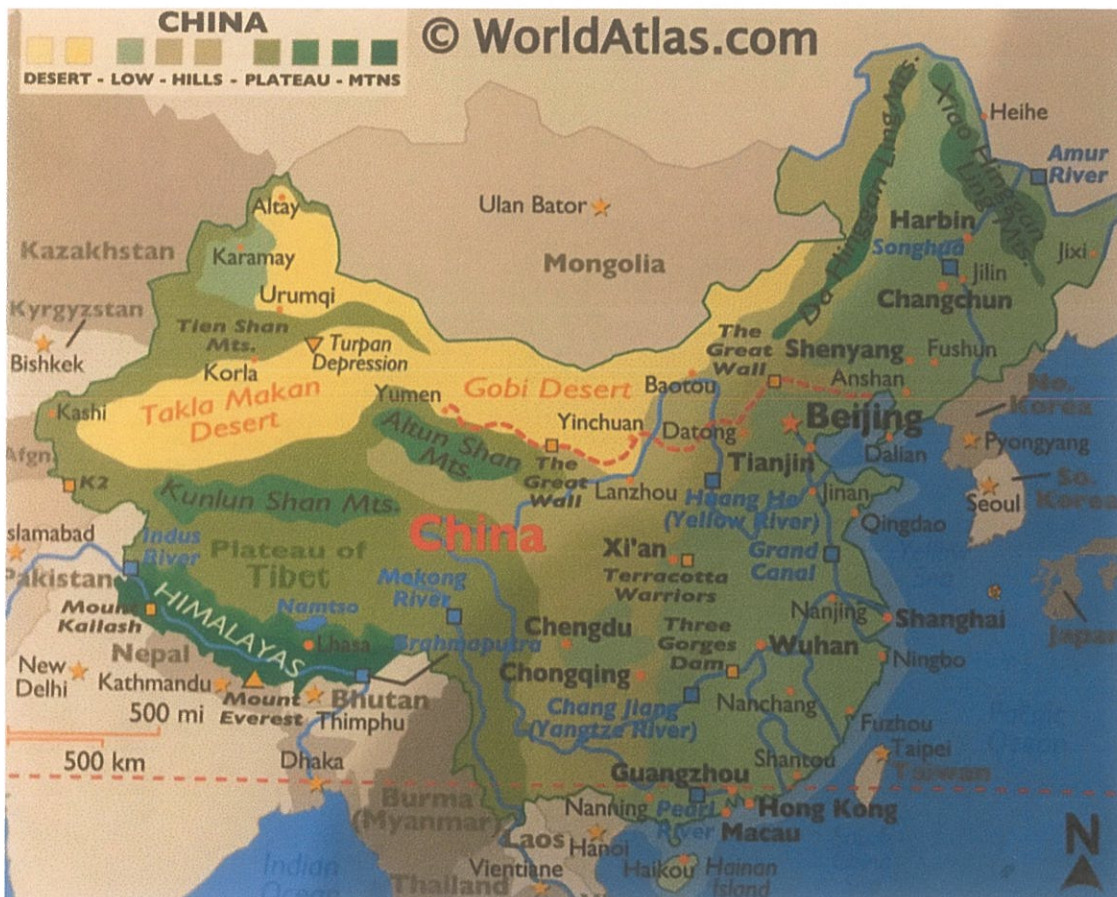


China - Zero Emissions Climate Action Plan

By Dr. Hari Lamba

(Proposed)



Proposed in Book, “Brighter Climate Futures – A Global Energy, Climate & Ecosystem Transformation,” Dr. Hari Lamba, Regent Press, Berkeley, California, USA, September 2020. www.brighterclimatefutures.com. Image: WorldAtlas.com, Copyright of Proposal © Harinder (Hari) Lamba 2020. Feel free to print this document or distribute electronically (unlimited). When you mention its contents, please reference this document or the above book.

China Climate Update

Supplement to the Proposed China Climate Action Plan, October 23, 2021

The biggest action that can occur that will lead to the success of COP 26 is for China (and the rest of the world) to agree to start immediately transitioning out of COAL !

After the attached proposal was written as part of my book, the Chinese president had agreed to peak their carbon emissions by 2030. Afterwards, he said that China would peak its emissions before 2030 and then aim at becoming carbon neutral by 2060.

But China, like the rest of the world, needs to start reducing its greenhouse gas emissions immediately!! It has had 30 years since 1992 to increase its use of fossil fuels, so that in 2017, its total emissions were 28% of the world total, and its per capita emissions of 8 tons of carbon dioxide equivalent (TCO₂e) were about the same as that of the European Union. So, it has had enough time and now needs, like the rest of the world, to transition out of fossil fuels.

There are several reasons why it makes good sense for China to adopt something like the Proposed Climate Action Plan that follows or something of that magnitude!

First, it makes **ECONOMIC** sense. Solar energy is much cheaper than coal and so can deliver more energy at less cost. And China as the largest producer of low-cost Solar PV (photo-voltaic) panels can easily do this and it will be good for its industry. It can also store large amounts of renewable energy in battery systems and in green hydrogen (where it is doing well already), which again helps its economics and energy sufficiency.

Second reason is the **HEALTH** of its population. Coal is resulting in a very high level of air and water pollution. Major parts of China essentially often become like a gas chamber that hurts the health of its population in a big way.

The third reason is to **DISASTER PROTECTION** by not suffering from devastating worsening climate related natural disasters that it is increasingly suffering from (like the rest of the whole world).

It took hundreds of millions of years of dense coniferous forests to get buried in order to form the coal seams, By sequestering carbon in the ground, the atmosphere cooled and life became favorable for our species and life as we know it.

Note: For piecharts, the column on the right items start at the 12 O'Clock position and go clockwise. For proposed plan, Coal is zero at the top, and Renew Storage at top left.

The Proposed Energy, Climate & Ecosystem Transformation Plan For China

Current Situation for China

China has already begun to suffer from the effects of Climate Change with temperature rises, massive floods, cyclones hitting the coast and the damage to agriculture. The rain was about 1.8% higher in 2017 than in previous years. The Tibetan Plateau has suffered from temperature increases that are about four times faster than elsewhere. In 2017, the annual average atmospheric concentration of gases measured at the Wanlinguan Station were 404.4 parts per million (ppm) for carbon dioxide, 190.7 parts per billion (ppb) for methane and 329.7 ppb for nitrous oxide. Chinese citizens have begun to recognize and understand the impact of Climate Change, understand the need for personal actions to reduce their carbon footprints, and are generally supportive of fiscal and taxation policies to solve the problem.

Rising sea level can be devastating for China as even a one meter rise in sea level will have a massive effect on the coastal cities of Shanghai, Tianjin and Guangzhou, and would displace an estimated 67 million people. The effect of drought and floods have been increasing in severity with damage to natural environment, infrastructure and agriculture, that worsen living conditions and poverty. In North China, with increasing temperatures and evaporation there is increased drought and water shortage. Although southern China gets more rainfall, the water flows away in floods, and generally water shortage issues are a concern for all of China. Then there are the

bad effects on human health due to increases in infectious diseases such as diarrhea and cholera, the destruction of ecologically vulnerable areas and the increase in poverty of the populations living in these areas. Glaciers in the northwest part of China are melting and will be increasingly threatened by Climate Change.

The much higher levels of soot and smog have had a damaging effect on air quality in China with very bad effects for human health. The government has done much to try and reduce pollution of particulates (like smoke) and sulfur dioxide (that also causes acid rain), but the levels of ozone pollution have increased from cars, factories and power plants. However, after a slight decrease in the 2015-2017 period, coal use has expanded again. With China basing most of its progress on coal to produce electricity in power plants, the air quality in most regions of China has become very unhealthy. All of this, together with increasing temperatures, will worsen the air's effect on human health, and is leading to increased deaths from pollution. China has suffered severe impacts because of Climate Change by the way of melting glaciers, overflow of glacial lakes, decrease in the water of major rivers, rising sea levels (affecting the big coastal cities like Shanghai and Hong Kong), sinking of land in Shanghai, loss of biodiversity, and worsening natural disasters. ^[42]

China's Greenhouse Gas Emissions and Current and Projected Energy Use

China is the largest consumer and producer of coal in the world, and its share of coal in its energy consumption declined in 2010 from 80% to about 60% in 2017 (close to the percentage shown in the pie chart below). In this period, imports rose to make up for decrease in domestic production and new coal fired power plants were constructed to meet the increasing electricity demand. As of 2018, about 260 GW (gigawatts) of coal power plants were under construction, and China was building coal power plants in other countries. China's coal production went from about 1,000 million metric tons (Mmt) in 1990, to about 1,500 Mmt in 2000 and then shot up to about 3,500 Mmt by about 2011. As of 2018, its domestic production was 3,550 Mmt, imports were 295 Mmt (mainly from Indonesia and Australia), and total coal consumption was 3,845 Million Metric Tons. In 2014,

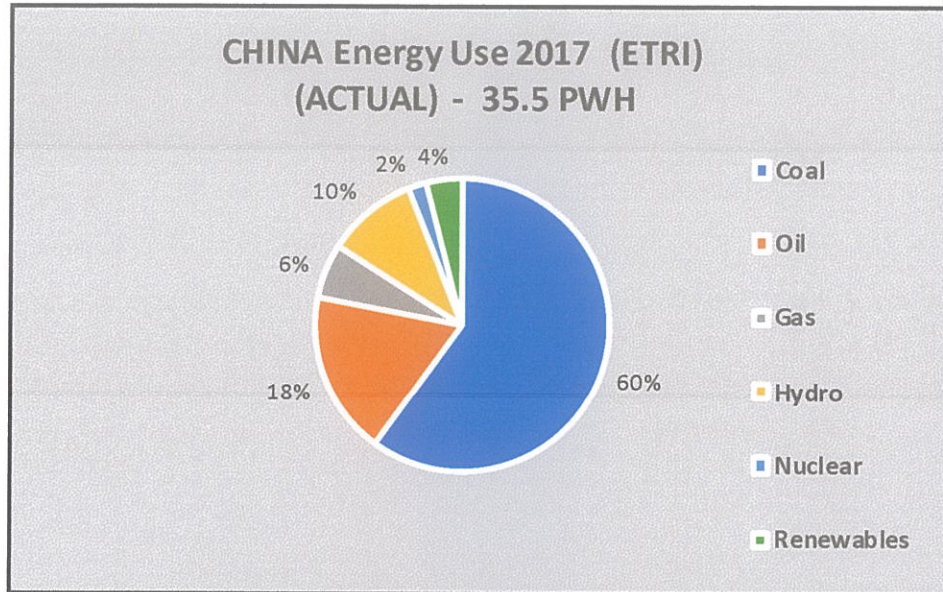
the installed capacity for coal based electric power production was 907 GW (Giga Watts) or about 77% of its total electric generation capacity. As coal power plants do not run at full capacity, the electrical energy produced may be less than that indicated by capacity.

Most of the coal used by industry is in the making of steel. Although coal is not allowed to be used in cities, rural areas use coal for domestic consumption (mainly cooking), which leads to very high levels of indoor air pollution and severe health problems among the rural population. The burning of coal emits arsenic, fluorine, aromatic polycyclic hydrocarbons and mercury. Severe arsenic poisoning, skeletal fluorosis (about 10 million people suffering from it), esophageal and lung cancers, and selenium poisoning, are some of the severe health problems that result. A World Bank study had revealed that air pollution, mainly from coal but also from car exhausts, leads to about 750,000 deaths every year. **Most importantly for Climate Change, because of coal, China has become the largest emitter of carbon dioxide, emitting about 25% of the whole world's emissions. This amount does not include carbon dioxide emissions from coal mine fires (often from abandoned mines) that are estimated to add about 360 million metric tons of carbon dioxide.**

China's oil consumption has been high also, and the consumption of natural gas has been growing. China has taken significant action in renewable energy, reaching about 4% of its total use by 2017. See below for the total energy consumption of China in 2017 as a pie chart. China has also engaged in a significant level of reforestation activity.

For emissions, from 3,300 MTCO_{2e} (million metric tons of CO₂, carbon dioxide, equivalent), its greenhouse gas emissions increased to about 5,100 MTCO_{2e} by the year 2,000, to 10,900 MtCO_{2e} by the year 2010, and on to a higher 12,800 MtCO_{2e} by 2015 (ClimateTracker information). Its emissions were close to 15,000 MtCO_{2e} by mid 2019. **So, while its emissions increased by about 50% from 1990 to 2000, during the that period 2000-2019, its emissions have TRIPLED or had gone up by about 300% and are essentially double the US emissions of 6,670 MtCO_{2e}.**

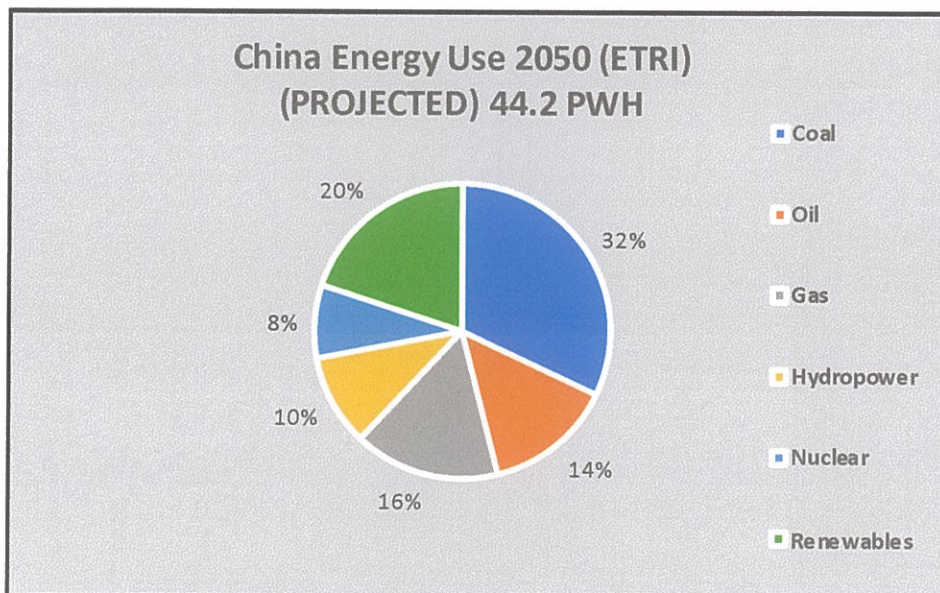
Current Projections by an Energy Institute (ETRI) for 2050 are shown next after the 2017 pie chart. Based on the China National Petroleum Corporation's Energy and Technology Research Institute (CNPC-ETRI) report the 2017 total energy consumption was as shown on the following page. ^[43]



CHINA'S ENERGY CONSUMPTION IN 2017

China's Energy Consumption in 2017. As can be seen, this was met about 60% by coal, 18% by oil and 6% by natural gas, or about 84% by fossil fuels. Renewable energy, although small at 4% was growing rapidly. The total energy use of 35.5 PWH (Peta Watt Hours or 10E15 watt hours, or 3,050 Million Metric Tons of Oil Equivalent) was higher than that of the US, which was 28.8 PWH.

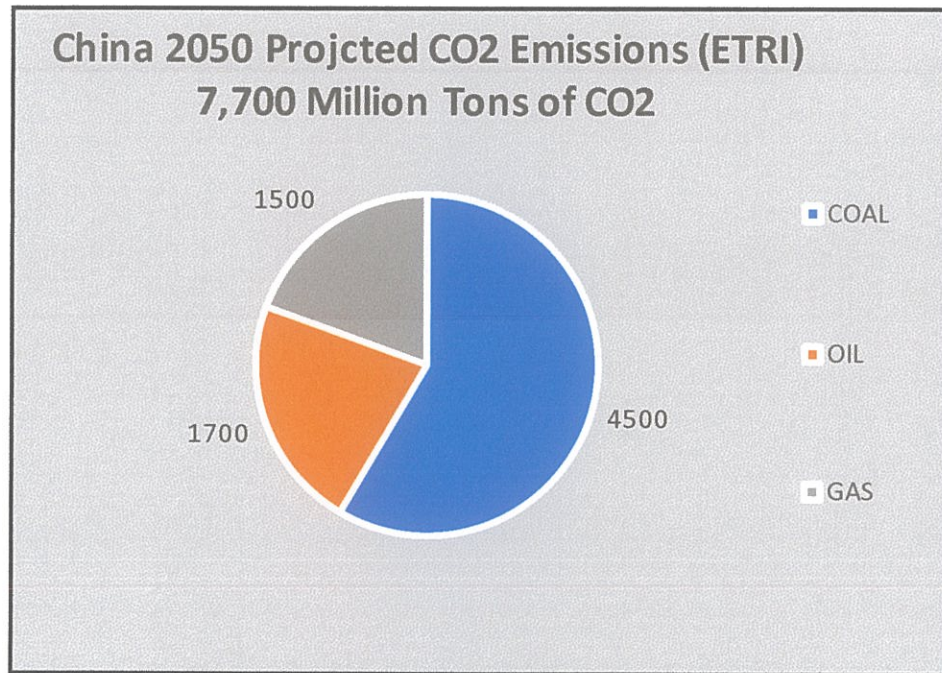
The projected energy consumption for 2050 is as follows:



CHINA'S ENERGY CONSUMPTION PROJECTED FOR 2050

As can be seen, this is projected to be met about 32% by coal, 14% by oil and 16% by natural gas, or about 62% by fossil fuels.

Renewable energy (mainly solar and wind) grows to about 20%. The total energy use of 44.2 PWH (Peta Watt Hours or 10E15 watt hours), will grow from the 2017 energy use of 35.5 PWH, but the Carbon dioxide emissions would still very high at 7,700 Million metric tons of CO₂, driven a lot by a high coal use. This is shown in the following pie chart.



CHINA CO₂ EMISSIONS PROJECTED FOR 2050

If this happens then the Global Climate Change goals of 1.5C for the world will not be met!

We now present the Plan for China, that will be much better for China and for the world.

Energy, Climate and Ecosystem Plan for China

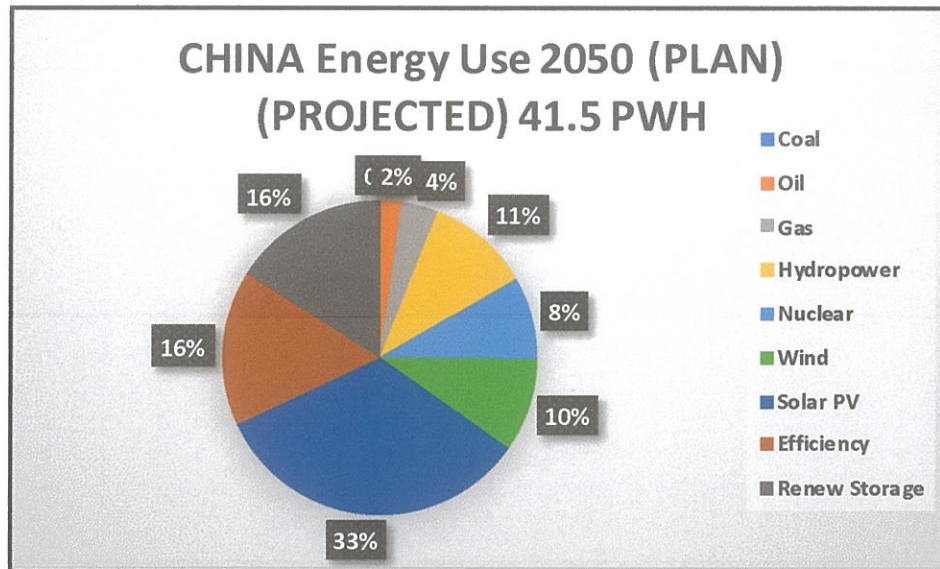
The Plan for China to achieve the above is as follows:

- 1.** China as per its INDC, Intended National Determined Contributions for the Paris Agreement, said that its greenhouse gas emissions would peak by 2030, and committed to reducing its emission only after that. Instead, the Plan is calling for its emissions to start reducing immediately – as it has had since 1992 to increase its emissions for development.
- 2.** Energy use of China will GROW from 35.5 PWH (petawatt Hours) in 2017 to 44.2 PWH by 2050, the same as projected by their ETRI. All of it will be renewable energy.
- 3.** ALL of the coal fired and natural gas electric power plants will be REPLACED by a combination of renewable energy (mainly solar PV) and battery storage power plants, with evening night power provided initially by small natural gas plants and later by storage fuel power plants. It will benefit as it is the largest and lowest cost producer of solar panels.
- 4.** ALL coal use in Industry will be **replaced** by electrification and storage fuels, and the added electricity generated by renewable energy (mainly solar PV). Eliminating coal will get rid of the polluted air that the Chinese people are suffering from. They do not need it when clean solar energy is available.
- 5.** ALL oil use in transportation will be transitioned to electric cars and storage fuel vehicles by developing solar-electric highways, with the sale of fossil fuel cars stopping by 2030, and all fossil fuel cars (about 200 million currently) replaced by electric cars and storage fuel cars by 250.
- 6.** China will need to engage in the technical and infrastructure programs to electrify its industry, transportation, and buildings, and produce the added electric power with use of renewable energy (mainly solar PV), and expand its electricity production 4-5 fold.
- 7.** China will participate in an advanced RDD&D (Research, Development, Demonstration and Deployment) consortium for the development of Green methods that use renewable energy to produce and use “storage” fuels like ammonia

and hydrogen. Already it is doing much research, but it needs to proceed to practical application. It also needs to proceed to develop the means of storing, transporting and using storage fuels.

- 8.** China has done well with High Speed Rail development along its eastern coast. It now needs to expand this in all directions going westwards, so as to replace much of the airline traffic to the interior, and reduce its air travel to the interior.
- 9.** China has done a massive job in terms of reforestation. As part of the Global Plan to add 1 billion hectares (Chapter 6), China needs to bring the total to 80 additional million hectares (40 million hectares for temperate forests and 40 million hectares for tropical forests). However, it needs to pay more attention to biodiversity and the needs of and control by local communities that already live in these areas.
- 10.** China needs a massive program for coastal ecosystems along its entire east coast (14,500 kilometers or about 9,010 miles from the Gulf of Bohai in the north to the Gulf of Tonkin in the south) along the lines of the global Blue Carbon Initiative and add mangrove swamps, salt marshes and sea grasses. China's coastal ecosystems are under attack, and since the 1950s, its coastline has lost 57% of its coastal wetlands, 73% of its mangrove cover and 80% of its coral reefs. China needs to go beyond restoration to a massive re-introduction and replanting of its coastal ecosystems.
- 11.** China needs to use all of the financing outlined in chapter 9 to fund its Climate Change transition. Aside from damage to Climate Change, it has been estimated that China needs to apply a tax of about 23% on the price of coal, to make up from losses to its economy (health, pollution, etc.) that are estimated to be as much as 7% of its GDP.
- 12.** China then needs to cooperate with and collaborate with the rest of the world through the UNFCCC process and otherwise, so that the global Climate Change action plan can succeed. US and China should cooperate in this process to help the rest of the world, even as they aggressively implement their own plans.

The Plan proposes the following energy strategy for China.



CHINA ENERGY USE PROJECTED FOR 2050 BY THE PLAN

Instead of 44.2 PWH, the Plan shows that 41.5 PWH could be achieved – still a big growth from 2017. Hydropower and nuclear are the same as projected by ETRI above. Fossil fuels go down to about 6% of the total, wind power going to a large part of China’s wind availability, solar PV expanding to be about 33% of the total, efficiency at about 16%, and energy through renewable energy based storage fuels contributing about 16% also. This will meet all of China’s energy needs and carbon dioxide emissions from fossil fuels will be down to very low levels.

As for the rest of the world, non-carbon storage fuels will be needed that can be produced with renewable energy. China has already done research on these fuels, and is engaging in research and development to develop the use of these fuels. As global RDD&D (Research, Development, Demonstration & Deployment) on storage fuels makes progress as per the Global Plan, then these fuels will become available, and China can use solar PV electric power to produce these fuels or import them as it imports oil and natural gas today. These fuels, like hydrogen and ammonia, will also replace gasoline (petrol) and diesel as automotive fuels.

Being the biggest nation of East Asia and one that has developed good financial and technical resources, China should cooperate with the other nations of east Asia, some of which have similar

capabilities, to help the nations of the region meet their plans and help implement the Global Plan. China should modify its planning, get rid of coal and switch totally to renewable energy. That will be good for its health and economy. If it does not do that, and India does the same, the climate crisis will not be solved.

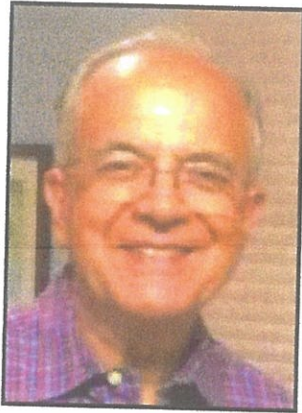
[42] "Climate Change Impacts on China Environment: Biophysical Impacts," Elisa Chih-Yin Lai, February 2009, Wilson Center. https://www.wilson-center.org/sites/default/files/media/documents/publication/climate_biophysical1.pdf

[43] "World and China Energy Outlook 2050 – 2018 Version," CNPC, ETRI, China National Petroleum Corporation, 2018.

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ABOUT THE AUTHOR



The author Dr. Harinder (Hari) Singh Lamba, has experience in engineering, business and ecology. He has a Ph.D. in engineering from the University of Illinois at Urbana-Champaign, with about 40 years of experience in industry, both in engineering product development and in advanced technology. He migrated from India to the USA in 1970 with a bachelor's degree in Aeronautical Engineering. He was one of the founders of the

Earth Summit Network, an informal organization formed in Chicago in 1991-92 to educate the local public about the Earth Summit, or the United Nations Conference on Environment and Development (UNCED) that was held at Rio de Janeiro, Brazil in 1992, where the original global warming treaty was signed. Since then he has been active in non-profit groups, talking about and making presentations on Climate Change.

Through his volunteer work and through self-education, he has also developed a good understanding of environmental (ecological), developmental (technical, economic, industrial and financial) and political (democracy) issues. **Because of his background, he has the unique ability to understand all aspects of the Plan and its solutions needed in energy, climate, economic development and ecosystems.** He has published a number of technical engineering papers and has technical patents. He is the author of a number of books including, "Rethinking Progress – Towards a Creative Transformation of Global Society," and a "Personal Climate Change Handbook," 2016, a 40 page book that is available on Amazon. ~~See below for a list of the author's books.~~ The author's aim in this activity is to see the Plan accepted, and something like the Plan implemented globally in a timely and effective manner.