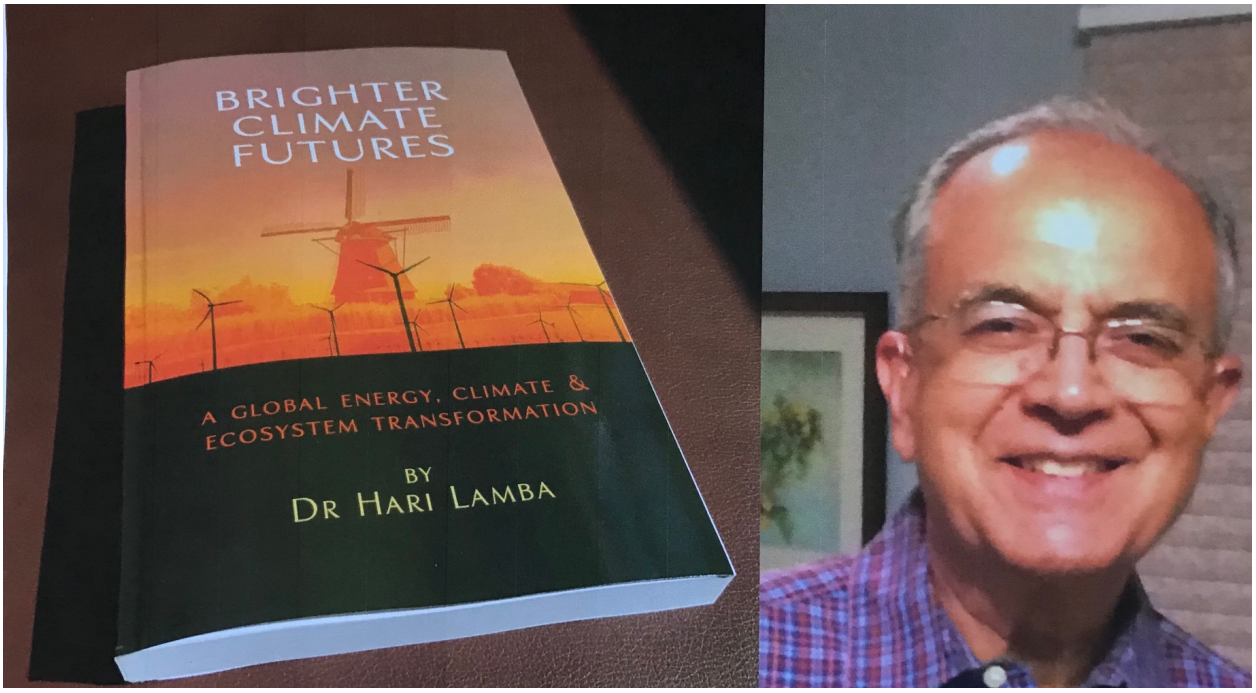
A Summary of

"Brighter Climate Futures"

A Transformation through Clean Energy, Climate Solutions, Expanded Ecosystems and & A Good Life for All"

A Summary of the PLAN & the BOOK
Dr. Hari Lamba



Summary of Brighter Climate Futures – A Global Energy, Climate and Ecosystems PLAN
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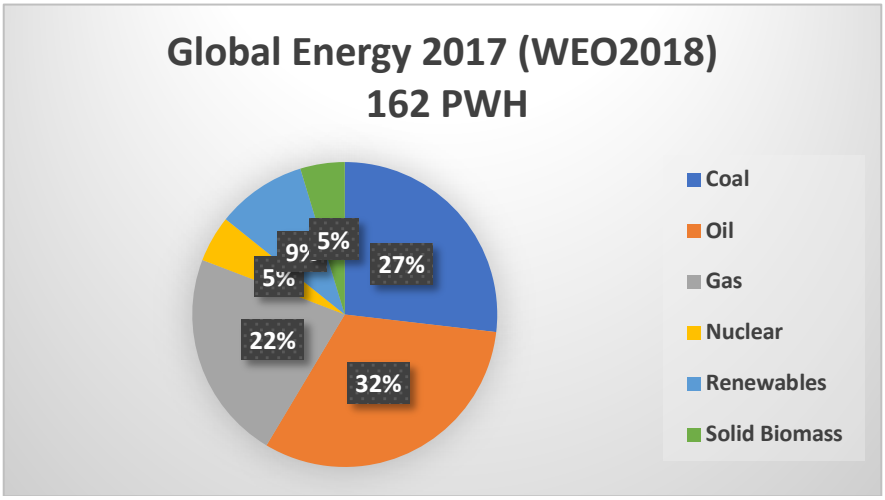
Problem – An Excessive Consumption of Fossil Fuels

Our Situation today!



Data from the International Energy Agency (IEA), World Energy Outlook 2018 (WEO2018) Report. 2017 Energy Consumption of 13,972 Mtoe (Millions of Tons of Oil Equivalent). Converted to Electrical Energy this is 162 PWH (Peta Watt Hours). 1 PWH is a Billion MWH (Mega Watt Hours, or 1,000 KWH)

- Burning of Fossil Fuels gives us 81% of Global Energy we consume
- Coal: 27%, Oil or Petroleum: 32% and Natural Gas: 22%
- Burning these fuels gives us 87% of the Carbon Dioxide emissions (13% due to land use changes like deforestation) – gas going to our air, so that there is more and more of it in the atmosphere
- Solar and Wind Energy production and use have grown significantly but are yet a small percentage of the total.

Explaining Carbon Dioxide

Carbon Dioxide (CO2) is a colorless odorless gas that you breathe out with each breath in small quantities, and which trees and plants breathe in and absorb in significant amounts to build their structure with carbon. **Carbon Dioxide is a Greenhouse gas – that is, it traps heat due to sunlight in the lower atmosphere (where we live and breathe), like a glass that traps heat in a greenhouse.** Some carbon dioxide is good as it keeps the atmosphere of our Earth at a comfortable temperature. Too much is very bad as it is leading to Global Warming – a steady

increase in the temperatures that is starting to cook us! We have to keep the global average temperature rise low so that it does not get too bad!

So What Do We Need to Do?

The basics is that we have to stop burning fossil fuels and emitting Greenhouse Gases to our air. We have to stop other emitting other greenhouse gases like Methane and Nitrous Oxide – Some of them methane is also released when oil and gas are produced. If we stop deforestation, then we can stop releasing most of the rest of the carbon dioxide. The United Nations intergovernmental Panel on Climate Change (IPCC) has told us that the global average temperature rise should not be more than 1.5 degrees Celsius in order to avoid the worst consequences of Climate Change. IPCC is the most credible organization in the world – do not listen to climate deniers! I have a whole chapter in my boo refuting their false claims!

Setting the Goals

So, What should be the Goals for the Plan described herein, and in the Book?

To meet the Greenhouse Gas (GHG) emissions reductions for a 1.5 Degree Celsius Goal (Average Global Temperature Rise not to exceed this), the three main greenhouse gases for which we need to reduce Emissions (1.5C Goals)*:

Carbon Dioxide

- **Emissions from Fossil Fuels to be reduced 50% by 2030 and 100% by 2050**
- **Plan counts only 5% reduction in carbon dioxide emissions from forests, coastal ecosystems and agriculture changes**

Methane – 50% reductions in emissions by 2050
Nitrous Oxide – 25% reductions in emissions by 2050

***AS PER IPCC (UNITED NATIONS, Intergovernmental Panel on Climate Change)**

So Here is a Summary of the Plan and what it will give us?

1. Plenty of Renewable Energy for the World's Energy Needs (& US)
2. Elimination of fossil fuel emissions by 2050 for a 1.5 C Plan

3. Big Expansion of Carbon Sink Ecosystems – Forests, Coastal & Agricultural
4. Different from other global plans out there in that it is A-Z (comprehensive) – deals with the what, the when, and the how

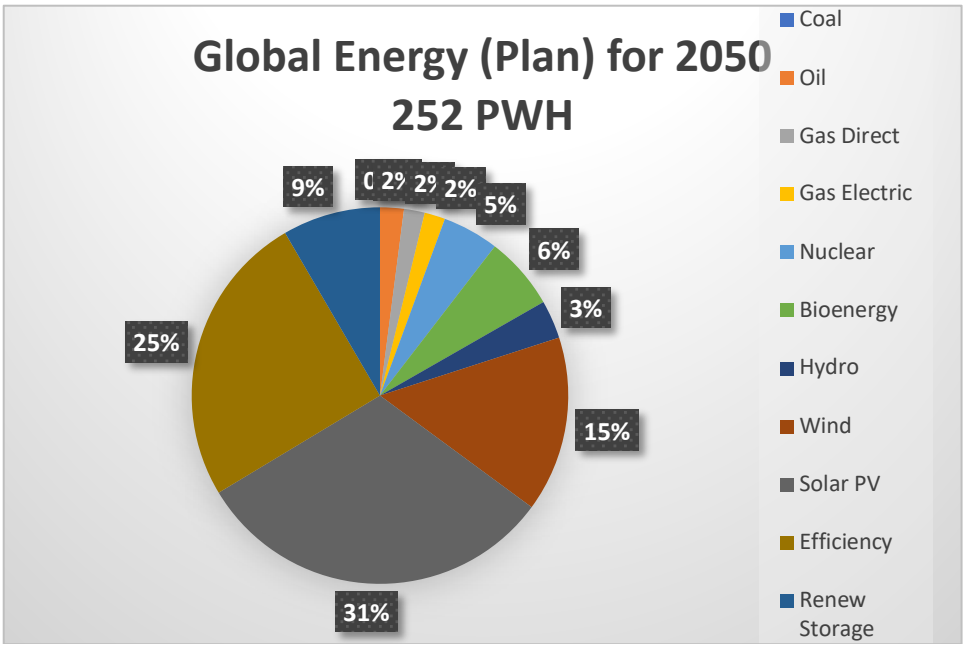
The International Energy Agency (IEA - WEO2018 Report) has told us that if current policies continue (Business as Usual), that global energy use will grow to 252 PWH by 2050 (from 162 PWH) in 2017 – IEA numbers extended (or extrapolated) from their year 2040 numbers. They project that fossil fuel use will still be 78%, and if the world tries very hard by substituting with renewable energy, with what it calls a Sustainable Development Scenario, fossil fuel use will still be at about 49% - a sure recipe for Climate Failure!

So What does the Plan proposed herein, and in the Book give us?

The Plan gives us plenty of clean Renewable Energy Solves the Climate Problem & Creates good living conditions for all

So here is a brief description

- The PLAN will meet the same 55% expansion in Global Energy needs by 2050, but will do it entirely without Fossil Fuels and mostly with a vast expansion of clean renewable energy fuels.
- A big expansion in Solar PV*, and a relatively big expansion in Wind Energy. These combined with a big expansion in Energy Efficiency (being able to do the same things but with less energy), and the production and use of Non-carbon fuels that store large amounts of renewable energy. See below about these fuels – for now let us call these "Storage" fuels.
- The big challenge is that we need to be able to Store Renewable Energy in large amounts, so that it can be used at all other times, like when the sun is not shining. Although there are other methods, two methods hold promise – batteries and "storage" fuels. The "storage" fuels are what as referred to as Renew Storage on the Pie Chart that follows.
- So here is the PLAN proposed for 2050



Plan: So coal is totally gone, and only small amounts of oil and natural gas remain (natural gas for direct use, and some natural gas for producing electricity). There is a vast expansion of Solar PV*, Wind, Energy Efficiency and Renew Storage.

*Solar PV (Photo-Voltaic, where Photo refers to the sun and Voltaic, is electric) is what is currently used by most solar systems that make electricity directly when the sun shines on them.

Here are some facts why this strategy makes sense:

Solar Energy: Solar PV* Panels on Less than 1% of Earth's Land Area can produce ALL of world's energy (Calculation for 2017 global energy use – energy data from International Energy Agency)

Efficiency of Fossil Fuels: A Dutch study of worldwide electric power plants showed important details of fossil fuel power plants.

- Coal: ---------35% used ---- 65% wasted
- Oil: ---------- 38% used -----62% wasted
- Natural Gas: 45% used ----- 55% wasted
- Fossil Fuels waste most of the energy they burn!!

Greenhouse Gas Emissions: Besides all the high amounts of local pollution that you get (especially for Coal), fossil fuels are very high emitters of Greenhouse gases.

- **For Every Million BTU (British Thermal Units) – a unit of Energy, on the average, the fuels emit the following amounts of Carbon Dioxide**
- **Coal (average): 210 Pounds (95 Kg)**
- **Gasoline/Diesel: 160 Pounds (73 Kg)**
- **Natural Gas: 117 Pounds (53 Kg)**

They all contribute big to Global warming, but Coal is clearly the worst!

Relative Costs of Different Energies:

Based on Wikipedia – US $ per KW (Kilo Watt)
These are costs for Installing New Electric Power Plants (on the average, as each one has different options)

Oil/Gas:	$ 1,000.
Coal:	$ 3,500.
Nuclear:	$ 6,000.
Onshore Wind:	$ 1,600.
Solar PV (Fixed):	$ 1,060.
Hydropower:	$ 2,680.
Geothermal:	$ 2,800.

Nuclear is very expensive (often subsidized by military operations) and takes a long time to install. Then there is radioactive pollution, radioactive waste and security issues.
Fuel and transportation costs for renewables are zero (Sunlight and wind are totally free, and are available right at the production site)
Coal requires heavy trains and ships and diesel fuel for transportation.
Oil takes a lot of energy to transport to a refinery, refine it there and transport it to you.

Once the power plant is installed, For Renewable Energy

The Fuel is Free!

Also, all parts of the Earth receive Sunlight, so Solar Energy can be produced close to you! It needs much smaller electric transmission lines.

Information on "Storage" Fuels – Hydrogen and Ammonia

There is a need to store Renewable Energy in large quantities in fuels that are transportable, energy dense and non-carbon, so that burning or using them does not release carbon dioxide or other greenhouse gases. Hydrogen is totally carbon free and burning it causes it to combine with oxygen in the air to give water. Burning Ammonia (which contains both nitrogen and hydrogen) can give Nitrous Oxides, but these can be reduced in a manner similar to that of catalytic converters of cars. Ammonia is much easier to store and transport than Hydrogen. Currently making them mainly uses Natural Gas, and results in carbon dioxide emissions of over 800 million metric tons. Both gases are produced and used in large quantities – Hydrogen to refine oil and make Ammonia, and Ammonia as a fertilizer in agriculture. The world knows how to handle both of these gases in large quantities.

There are people around the world doing research on how to produce Hydrogen by using electricity from Solar Energy to split water by (which is basically Hydrogen Oxide or H2O) into Hydrogen and Oxygen, by a process called electrolysis. There are others who are using different ways of using electricity from Solar energy to combine this Hydrogen with Nitrogen from the air (which is about 78% of the air you breathe) to produce Ammonia. The research is coming along well and needs to be scaled up to good size demonstration units and then into larger production units. This process is called Research, Development, Demonstration and Deployment (RDD&D). The last part, Deployment, is where an area or nation or world installs the infrastructure to produce (small to large factories), store, transport, supply and then use the fuel. Over a 30 year period, from 2021-2050, this should be easy to achieve in a cost effective manner, providing we do the RDD&D.

The reason why I call these as "Storage" Fuels is because these fuels are capable of storing renewable energy. Once we put in place ways to produce these non-carbon "Storage" Fuels that can store large amounts of renewable energy (mainly solar), then all of the proposed Plan becomes a practical reality.

A Transformation to Rejuvenate Carbon Sink Ecosystems

All Soils, Plants and Trees are Sinks as they absorb Carbon Dioxide from the air, but only if they are restored and expanded

So, the Plan proposes a Massive Expansion of Global Forests by 1 Billion Hectares (2.5 billion acres)

Reforestation & Afforestation

Deforestation of all types is to be banned and logging through the use of clear cutting methods be discouraged. The reforestation and afforestation means a net ADDITION of standing forest in all regions of the world – in Boreal (cold areas), temperate and tropical regions, based on the following guidelines: (1) As much as 50% be permanent biodiverse forest that is not harvested,

(2) Biodiversity of all types to be encouraged – e.g. trees, plants, wildlife, insects and birds, (3) Community and locally owned forests that provide products by extraction without cutting of the forests – fruit, and other products, (4) The rest can be plantation type forests that are harvested by the principles of sustainable forestry (no clear cutting), (5) All type of forests to be designed with breaks, thinning and wildfire defensible spaces so that wildfires are less intense and are easier to control, and (6) Agroforestry (forests and agricultural areas laid out together) and urban forestry to be encouraged with due regard to biodiversity as well as livelihoods.

The PLAN also proposes a Massive Expansion of Coastal Ecosystems along the Non-Ice Coastline of the whole world.

1. Simultaneous expansion of all existing coastal ecosystems in all continents except Antarctica by 2050. The estimate of the global length of coasts varies from 1.2 to 1.6 million Kilometers (0.75 to 1 million miles). These can be mangrove swamps, salt marshes, and sea grasses, or other ocean ecosystems.
2. **Along this ENTIRE length, the introduction, growth and management of coastal ecosystems from a few hundred meters (or yards) to as much as 10 kilometers (or about 6 miles) off shore along ALL coasts – about an average of 1 kilometer. This will give us about 1.2 to 1.6 million square kilometers (0.5 to 0.65 million square miles).**
3. PLAN proposes that this be on the following guidelines: (1) A majority of the ecosystems encourage plant and ocean life diversity, (2) Blue or ocean carbon as this is called absorbs more carbon by area than even tropical forests, (3) A significant part of activities should encourage species habitats that help fisheries, so that the livelihood of fishermen is supported and they thrive, (4) Commercial fish and ocean farming of all types is to be discouraged, except that which encourages biodiversity and is done without use of anti-biotics and fertilizer (like transformed agriculture).

The PLAN Proposes Solar-Electric Highways

Highways and Roadways: The Global Plan proposes direct electrification of the world's highways and roadways. Here, one can have solar panel systems with raised structures covering highways, or where the space along the highways is available, ground mounted solar systems. These will be combined with a battery system and "storage Fuel" production and supply station. So, instead of going to a Gas or Petrol Station, one would go to a Solar-electric charging station and get one's electric car recharged, or refueled with Hydrogen, if one has a fuel cell car.

Here Are More Details of the PLAN

A PLAN is presented that will keep the global average temperature rise below 1.5 degrees Celsius (1.5C) in a way that meets the world's expanding future Energy needs, reduces carbon emissions down to zero by 2050, rejuvenates and expands major Carbon Sink ecosystems like the world's forests, coastal ecosystems, and a transformed agriculture. The PLAN is both technically feasible and economically viable – means it can be implemented successfully, and the money to do it is well within the capacity of global society. The PLAN will also produce a bountiful life for all, if the principles of energy democracy (local control and ownership), and a

just transition (for fossil fuel workers) are adopted. **The bottom line is that a catastrophic future) can be avoided, planet Earth will be much more beautiful with a rejuvenation of all life forms, and create a good life for all!**

The Energy Transformation that we are about to embark upon is unlike anything humanity has ever done. The PLAN proposed herein will make it happen if the political, financial and technical resources are brought to bear on the issue with a sense of urgency and a "can do" attitude. This a PLAN of a type that has a high probability of success. The future after the transition will be much better than where we are now, and infinitely better than where we are headed. The PLAN is always shown in capital letters to distinguish it from other plans.

Aims of the Proposed PLAN

1. **Get something like the PLAN accepted and something like the PLAN implemented.**
2. Present and Describe a Plan that is Technically Feasible and Economically Viable
3. Show that we can have plenty of Clean Renewable Energy for all our needs, use energy wisely and efficiently, and get rid of polluting fossil fuels that are causing climate change
4. Expand and rejuvenate our forest, coastal and agricultural ecosystems, so that they not only act as much bigger carbon sinks but also restore much of the Earth's beauty, and the natural health of its ecosystems and the diversity of life.
5. Put in place a year round global effort and organization to reduce the risk of Climate related natural Disasters, and be prepared to handle them before, during and after them.
6. Show how we can practically implement the US Green New Deal, and provide a practical way of implementing a Global Green New Deal

Summary List of the PLAN to Transform

- **GOAL:** Global Average Temperature Rise of no more than 1.5 Degrees Celsius (2.7 Degrees Fahrenheit)
- Plenty of Clean Renewable Energy – Even Solar Energy by itself is more than enough
- All Fossil Fuels Replaced by renewable energy by 2050
- Greenhouse Gas Emissions Down (Carbon Dioxide from fossil fuels zero by 2050)
- Electrification of everything plus Energy Efficiency
- Massive expansion of the electric grid and its smartness.
- Non-Carbon Fuels like Hydrogen that store renewable energy in large quantities. Let us call these "Storage" Fuels
- Solar-Electric Highways for Electric Vehicles and those fueled by "Storage" Fuels
- Massive Expansion of Carbon Sinks

    - Beautiful Forests, Coastal Ecosystems and a transformed regenerative agriculture
    - A Big increase in the health, Biodiversity and Beauty of our Earth
- Disaster Risk Reduction & Advanced Disaster Management for Climate related natural disasters
- Adaptation to heat waves, floods and sea level rise
- A Jobs and Economy approach that benefits maximum number of people
- The US Green New Deal (GND) – How it can be practically implemented
    - Involving all and taking care of all
- A Just Transition for all Fossil Fuel Workers and Companies, as the world economy transitions to renewable energy
- Energy Democracy – that empowers and enables local democratic, and consumer and worker owned companies a significant part of the new energy opportunities
- Automatic funding through taxation of fossil fuel related activities
- Overcoming the fossil fuel forces and climate deniers that have fought against solutions
- A beautiful clean Earth with a good life for all
- Transformation of the Planet and the world economy for the better

Detailed Quantitative Plans – Global & National

- A detailed global energy, climate (emissions) and ecosystems plan – energy for expanding needs
- Similar detailed plans for the following nations
    - United States of America
        - Including a detailed plan for California
    - China
    - India
    - European Union (of 28 nations)
    - Summaries for other nations by category
- A detailed plan for Organizing, Funding and Implementing the Plan - Globally

So What Can I Do?

1. Learn to reduce you own your own Carbon footprint. If you can afford the upfront investment (you will save money over time), get solar panels, electrify your house (substitute any natural gas appliances you use), drive an

electric car, and insist on buying and using only items and appliances that use the least energy.
2. Learn about and cooperate with all local people and organizations and build coalitions
3. Distribute this document electronically or by printing it and urge people to support this plan, and put pressure on local, state, national and global leaders to accept and implement the PLAN, or something like it – immediately. We only have 30 years (2021-2050) to make it all happen!
4. Order and read the Book below so as to fully understand what needs to be done. Convince others to read the book and become active.
5. Visit the following website and tell other people about it, and use it as a means of communicating with the author.

Website: www.brighterclimatefutures.com

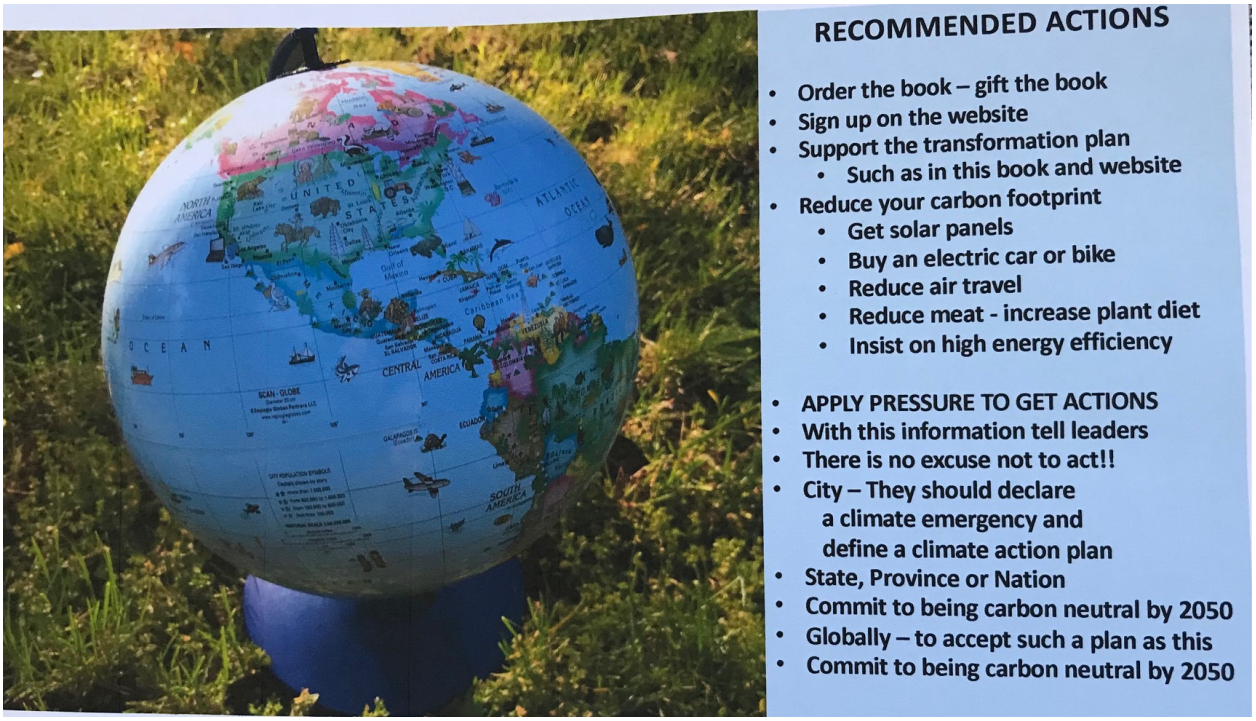
About the Author

The author Dr. Hari Lamba, has experience in engineering, business and ecology. He has a Ph.D. in engineering with about 40 years of experience in industry. He was one of the founders of the Earth Summit Network, an informal organization formed in Chicago during 1991-92 to educate the local public about the Earth Summit, or the United Nations Conference on Environment and Development (UNCED) that was held in 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. He is active in various groups including the Sierra Club.

He aims to use the website, book and personal actions to cooperate with global organizations for the adoption of a global plan that is strong enough to limit global temperature rise and provide plenty of renewable energy. He will attempt to convince the major emitter and influential nations to increase their ambitions, implement their own enhanced plans, and to push for effective global organization and implementation of a global plan. He intends to inspire, educate and learn from everyone in the world that has good ideas, to cooperate with all the active people and movements, to add a global strategy to support their efforts and give them added strength to fight their struggles. He will support and strengthen US efforts for climate change solutions as urged by proposals such as the Green New Deal and any other meaningful climate change solutions.

A more detailed description of everything is in the Book. Reading the book will help you better understand the kind of transformation that is being proposed and kind of plan that the world should adopt.

This Book is available all over the world



Website: www.brighterclimatefutures.com

Use website to communicate, to educate yourself, to send your ideas or proposals to me (in summary), or to join forces. The time for hand wringing is over. We now need to Plan and Transform! So get active and remain active until your leaders make it happen, and watch them to make sure that they do it!

Please feel free to email directly if you want!

Dr. Hari Lamba
San Francisco area, California, USA
Hlamba101@gmail.com