of the 50 most polluted cities in the world, which combined with the need of low carbon energy production, is an important factor that calls for SE production. It has been reported that energy demand could be reduced as much as by 25% through various measures such as increased energy efficiency and technology interventions in various demand sectors. This would ultimately have several environmental benefits and total CO_2 emissions of about 7703 MT may reduce to 4826 by 2047. Increased share of electricity in total energy demand will also have positive environmental effects (NITI Aayog and IEEJ, 2017).

In view of the above, energy policies that solely address economic growth will not be successful and a balancing approach that considers SEE factors is necessary for achieving SDGs within the time frame. For achieving SDGs of the UN and SE4ALL households in India, implementation of policies and strategies that improve the access, availability and affordability of electricity and increase awareness of the general population regarding energy conservation, is necessary.

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Mother Earth

Vinay Bhardwaj *

WE
HAVE ONLY ONE LIFE,
WE HAVE ONLY ONE EARTH.
FOR US TO LIVE OUR LIFE HAPPILY,
WE CAN'T EXIST SEPERATELY.
LET US ALL REJOICE OUR BIRTH.
LET US ALL PLAY OUR PART.
BEFORE IT'S TOO LATE,
LETUS PLEDGE AND START TODAY,
LET US STOP WOUNDING THE EARTH,
LET US STOP RAPING THE ENVIRONMENT,
THE NATURE WONT REQUIRE
A POLICE,A COURT OR A GOVERNMENT
FOR ACTIONS OR TO SAY INACTIONS
IT WILL GIVE ITS OWN VERDICT,
LEAVING NO DOUBT
WE CAN CLEARLY PREDICT.
CARE OF NATURE IS OUR FUTURE,
NOTHING LESS NOTHING MORE.
IMAGINE COLOURLESS RAINBOW,
OR WATERLESS RIVERS.
IMAGINE THE DARK GREY SKY,
AND JUNGLE WITHOUT
BIRDS, ANIMALS AND TREES.
IMAGINE THE ACIDRAINS AND
DARK CLOUDS OF SMOKE. …….

…… CARE, COEXISTANCE AND COMPASSION
IS THE ONLY MANTRA
WE CAN SURVIVE.
OR ELSE THE PATH OF SELF DESTRUCTION
WILL KILL US LIKE BHASMASUR.
SO WE NEED TO CHOOSE,
TO SEE WE DO NOT LOOSE.
OUR LIFE,OUR EARTH.
OUR AIR,WATER AND SKY.
OUR PLANTS AND CREATURES.
OUR NATURE,OUR TREASURE.
START TODAY WITH A LITTLE STEP,
FOR A GREEN LEAP FOR TOMORROW
AND TAKE AWAY NATURE'S SORROW.
LET US CUT OUR GREED
AND SOW A SEED
WHICH HAS THE RAY OF HOPE.
TO AGAIN PAINT THE EARTH
GREEN AND BLUE,
FOR EVERY LIFE ON EARTH.
ME AND YOU,
TOGETHER WE CAN DO!!
TOGETHER WE WILL DO!!

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Drop is Hope

Vinay Bhardwaj *

The drop of Water
So pure so clean
Descended from the
Clouds in the sky
With her little dream
To meet the Mother earth
And turn her into green.
Collectively they form
The thirst quenching Rain
Thirst of every form of life
Be it in forest ..desert ..glacier
Pond ..Lake .. Sea ..River
Drop is Hope
Hope for life
Hope for progress
Hope for U..Me..We all
Hope for survival
Hope for future.
A little care today
Will keep away
Tomorrow's scare
A little attention today
Will free mankind from
Any tension of tomorrow.
So let's keep the
Drop safe
And keep the
Hope alive
Till we are …
Till we live. …….!!

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आने वाले कल की खातिर

विनय भारद्वाज *

ये दर्द लेकर क्यूँ जीयें कि
हम पृथ्वी के लिये ना कुछ कर पाये
आने वाले कल की खातिर
कदम हम ऐसे बढ़ायें
नई पीढ़ी को हम पर्याप्त
स्वच्छ हवा पानी दे पाएँ
दिखाई दे रहा भयावह मंज़र
गर बिना सोचे समझें यूँहीं चलते जाएँ
बदल सकते हैं तस्वीर अगर हम ठाने
और सब मिलकर नई राह बनायें
छोटे छोटे प्रयासों से हम आज
धरती के घावों पर मरहम लगायें
पूर्वजों से पाया था जैसा
वैसा ही उपवन इसे बनायें
सोचो भला जानवर आज बस्ती में क्यूँ आएं
हमने ही तो जंगल काट आशियाने अपने बनाये
सूखती नदियों ,झरने,झीलों ,जलाशयों की
धड़कने हम फिर से लोटा लाएं
विषाक्त मटमैले हो रहे गगन को
हम फिर नीलाम्बर का रूप दिलाएं
दमघोटू हुई पवन आज उसे
फिर से प्राण वायु बनायें. .....

..... ये ना सोचो एहसान कर रहे पृथ्वी पर
जो हम बेहतरी के उपाय कर पाये
हरित धरा ,पर्यावरण संतुलन से ही
हम नई सदी तक पहुँच पायें
सोच प्रतिपल निरंतर ऐसी बनी रहे हमारी
इसे याद रखने को ही हम पृथ्वी दिवस मनाएं
सरकारों का ही नहीं ये सरोकार हम सबका है
काश कि मिल कर हम लालच के कुंए को भर पायें
हरियाली से ही होगी सर्व जगत की खुशहाली
सामंजस्य से हम पृथ्वी को फिर से स्वर्ग बनायें
समझ सको तो संभल जाओ
सुन प्रकृति की चेतावनी के स्वर
जलवायु परिवर्तन हो रहा जगत में
सर्वजगत हो रहा करोना का कहर
परिवर्तन करें जीवन शैली में
परिवर्तन हो हमारे आचरण में
परिवर्तन की ऐसी धारा बहाएँ
प्राणी ,जीव ,वनस्पति सब हिलमिल हर्षायें

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