

PRISM

A PPF Dispatch

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The Policy Perspectives Foundation (PPF) is a non-profit, apolitical think tank on matters of national interest. PPF's activities focus on complex and inter-connected challenges to peace, stability and development in India in cognizance of the external dimension. PPF is committed to spreading awareness, building capacity and promoting resilience.

By the end August 2020 global coronavirus infections soared past 25 million and after a brief respite, India's COVID-19 cases are also rising rapidly. Nearly 843,000 people have died of COVID-19 globally. In India fresh infections are exceeding 75,000 a day and the weekly count is more than 500,000. Daily fatalities are over 1,000 a day and the trends suggest an impending spike in some states. On the other hand, the mortality rate has been falling and India's COVID-19 recoveries crossed 27 lakh. Despite the grim numbers, there has been steady opposition to lockdowns and social distancing measures in many parts of the world, often because of their crushing economic cost.

India's Union Home Ministry has issued the guidelines for 'Unlock 4' under which metro trains will be allowed to resume services from September 7 in a graded manner, while political, social, and religious congregations of up to 100 people will be permitted from September 21. However, schools, colleges and other educational institutions will remain closed for students till September 30. Cinema halls, swimming pools, entertainment parks, theatres and similar places will remain shut. As the government eases the lockdown restrictions to help ease pressure on the reeling economy, there is likely to be a surge of coronavirus infected cases.

In this issue of Prism, we remember Bharat Ratna Pranab Mukherjee, 13th President of India who passed away on August 31. This issue carries commentaries on the credibility deficit that the World Health Organisation faces because of its failure in issuing timely alerts about the infectivity of coronavirus, the impact of COVID-19 on Digital India and the state of solar energy in India whose commercial exploitation has still not been optimized.



'Passing of a Legend - Remembering Pranabda' (1935-2020)

— P C Halder

Bharat Ratna Pranab Mukherjee, 13th President of India, left for his heavenly abode on 31st August, 2020 after a brief illness. Known also as a 'peoples' president', Pranabda as he was commonly referred to by all his admirers cutting across the barriers of age, political and religious denominations left behind a rich legacy. A staunch believer in democracy and universal equality, he displayed a bi-partisan approach in politics and became known for his success in finding common ground to resolve knotty and delicate parliamentary issues. A scholar par excellence, he did his politics with both his heart and mind and commanded respectful attention of both his admirers and opponents. He brought distinction to senior positions he held in the government in his long political career as Union Minister with key portfolios. His service to the nation culminated with the assumption of the office of the President of India in 2012 which he held till 2017. His immense contribution to the nation was duly acknowledged when the prestigious "Bharat Ratna" award was conferred by the Government of India in 2019.

A man of engaging qualities, he was the 'trouble shooter' to resolve knotty political tangles. 'Universal access was his mantra which earned him universal admiration across the board. He like any grandfather was also prone to lose his temper often but only to regain his composure soon to become his affectionate genial self again. A great scholar with a commendable mastery over facts and figures, encyclopedic knowledge and elephantine memory holding both the political minutiae and parliamentary practices, he was a veritable resource person and an engaging storyteller. He looked more a professor and teacher on such occasions. A keen and sharp mind, he was indispensable to his

party, government, journalists, and scholars. One has even seen him guiding senior bureaucrats about where a government decision relevant to the subject could be found in the old files.

His deep understanding of the plurality and the unique assimilative features of Indian democracy was unparalleled amongst the contemporary political personalities. He was deeply religious in his personal life and simultaneously strongly committed to secular thoughts.

He certainly was many things to many people. A lot of pieces will come out on him in the coming days and weeks illuminating his many faceted personality. What should, therefore, be the best tribute to him and his memory. We pondered over this issue in the Policy Perspectives Foundation and came round to the view that his thoughts on heritage and future of India should be an apt choice.

Thoughts expressed by the late President in his address at the RSS Headquarters, Nagpur are truly relevant in today's India and for its future. Salient strands of his thoughts expressed on the occasion are worth a recall. Referring to India's more than 5000 years old of civilisation and history, he described India of those days as a globally connected 'open society' with 'a free exchange of culture, faith and invention'; university system comprising 'Takshashila, Vikramshila, Valabhi, Sompura and Odantapuri' attracting as magnets 'finest minds and scholars' providing liberal environment of creativity in art and literature. He recalled words of Rabindranath Tagore in his poem - 'Bharat Tirtha' - "*No one knows at whose beckoning call how many streams, of humanity came in indomitable waves from all over the world, over the millennia and mingled like rivers, into this vast ocean and created an individual soul, that is Bharat.*" Adding that India was a state long before the concept of 'European Nation State', emerged after the



Treaty of Westphalia in 1648, based on elements like a territory, language, religion, and a common enemy. He pointed that evolution of Indian Nationalism unlike that of Europe was based on 'Universalism' drawing sustenance from the principles of 'Vasudhaiva Kutumbakam and Sarve Bhavantu Sukhinah, Sarve Santu Niramayah. Mentioning tolerance, pluralism and diversity as part of India's 'collective consciousness' for centuries, he cautioned against defining 'our' nationhood in terms of religion, region, hatred and intolerance as that would lead to dilution of 'national identity'. According to him, the construct of

Indian nationalism is "Constitutional Patriotism" based on an understanding of our inherited and shared diversity with its soul residing 'in pluralism and tolerance' with secularism and inclusion as faith; and the composite culture.

Words of Pranabda convey his vision of India -one that he believed in and worked for. He may not be amongst us today but his vision lingers and would always remind and encourage the future generations. May his soul rest in eternal peace.

The author is President PPF.

Key milestones in the life of Former President of India and Bharat Ratna, Pranab Mukherjee	
Dec 11, 1935	Born in Miriti village, Birbhum, West Bengal
1957	Post-Graduation; Marriage with Subhra Devi
1963-69	Lecturer, Bidyanagar College, 24 Parganas
1966	Bangla Congress
1969	Elected MP Rajya Sabha from Bangla Congress
1973	Merger of Bangla Congress with INC
	Minister of State in Indira Cabinet
1975	Re-elected to Rajya Sabha as Congress nominee
1977	Lost Lok Sabha Election from Maldah as Congress candidate
1980	Lost Lok Sabha Poll from Bolpur
1980-2002	Leader of the party, Rajya Sabha MP & Union Minister
1982-84	Union Finance Minister
1986	Quits Congress
1989	Returns to Congress
1991-96	Dy. Chairperson, Planning Commission
1995-96	Union External Affairs Minister
2004-2006	Elected as Lok Sabha MP from Jangipur (W.B)
	Union Defence Minister
2006-2009	Union External Affairs Minister
2008	Awarded Padma Vibhushan
2009-2012	Union Finance Minister
2012-2017	President of India
2019	Awarded Bharat Ratna
Aug 31, 2020	Leaves for heavenly abode.

Coronavirus and the Credibility of the WHO

— Vaishali Basu Sharma

The World Health Organisation (WHO) took a serious blow to its reputation and credibility when it failed in issuing timely alerts about the infectivity of coronavirus. One of the agency's largest voluntary contributors, the US is now considering withdrawing funding to the WHO. "The WHO really blew it." President Trump has been most vocal in his criticism of the World Health Organization (WHO) accusing it for being too "China-centric" in its tackling of the coronavirus pandemic.

Around the world analysts are of the opinion that in order to remain unassailable the Communist Party of China (CPC), distorted the scale of COVID-19's impact in China and that the number of deaths has been hugely underreported. Yet the WHO chose to rely on information from Chinese health authorities and on January 14, 2020 it tweeted from its official handle that, "Preliminary investigations conducted by the Chinese authorities have found no clear evidence of human-to-human transmission of the novel #coronavirus (2019-nCoV) identified in #Wuhan, #China." This tweet came at a time when around the world journalists were already suspecting China's statistics, and those associated with the NYT, WaPo, WSJ were being expelled from China, in a frantic effort to cover up the scale and lethality of the coronavirus.

The WHO's alleged reiteration of the Chinese position, has raised questions on the credibility of the organization. WHO's reputation as a trusted source of health information and technical and policy expertise on a global level has been

damaged. Did it in all honesty act as an impartial convener of health standards?

In March even as number of new COVID-19, or coronavirus, infections in other countries kept increasing China reported only 78,191 confirmed cases. The numbers itself raised doubts over the veracity of China's coronavirus statistics, which the WHO was completely backing.

Amidst reports of China expunging international journalists and hiding data the WHO Director-General Tedros Adhanom Ghebreyesus was disparaging other affected countries which were allegedly still not sharing data with the agency, "WHO cannot provide appropriate public health guidance without disaggregated data and detailed line lists." Epidemiologist Bruce Aylward, who headed the WHO mission team to China in February in his assessment stated that "There's no question that China's bold approach has changed the course of rapidly escalation of this epidemic," with hardly any evaluation about spread and nature of the virus

But the most bewildering was the WHO's reluctance for the coronavirus outbreak to be declared a pandemic. A pandemic classifies as a pandemic when it crosses international boundaries and affects a large number of people worldwide. Despite spread of COVID 19 beyond China by the end of February, it was only as late as March 11, 2020 when the health agency decided to characterize COVID-19 as a pandemic. On February 26 Tedros said, "Using the word pandemic carelessly has no tangible benefit, but it does have significant risk in terms of amplifying unnecessary and unjustified fear and stigma, and paralyzing systems." WHO officials kept insisting that it was time to focus on containment, not language. WHO's delay in

classifying COVID 19 as a pandemic prevented governments around the world from deploying mitigation strategies, like closing schools and canceling mass gatherings earlier on. WHO should have made that call at least two weeks prior to March 11, when the virus began its initial rapid spread in Italy, the Islamic Republic of Iran and the Republic of Korea.

Is the WHO's defensive position vis-à-vis China's culpability in terms of concealing the magnitude of the spread of COVID 19 calibrated by the amount of contributions made by the Chinese government to the UN and its various agencies? The WHO relies on funding from both government and private sources. Its funding comes from assessed contributions which are the dues countries pay in order to be a member of the Organization and voluntary contributions.

In recent years, year, more than 80% of WHO funds came from voluntary contributions made by governments, private organisations like charities, as well as multilateral bodies like the EU. And China's support for the United Nations (UN) and its agencies has grown considerably. Today China is the second-largest contributor to the UN's regular budget.

The severe acute respiratory syndrome (SARS), avian influenza A(H5N1) virus, pandemic A (H1N1) 2009 virus, all originated in China. Since the experience of dealing with these outbreaks, the Chinese government has been perceptive enough to make efforts to burnish its image to the international community. A major step in that direction has been to increase its level of participation in global health and development platforms contributing millions to multilateral institutions since 2010. China alone hosts 65 WHO collaborating centres. China is on the

Executive Board of WHO and is a board member of the Global Fund to Fight AIDS, Tuberculosis and Malaria and the Joint United Nations Programme on HIV/AIDS (UNAIDS). After the Ebola virus disease outbreak in West Africa China exercised strong global leadership committing more than US \$ 120 million to the three West African countries. In the past few years, China has become a generous contributor to the WHO, which enables the agency to fulfil its quest to supply of affordable, essential medicines and vaccines globally.

Ethiopia, from where WHO DG Tedros Adhanom Ghebreyesus hails from has received hundreds of millions of dollars for mega-projects. There are allegations that since China is unhappy with the low returns on its investments it may pull out of Ethiopia, which would crumble its economy. Tedros's advocacy of China is a desperate measure to avoid Chinese withdrawal from his native African country. Further Beijing had backed his candidature for WHO DG in 2017. Bradley A. Thayer, professor of political science at the University of Texas-San Antonio and Lianchao Han, vice president of Citizen Power Initiatives for China believe that since Tedros Adhanom Ghebreyesus helped China to play down the severity, prevalence and scope of the COVID-19 outbreak he should be held accountable for recklessly managing this deadly pandemic. Now the Chinese government with the help of companies like Alibaba has launched an aggressive "coronavirus diplomacy" and donation blitz to wash out the it's lately earned ill-repute.

In May this year India's nominee Dr Harsh Vardhan, Minister of Health and Family Welfare, was elected as Chair of WHO's 34-member

Executive Board. That the chairperson's position will come to India was taken long before the world woke up to the Sars-CoV-2 pathogen that originated in China's Wuhan and spread rapidly across the world. Last year the WHO's South-East Asia group unanimously proposed New Delhi to the executive board for a three-year-term. In this position India's nominee has to work closely with Director General Tedros Adhanom Ghebreyesus. The WHO Solidarity trial to help find an effective treatment for COVID-19, is underway in India.

China's economic stature translates into more resources for bargaining and coercion. Its leverage has vastly increased and misused, for instance its blocking Taiwan's appeal for membership in the WHO. The pandemic has revealed that the WHO is incapable of managing the global health impartially, and in its operation has a systematic bias towards China which now heads up four of the 15 UN specialized agencies. Coronavirus pandemic has exposed a void in global leadership that has been exacerbated by the uneven response of the US administration and international organizations. Over the past decade, there has been a palpable shift in the scale of the West's influence over the governance and direction of global research.

These are indeed testing times for the WHO. As the pandemic has affected the most developed nations in the world, it has surfaced fundamental tensions between donors and specialized multinational body. Tedros has damaged his credibility, possibly beyond repair, and taken the credibility of the WHO down with him - at a crucial moment when the agency's trustworthiness may be more important than at any time in its 72-year history.

The WHO can still salvage its credibility if it is able to administer the development and consecutive accessibility of a vaccine for COVID 19. The next level in the COVID saga test will witness whether the WHO is able to successfully lead a collaborative effort for the COVID-19 Vaccines Global Access Facility (COVAX) as it involves joint procurement and pooling risk across multiple vaccines. The WHO must be credited for planning COVAX, along with the Coalition for Epidemic Preparedness Innovations and Gavi, the Vaccine Alliance, for accelerated development and testing of a vaccine. How successful COVAX will be depends on whether WHO's is able to ensure that all countries within the Facility are able to access whatever vaccine is proven to be safe and effective. Coordinating the efforts of 172 countries in COVAX global vaccine Facility, providing timely and equitable access to all vaccines, licensed and approved, while keeping prices as low as possible will prove to be a real test. Unfortunately, the United States has already announced that it will not be participating in the COVAX plan as it is co-led by the WHO. The Trump administration had announced earlier in May that it was withdrawing from the WHO and cutting its funding to the organization.

It remains to be seen if the WHO can still mend its reputation. The pandemic has brought to fore the significance of health and the insignificance of boundaries. Top officials with the WHO have warned against the potential impacts of "vaccine nationalism", which would be seen if wealthier nations rely on the efficacy of their own vaccine development, encouraging other countries to do the same, and eventually lead to hoarding of the vaccine and higher prices for doses.



While there is a lot to be cynical about the merits of multinational organisations like the WHO, for now it is essential that the countries cooperate and tackle the risks and dangers being posed by COVID-19 in partnership. India has assumed leadership of the Executive Board of the WHO at a very challenging time. Despite the shortfalls of the organization, as current leader all eyes will remain on India as it steers the Executive Board in addressing this defining pandemic.

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COVID-19: The Era of Digital Dynamics

— Manika Malhotra

The lingering COVID-19 era of remote 'everything', has witnessed alone, an exceptional degree of digital transformation in just a few months. Many platforms have enabled this accelerated transformation by providing robust and accessible digital solutions to chat, call and meet, seamlessly. The year '2020' has witnessed and continues to witness dramatic changes across various sectors of education, healthcare, business and some other sectors which have far reaching impact on how we live, serve, educate and shape our future. The changes are inevitable part of the evolution of humans but how we manage the impact of these changes and how we shape the contours of our society will to a great extent lie in our hands. The current crisis has also contributed to the widening of the existing 'digital inequality'. While the pandemic cannot be held responsible for creating this digital divide, it has certainly exacerbated it and this pandemic-induced change in habits, of the

progressing 'majority- digital world', is believed to persist well beyond the COVID-19 period.

Although digitization is being considered as a sustainable solution during COVID-19 era, it still encounters annoying and debilitating constraints in terms of universal coverage and adaptability. The most concerning bottleneck of India's digital transformation arises from the digital and income inequality interdependence which creates its own set of challenges and disrupts the intended process. The limited impact of technology based initiatives on income levels of low income groups can be partially attributed to inadequate digital literacy along with poor access to internet amongst the respective strata of society. With new technologies and emerging digital alternatives, many old jobs are getting redundant and the new ones only seem to benefit a cluster of the population due to deficiency in reach. A study by IAMAI (2018) revealed that only 16% rural users access internet for making digital payments. Limited penetration of internet, gaps in quality and affordability, unstable supply of electricity and inadequate adoption of basic technology has widened the pre-existing inequalities and this may only grow in the years to come. According to the Centre for Digital Financial Inclusion's survey on migrants' profiles (2018), majority of the migrant workers (66%) own a mobile phone but only 28% of them have a smartphone and only 10% of the recipients (usually someone from the migrant's family in the source state) own a smartphone. COVID-19 has certainly added to the present set of vulnerabilities of majority of the population. From accessing social as well financial protection to ensuring employment, it has caused an unequal impact across every aspect of livelihood, especially affecting the 'less privileged', who are

still struggling to adapt to the digital demands of the 'new normal' setup.

On August 15, 2020 Hon'ble Prime Minister launched the National Digital Health Mission (NDHM), a digital healthcare initiative, through which a unique health ID (accessible through a mobile application/website) will store an individual's medical records, including visits to hospitals, medical history, the line of treatment etc. and will allow them to communicate with doctors digitally. Despite the enormous potential of the initiative, one cannot overlook the various challenges that may arise in its implementation. Considering that most of the public hospitals are not well equipped to digitally carry out the necessary activities and neither is the staff adequately trained to operate in the digital setup raises many concerns about the precarious roadmap of digital healthcare and its implementation. Practices such as telemedicine aim to serve as an alternative to in-person visits for both primary as well as specialty care. Ground level implementation of the same, may therefore necessitate setting up and deploying easy mobile applications and quality (basic) access to internet for patients to access these applications and communicate with the doctors. On the other hand, the patients visiting the public hospitals across states comprise of individuals belonging to different strata of population, also incorporating those who barely own a mobile phone/smartphone or have access to internet.

Besides healthcare, it is the education sector that has been witnessing revolutionary drift in its functioning and operations during COVID-19. After spending years in a conventional classroom setup, not just parents and students but also the teachers, who lack adequate digital competence,

were forced to shift to digital teaching method. This transition has not been easy for many, especially in the absence of any planned training mechanisms and processes. Where on the one hand teachers are still learning to operate in virtual classroom, the students and families on the other are also facing various challenges. Interaction with a 52 year old teacher of a private school in Delhi revealed how this transition has left her completely dependent on her children, resulting in aggravated anxiousness and also affecting her productivity. Within few weeks into the pandemic, she believes to have changed from an independent working woman equally efficient in managing home to someone who is juggling her complex professional requirements along with other household chores. She stated that factors such as lack of prior digital knowledge and absence of any pre-defined sources and/or methods for digital training in the education system have caused inconvenience during the crisis period. On the other hand, the situation of government schools is found to be even worse as it is not only the teachers who are struggling to operate, a domestic helper who is a mother of two children discussed the difficulties she is facing in managing the lessons of both her daughters due to lack of Wi-Fi connection at home and availability of just one smartphone in the family. This certainly allows us to envisage the extent to which many such students have been pushed away, unable to access basic education and are digitally excluded. We can now thank the pandemic to have at least made us realize the fundamental need of having access to digital technologies as well as building digital competence in order to improve one's ability to advance in life.

The 75th National Sample Survey (NSS) (2017-18) on Household Social Consumption: Education conducted by the National Statistical Office (NSO), Ministry of Statistics and Programme Implementation, presented key findings on the ability of Indians to use internet and operate computer etc. The survey also revealed that only 10.7% of households own a computer and merely 24% of them have access to internet. The rural-urban dichotomy is starkly visible in the current digital landscape with only 14.9 % of rural households having an internet facility compared to 42% of urban households. Besides inadequate accessibility, lack of digital competence is a deterring roadblock in India's e-journey. The survey reveals that only 16% Indians are able to operate a computer and only 20% have adequate understanding of using the internet. The rural-urban divide is supplemented by noticeable gender disparities as well. Digital literacy as well as ownership of ICT was found to be lower amongst females in both rural as well as urban areas. The digital loop that persists since years, despite improvements, perpetuates unequal benefits as well as participation. COVID-19 crisis reflects upon the power of digital divide to effect the economic development of a country by transcending into various forms of economic and social inequalities.

Easy, universal and undisrupted access to technology is now all the more crucial in ensuring equitable access to education, jobs, healthcare and various other critical spheres. India cannot afford to be oblivious to the persisting digital divide and the prevailing inadequacy in imparting digital literacy especially when the 'digital reset' of Indian economy has made its way into every aspect of our life. Some states have made visible efforts to

address the issue of accessibility, especially in rural areas by facilitating virtual classes for students on television sets-a medium found to have better penetration in remote areas than internet. Urban landscape, on the other hand, faces its own set of challenges which may require adopting a customized approach and introducing flexible solutions such as utilizing school buses/vehicles as mobile Wi-Fi hotspots and/or providing subsidies especially to those surviving without the privilege of smartphones and access to internet. Countries like Nepal and Malaysia have already introduced Internet fee discounts to prevent accentuating inequalities during the COVID-19 period. Whilst ensuring equal and convenient access to digital world, it is imperative to also train and equip the population to participate meaningfully. Building foundational technological skills of the human capital in this era of digital dynamics is needed not only to successfully implement the intended digital policy initiatives but to ensure more equitable economic recovery from the COVID-19 crisis. The government, private sector as well as the civil society needs to proactively engage in recognizing the challenges; facilitate accessibility and skills through creative solutions and support the fellow Indians as they still navigate their way through the complex digital path.

The author is a researcher with PPF.

India and Solar Energy

— Sanjay Sinha

The International Solar Alliance (ISA), formed following an initiative by India and France in 2015 with headquarters at Gwal Pahari near Gurugram in India, is organizing the first World Solar Technology Summit (WSTS) on a virtual

platform on September 8, 2020. Shri R K Singh, Union Minister for Power and Renewable Energy recently made this announcement (September 17). He disclosed that the WSTS would attempt to bring together scientists, including Nobel laureates, and engineers from member countries to sit down and think about the challenges in realizing the dream of making energy affordable and abundant.

The idea to form ISA was first mooted by Prime Minister Narendra Modi, while addressing (Nov.13, 2015) Indian diaspora in the presence of the then British Prime Minister David Cameron, at Wembley stadium London. He had mentioned about an alliance of the sunshine countries, i.e. those broadly located between the tropics of Cancer and Capricorn and by virtue of their geographical location received plenty of sunshine. He termed them as 'suryaputras'. The idea took shape a few days later when he and the then French President Francois Hollande formally announced (Nov. 30) the formation of ISA during the 21st session of the United Nations Climate Change Conference of the parties (COP - 21) in Paris. It was attended by the then UN Secretary General Ban Ki-moon alongside heads of states of about 120 nations who affirmed their participation in the alliance to dedicate efforts for promotion of solar energy to reduce dependence on fossil fuel. The ISA is a treaty based inter-governmental organization whose members primarily are countries that fully or partially fall within the tropics. Countries that are not located within the tropics can also become members and enjoy benefits of the alliance. The framework agreement of the ISA was opened for signature in Marrakech, Morocco on the sidelines of the next Conference of the Parties (COP-22) on Nov.15, 2016. So far, 74 countries have signed and 52

countries have ratified the framework agreement.

In the aforesaid COP-21, the Paris agreement was negotiated which led to a global agreement on the reduction of greenhouse gases (GHG). The key result was to set the goal of reducing global warming to 'well below 2°C' when compared to the pre industrial levels. It was also agreed that the countries would suo-motu pursue efforts to limit the temperature increase to 1.5 °c. On October 2, 2016, India, the World's 4th largest carbon emitter (China - 28%, US - 16%, EU - 10%, India - 6%) became the 62nd country to join the Paris agreement. As part of the agreement, India would reduce carbon emission intensity from 2005 levels by about 35% during the next 15 years, would raise its installed electricity generation capacity from non-fossil fuel sources to 40 % by 2030 and would increase its forest cover by 5 million hectares along with an improvement in the quality of green cover by an equal measure by 2030.

Nearly five years have elapsed after the Paris agreement, and close to 4 years since India joined it. How has been India's progress? The first commitment was to reduce the carbon emission intensity. Whether it has been able to achieve the goal or not is difficult to quantify. However, assertions made by the Indian government as well as assessments by independent institutions indicate that India would be able to largely achieve the target. The second commitment, to raise to 40% the installed electricity generation capacity by non-fossil fuel sources (renewable, hydroelectric, and nuclear) by 2030, is more easily addressed. Already, India has been able to raise its generation level from such sources to 37%. It is estimated that this figure could go up to



about 65% by 2030. However, India had also set itself an interim target of reaching 175 GW (Solar -100, Wind - 60, Biomass - 10 and Small Hydro - 5) from non-renewable sources by 2022. This seems difficult to achieve. Slump in the industrial activity due to COVID -19 has only added to the problem. As against the target of 100 GW from solar energy, India has been able to reach 35.3 GW and against 60 GW of wind energy, 37.9 GW has been achieved. Result is better in the field of biomass (10.1 against a target of 10 GW) and small hydro (4.7 against 5 GW). Overall, only 88 GW has been achieved till now which is barely 50 % of the target. It is already 2020 and only 2 more years are left. The major shortfall has been in the field of solar energy and wind energy, particularly the former.

India's third key commitment at the COP-21 was the creation of additional green forest cover and tree plantations. Fulfillment of this commitment by 2030 however seems difficult as the Green India Mission (GIM), which was launched in 2014 and which seeks to work towards protecting, restoring, and enhancing India's diminishing forest cover, has not been able to complete its annual targets. According to a Parliamentary Committee report, the GIM is grossly underfunded.

In the field of solar energy, India, being located on the tropic of Cancer, is naturally endowed with a huge potential, though only a little has been exploited so far. An estimated solar radiation of about 5,000 trillion Kilo Watt hours (KWh) per year is incident over the Indian landmass. There are mainly three methodologies to convert solar into electrical energy. The first is obviously through photo electricity. When the sunlight falls on certain elements and their

compounds, electricity is generated. This is in the form of direct current (DC) which has to be passed through a convertor to change it into alternating current (AC) for commercial use. Approximately, 40 MW of electricity can be generated by spreading solar panels over an area of one sq km. Large tracts of land in the country are unproductive, barren, or devoid of vegetation. Such wastelands can be ideally used for producing solar energy. If we are able to devote even 10,000 sq kms of such wasteland for solar electricity generation, about 400 GW can be generated which is more than the total current installed capacity of India which is 372 GW. A pitfall in the electricity generation with the help of photovoltaic cell, however, is that it generates electricity only during day time and non-monsoon periods. This shortcoming can be taken care of in the other methods which are utilizing the stored heat energy received from sun to be converted into electricity when required. The simplest method is to use the stored heat to produce steam which, in turn, is used to run turbines. The third methodology is a combination of these two technologies.

Two of the World's largest photovoltaic power stations are in India. The first is Bhadla Solar Park in Jodhpur, Rajasthan spread over an area of 57 sq kms with an installed capacity of 2,245 GW, and the second is at Pawagada in Tumkur, Karnataka spread over 53 sq kms and which has an installed capacity of 2,050 GW. Some of the other major photovoltaic power stations in India are at Kurnool, Andhra Pradesh (1,000 GW); NP Kunte, Andhra Pradesh, (900 GW); Rewa, Madhya Pradesh (750 GW); Charanka, Gujarat (690 GW); Kamuthi, Tamil Nadu (648 GW), Ananthpuram, Andhra Pradesh (400 GW) and Mandsaur, Madhya Pradesh (250 GW).

Production of electricity by the other methods has not yet taken off in India. The installed capacity of solar thermal plants is barely about 200 MW. Technology is not difficult but its commercial exploitation is taking time. At present, therefore, it is the photovoltaic power plants which are producing electricity from solar energy. But such plants require land and land is not only expensive in India, its acquisition is difficult. Dedication of land for installation of solar plants will have to compete with other needs. In addition to the utilization of waste lands, the other alternatives are the use of water surface over canals, lakes, reservoirs, farm ponds, and even sea for large solar power plants. These water bodies can also provide water to clean the solar panels. Railways and highways can also be used for generating solar power while avoiding the cost of land. Indian railways recently announced a plan in January 2019 to generate 4 GW of solar power by deploying solar panels along the rail tracks. Solar power generated by road areas may also be used for in-motion charging of electric vehicles. India is a densely populated country with large cluster of houses interspersed with tall building in most

urban pockets. The architecture, therefore, best suited for India would arguably be the capacity utilization of rooftop power generation connected via a local grid. Even the outer surface areas of tall buildings can be used for solar photovoltaic power generation. India can turn its densely populated urban pockets to its advantage.

Power generation from solar energy, which India is richly endowed with, is relatively cheaper than that produced by fossil fuels. As the technology advances it will become still more economical and available round the clock. Nuclear energy being not so safe, with Chernobyl and Fukushima immediately coming to mind, solar energy is the future. Moreover, if the emission of GHG is not cut down drastically and global warming contained, many low-lying coastal areas of the world, including those of India, run the risk of getting inundated, besides inviting severe other ecological disasters.

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