

# **PARIS AGREEMENT ON CLIMATE CHANGE – Signal for the End of Primacy of Fossil Fuels and Ushering in of Era of Internet of Things for Sustainable Economic Growth**

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*[Abstract: The Paris Agreement on climate change among 196 countries is the culmination of international negotiations on mitigating the effects of climate change owing to the emission of greenhouse gases arising from the use of fossil fuels as well as industrial processes. The Agreement, which was signed after 20 years of negotiations, signals the end of more than 100 years primacy of fossil fuels in the energy sector and of economic growth, giving way to renewable resources like solar energy, wind energy, etc. This change will lead to Internet of Power, which when meshed with the Internet of Communications will result in Transportation and Logistics Internet. Finally, these three internets will build-up as the Internet of Things platform, wherein all economic processes will exchange information with one another. The Internet of Things infrastructure in a carbon free world will spur sustained economic growth by reducing disparities and increasing employment potential for decades to come. At the Paris Meet, India had committed to generate 40% of its electricity from non-fossil energy by 2030. In line with its commitment, India is not only making efforts to accomplish the same, but has also started a national mission to make the country a digital powerhouse, thus paving the way for the next stage of industrial revolution—the Internet of Things.]*

Since at least the 19<sup>th</sup> century, scientists have been theorizing about the role of greenhouse gases, chiefly carbon dioxide (CO<sub>2</sub>), and have pointed out that the warming effect will increase alongside the atmospheric greenhouse gas concentrations. For the past few decades, scientists have been taking measurements to establish a relationship between current carbon levels and temperatures. According to the reported measurements, rising greenhouse gas emissions—resulting from the use of fossil fuels as well as industrial activities—lead to higher temperatures. Global warming has been on the rise with a spike in 1998 after which temperatures were lower but still warmer than previous decades that led some skeptics to claim that the world is cooling. Since 1998, global temperatures have risen at a slower pace than they did in the previous 30 years, and skeptics have seized this as evidence that global warming has paused. But, the important aspect is

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that global temperatures have neither fallen nor stalled—they have continued to rise. Besides, considering the complexities of weather systems, variations in heating rates are not unexpected. For the past two years, the rate of warming seems to have accelerated again.<sup>1</sup>

Global negotiations on climate change have been going on for more than two decades. In 1992, heads of governments met in Rio de Janeiro and worked out the United Nations Framework Convention on Climate Change (UNFCCC). It is still in force, calling upon governments to take action to avoid dangerous climate change. During the first five years, governments wrestled with one another over what each should do, and what should be the roles of developed and developing countries. These efforts resulted in Kyoto protocol in 1997. The pact required that governments take action to reduce emissions by 5% by 2012 against the backdrop of 1990 levels, and each developed country was given an emission reduction target. However, developing countries, including rapidly developing economies were given no targets and thus were free to increase their emissions at will. Juridicially, the protocol could come into force only when countries representing 55% of global emissions had ratified it. The U.S., then the largest emitter, did not ratify the protocol. As a result, it remained inoperative and negotiations stalled for the next few years. But, in 2004, Russia suddenly ratified the protocol to garner Europe's support for its WTO membership application, thus bringing the protocol into force. However, the US remained firmly outside Kyoto and yearly negotiations among State Parties made no headway. Hence, a new approach was needed to bring in the US as well as major developing economies like China (having become the biggest emitter) in order to push them to contain their emissions. In 2007 at Bali, an action plan for a new agreement was worked out that would overtake the Kyoto protocol. Resultantly, at Copenhagen, all of the developed and the major developing countries of the world agreed—for the first time—to the binding limits on their greenhouse gas emissions. However, the limits agreed upon were short of meeting scientific advice.

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<sup>1</sup> Harvey, F. (2015), 'Everything You Need to Know About the Paris Climate Summit and UN Talks,' *The Guardian*, November 20. Available at: <http://www.theguardian.com/environment/2015/jun/02/everything-you-need-to-know-about-the-paris-climate-summit-and-un-talks>

Nevertheless, at Copenhagen, the much desired forward movement had taken place minus a formal treaty and yet targets that were signed continue to stand.<sup>2</sup>

Scientific advice calling for urgent action to discuss the impact of climate change is becoming shriller by the day—forcing nations to further revise their commitments. Climate scientists report that the global atmospheric concentration of CO<sub>2</sub>, which has been in the range of 180 to 300 parts per million (ppm) for the past 650,000 years, has risen from 280 ppm just before the onset of industrial era to 400 ppm in 2013. The atmospheric concentration of methane and nitrous oxide (the other two powerful global warming gases) are showing steep trajectories. At the Copenhagen Summit in 2009, the EU proposed that worldwide, nations must limit the rise in earth's temperature to 2°C. But, scientifically speaking, the recommended limit will take us back to earth's temperature several million years ago with devastating consequences to ecosystems and human life. Nevertheless, EU's advice was ignored. As a result, the sharp rise in the use of carbon-based fuels has pushed up the atmospheric levels of CO<sub>2</sub> far more quickly than previously estimated that the temperature on Earth will rush past the 2°C target and soar by 4°C by the year 2100—the temperature not seen on earth for millions of years. It may be recalled that humans appeared only 19500 years ago. The adverse consequences of the rise in temperature have already been experienced in ecosystems around the world in the form of bitter winter snow, dramatic spring storm and floods, prolonged summer drought, melting of mountain glaciers, and a rise in sea levels. The only hope is to reduce the current concentration of CO<sub>2</sub> in the atmosphere from 400 ppm to 350 ppm or less.<sup>3</sup>

Under the weight of such scientific advice on the eve of the Paris Summit in December 2015, world's biggest carbon emitters revealed their commitments. Compared to the 1990 emission levels, the EU has committed to cut its emissions by 40% by 2030. The US will cut its emissions by 26% to 28%, compared with 2005

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<sup>2</sup> *Ibid.*

<sup>3</sup> Rifkin, J. (2015), 'How the Third Industrial Revolution will Create a Green Economy,' *The Huffington Post*, November 10. Available at: [http://www.huffingtonpost.com/entry/third-industrial-revolution-green-economy\\_b\\_8286142.html?section=india](http://www.huffingtonpost.com/entry/third-industrial-revolution-green-economy_b_8286142.html?section=india)

levels, by 2025. China has committed to peak its emission by 2030. Besides, nations responsible for 90% of global emissions have come up with their own targets known as Intended Nationally Determined Contributions (INDCs) with varying degrees of contribution. According to INDC, emission reduction targets have been split between developed and developing countries: while developed countries are expected to offer deeper cuts in emissions, for developing countries there is a range of targets which include limits on emissions compared to 'business as usual,' and pledges to increase low-carbon energy or preserve forests.<sup>4</sup> India has pledged to reduce the emission intensity of its GDP by 20% to 25%, compared to 2005 levels, by 2020. By 2030, the target for reducing the emission intensity of its GDP will be 30% to 35% from 2005 levels. India will create an additional carbon sink of 2.5 to 3 billion tonnes of CO<sub>2</sub> equivalent through additional forest cover. Besides, it has committed to achieve 40% cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030.<sup>5</sup>

The Summit concluded in December 2015, with 196 countries adopting the first ever universal, legally binding global climate deal. The Agreement sets out a global action plan to put the world on track in order to avoid dangerous climate change by limiting global warming to well below 2°C.

The Agreement is set to come into force in 2020. The key elements of the Agreement include Mitigation, Transparency, Adaptation, Determination of loss and damage, and, Support from developed countries.

### **Mitigation: Reducing Emissions**

*Governments agreed:*

- To decide on a long-term goal of keeping the average global temperature increase well below 2°C above pre-industrial levels;

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<sup>4</sup> *Op cit.* 1

<sup>5</sup> UNFCCC (2015), 'India's Intended Nationally Determined Contribution: Working Towards Climate Justice.'

- To limit the increase to 1.5°C to significantly reduce the risks and impacts of climate change;
- On the need for global emissions to peak as soon as possible, while recognizing that this will take longer for developing countries; and,
- To undertake rapid reductions thereafter in accordance with the best available science.

Both before and during the Conference, countries submitted comprehensive national climate change action plans (INDCs). These pledges are not enough to keep the global warming level below 2°C to 3°C and thus not quite enough to meet scientific advice. But the Agreement traces the way to achieve this target since one of its key components is the review of emission targets every five years in order to ratchet up emission cuts.

### **Transparency and global stocktake**

*Governments agreed to:*

- Come together every five years to set more ambitious targets as required by science;
- Report to each other and the public on how well they are doing to implement their target; and,
- Track progress of long-term goals through a robust transparency and accountability system.

### **Adaptation**

*Governments agreed to:*

- Strengthen society's ability to deal with the impacts of climate change; and,
- Provide continued and enhanced international support for adaptation to developing countries.

### **Loss and damage**

*The agreement also:*

- Recognizes the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change; and,
- Acknowledges the need to cooperate and enhance the understanding, action and support in different areas such as early warning systems, emergency preparedness and risk insurance.

### Support

- The EU and other developed countries will continue to support climate action to reduce emissions and build resilience to climate change impacts in developing countries;
- Other countries are encouraged to provide or continue to provide such support voluntarily; and,
- Developed countries intend to continue their existing collective goal to mobilize USD 100 billion per year until 2025 when a new collective goal will be set.

**Outside the UN Action Agenda:** A complementary approach is to put in more effort to bring down emissions outside the UN process. For instance, ‘non-state actors’ such as cities, local bodies and businesses can be engaged to do more. The initiative has come to be recognized as Lima-Paris Action Agenda, a joint undertaking of the Peruvian and French COP Presidencies.<sup>6</sup>

The Paris Agreement has come about at a time when global economy is slowing, productivity is waning and unemployment remains stubbornly high in all countries. At the same time, economic inequality is deepening, so much so that in the current year (2016) the 62 richest individuals in the world hold as much wealth as the poorest half of the human race.<sup>7</sup> Unless the Paris Agreement includes within itself a future assessment mechanism to take care of these issues, the Co<sub>2</sub> emission benchmarks will be perceived as punishments that will only serve to further constrict the economies. Now that all countries have agreed to reduce emissions, the

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<sup>6</sup> European Commission (2016), ‘Paris Agreement,’ Climate Action. Available at: [http://ec.europa.eu/clima/policies/international/negotiations/paris/index\\_en.htm](http://ec.europa.eu/clima/policies/international/negotiations/paris/index_en.htm)

<sup>7</sup> Whiting, A. (2016), ‘Richest 62 People Own Same As Half World’s Population – Oxfam,’ *Reuters*, January 18.

Agreement should include a new economic paradigm that can increase productivity, create new economic opportunities and put people back to work, and, ensure a more vibrant and sustainable society, while allowing for technological change of economies from carbon-based energies and technologies to renewable energies. On a careful combing of the Paris Agreement it appears that it is meant to signal the beginning of the end of more than 100 years dominance of fossil fuel as the primary driver of economic growth.<sup>8</sup>

Transitioning out of fuel-based power will be effective if Energy Internet—comprising five fundamental pillars which have to be phased-in simultaneously—is brought out. For this purpose:

1. Buildings and other infrastructure will need to be refurbished and retrofitted to make them more energy efficient so that renewable energy sources such as solar, wind, etc., can be installed to generate power for immediate consumption or for delivering it back to the electricity grid as compensation.
2. Ambitious targets must be set to replace fossil fuel with clean renewable energy to encourage early adopters to transform buildings and properties into micropower generation facilities.
3. Storage technologies including hydrogen fuel cells, batteries, water pumping, etc., will need to be embedded into local generation sets across the electricity grid to manage both the flow of intermittent green electricity and the stabilisation of peak and base loads.
4. Advanced metres and other digital technologies will need to be installed in every building to transform the electricity grid from servo-mechanical to digital connectivity in order to manage multiple energy sources flowing to the grid from local generators. The distributed smart electricity infrastructure will enable passive consumers of electricity to become active producers of their own green electricity, which they can then use off-grid to manage their facilities or sell back to the Energy Internet.

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<sup>8</sup> Worland, J. (2015), 'What to Know About the Historic 'Paris Agreement' on Climate Change,' *Time*, December 12.

5. Every parking space will need to be equipped with a charging station to allow electricity and fuel cell vehicles to secure power from Energy Internet as well as to sell back power to the electricity grid. Also, millions of electric and fuel cell vehicles connected to the Energy Internet will provide a massive back up storage system that can send electricity to the grid during peak demand when the price of electricity has spiked. This will enable vehicle owners to receive compensation for contributing electricity to the network.

The phase-in and the integration of the above five pillars shall transform the electricity grid from a centralized to a distributed electricity system, and, from fossil fuel to renewable energy. In the new system of Energy Internet every business, neighbourhood and home owner will become a producer of electricity, sharing his/her surplus with others across national and continental land masses.

The meshing up of Communication Internet and Energy Internet makes possible the buildout and scale up of the automated transportation and logistics internet. The convergence of these three internets constitutes the Internet of Things (IoT) platform for managing, powering and transporting goods in what has been termed as Third Industrial Revolution Economy.<sup>9</sup>

The IoT platform has demonstrated that not only does productivity get a tremendous boost with of the use of renewable sources of energy at zero marginal cost, but also it reduces the marginal cost of each shipment.

In a fully digitalized economy, extreme productivity, triggered by the optimization of efficiency agreement in the managing, powering and moving of economic activity decreases the amount of energy necessary to produce, store and distribute material, resources and labour as well as logistics necessary to produce, store, distribute, consume and recycle economic goods and services at near zero marginal cost. Thus, carrying out of the Paris Agreement will be perceived as a goal

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<sup>9</sup> Rifkin, J. (2015), 'The Rise of the Internet of Things and the Race to a Zero Marginal Cost Society,' *The Huffington Post*, November 10.

post in the journey towards a more prosperous and sustainable future—the era of low carbon economy.<sup>10</sup>

For establishing IoT, communication networks will have to be upgraded with the inclusion of universal broadband and free Wi-Fi. Energy infrastructure will need to be transformed from fossil fuel into renewable energy. Millions of buildings will have to be retrofitted and equipped with energy harvesting devices and converted into micropower plants. Hydrogen and other storage technologies will have to be woven into each layer of the infrastructure to secure intermittent renewable energy. Electricity grids will have to be converted into a smart digital Energy Internet to accommodate flow of energy produced by millions of green micropower plants. Simultaneously, transportation and logistics sector will have to be digitalized and transformed into an automated GPS-guided vehicle running on smart roads and railway systems.

Thus, as the implementation of the Paris Agreement calling for reducing the dependence on fossil fuels progresses, the accompanying activities will help develop the IoT which will require significant amount of public and private funds. The digital world will have to be phased-in, say, in a span of forty years, i.e. over two generations. Establishment of infrastructure for the digital world and the process of build-up of IoT infrastructure will necessitate the active engagement of virtually every government, every commercial sector, spur commercial innovation, promote small- and medium-sized enterprises and employ millions of workers over the period. Semi-skilled, skilled, professional and knowledge workers will need to be employed across every region of the world to construct and service the three Internets that make up the digital platform of the Third Industrial Economy. Transforming the fuel-based economy from fossil fuel to renewable energy is obviously labour intensive and will require millions of workers and spawn new businesses over the entire range of activities that will take place from converting industrial establishment into mini power plants to the converting the entire grid into green grid. Additionally, activities, jobs and businesses will be ‘created’ in relation to

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<sup>10</sup> Rifkin, J. (2015), ‘How an Integrated Eurasian Market can promote Biosphere Consciousness and Digital Entrepreneurialism,’ *The Huffington Post*, September 11.

the development of infrastructure for Internet of Logistics and Transportation. The massive build-up of IoT for a Third Industrial Revolution in every locality and region of the world will spur an extended surge of salaried labour for many decades.<sup>11</sup>

The IoT described above will come about with investments in research and development. The investment will come from public and/or private sectors which need to be mobilized. From the foregoing it is apparent that if the implementation of the Paris Agreement on climate change brings about the primacy of a decentralized power generation system using renewable energy which can bring about Internet of Power and which will finally culminate into the IoT platform.<sup>12</sup> The development process will be democratized, leading to narrowing down of inequalities and increase in employment opportunities in the following decades along with the lowering of carbon footprints. Since the world will be looking for massive investments, developed countries, under the Paris Agreement, have committed to mobilize 100 billion dollars per annum and more to support climate adaptation and mitigation in developing countries for years to come.

The falling of tariffs of renewable energy to an unprecedented low has already given boost to capacity addition for this segment in large economies like China and India.<sup>13</sup> India has already taken various measures aimed at increasing the share of renewables in electricity generation by up to 40% and further planning with regard to the use clean technologies in coal based power plants is underway. India has two ongoing programmes: (i) the Digital India programme to transform the country into a digitally empowered society and knowledge economy, and (ii) the Jawaharlal Nehru National Solar Mission, which aims at adding 20,000 MW of grid connected solar power by 2022. Therefore, while the meshing of Internet of Power and Internet of Communication seems a possibility in the near future, the IoT platform will soon become a reality.

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<sup>11</sup> *Ibid.*

<sup>12</sup> Ramesh, M. (2016), 'Solar Power Tariff Touches New Low of Rs. 4.34/Unit,' *Business Line*, January 20. Available at: <http://www.thehindubusinessline.com/news/solar-tariffs-fall-to-rs-434/article8123480.ece>

<sup>13</sup> *Ibid.*