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HAWKING'S IRREVERSIBILITY OR WILDAVSKY'S CORNUCOPIANISM

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ABSTRACT

Is global warming theory correct or not? The debate for and against has become even more fierce after the alarming report of the IPCC in 2018. It is argued that the GHGs are not the cause of global warming, which has been overmuch exaggerated. This continued controversy among scientists will make it impossible to make progress at the upcoming UNFCCC in Katowice. Yet, data about an impending environmental global disaster is continuously forthcoming; This struggle between climate change affirmers and deniers is just a new version of the battle between ecologists and so-called cornucopian's.

KEYWORDS: *Wildavsky's Return, Solar Power Plants, Carbon Capture, Abrupt Climate Change Theory*

Article History

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INTRODUCTION

Pro Climate Change: Global government coordination has come so far that the UN has enacted the policy objective of almost complete decarbonization in this century at the COP21 reunion in Paris 2015. Bur how is this formidable objective to be managed? Thus far, the COP21 project involves a halt to the increase in CO2 emissions by 2020, a 30% reduction in CO2s by 2030 (absolutely or relatively?) and more or less total decarbonization by 2075. But the means to these gigantic goals? It is all about managing energy transformation, as the augmentation of GHGs stems from human use of energy resources.,

Anti Climate Change: Aaron Wildavsky claimed 1997 that global warming is the "mother of environmental scares", fabricated as a leftist theory to attack capitalism and the global market economy. Based on a new theory of risk and risk perceptions, he and other s0-called cornucopians argued that ecologists adhered to precaution and state interventionism – suspect a danger or damage, act now, whereas resilience is the correct posture – wait and see, act when you really know. The cornucopians – Wildavsky (1997), Simon (2002) and Lomborg (2007) etc. -would advocate massive energy consumption to raise living standards: They would refer to Figure 1 showing environmental improvements for humans with increasing affluence – see below human development indicators.

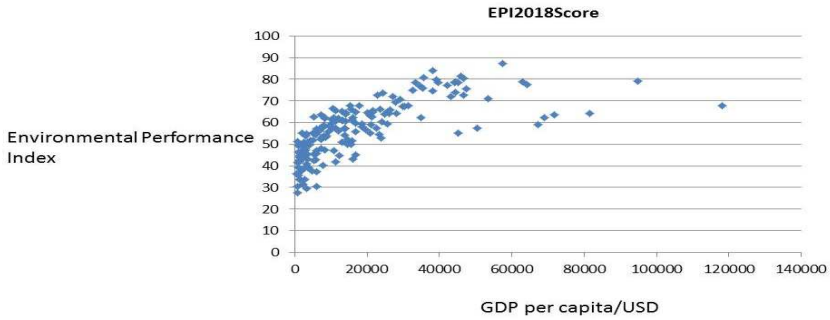


Figure 1: GDP and the Human Condition

Source: Environmental Performance Index, Yale University, Https://Epi.Envirocenter.Yale.World Bank Data Indicators

And they would say that private property rights protect everyone' environment. Thus, the spread of the market economy and its institutions is highly beneficial for mankind.

Ecologists on, the other hand, would refer to biodiversity, arguing that mankind is facing an enormous extinction of species, resulting from economic exploitation in combination with global warming – see Figure 2.

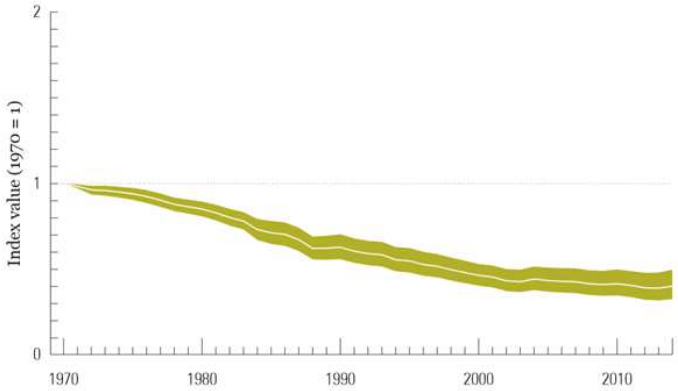


Figure 2: Biodiversity

Note: Global Living Planet Index 1970 - 2014

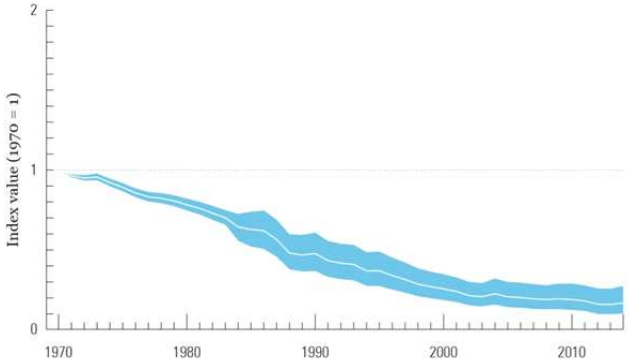


Figure 3

Note: Global Living Planet Index for Freshwater Species

Source: Living Planet Report, World Wildlife Fund 2018

The reduction in biodiversity is fueled by climate change, as global warming n various ways deteriorate the habitat of animal species, claims ecologists. Cornucopians – the globe is a horn of plenty – state that prominent natural scientists reject the IPCC consensus on the GHGs and their detrimental effects.

COP21 PROJECT ENTAILS MANAGEMENT

Climate experts and earth scientists talk "abrupt climate change" as well as the "methane bomb", widening the set of GHGs to focus upon methane, emerging chaotically from the melting permafrost in the Northern most part of the hemisphere or from melting ice containing frozen methane at the seabed in the Arctic. The potential amount of methane to be released in the worst case scenario is so large that global warming would quickly move beyond the Hawking irreversible point, spelling doom for mankind. The time spam for the methane bomb is uncertain, from 50-200 years. What to do? At this point in time, global coordination against climate change can only intensify its efforts at decarbonization during the 21st century. The COP21 project has to be pursued and fulfilled in an improved version with quicker actions, complemented by other activities like carbon sequestration or Geo-engineering, if workable. Hopefully, the US will reenter this common pool regime later.

The overall objective of the COP21 project from Paris 2015 is to start decarbonization by 2020 and finish it by 2075. A necessary condition is that states conduct energy policies that eliminate coal and start solar power parks. This requires enormous management skills by individual governments with support from global coordination agencies or committees. A drastic policy tool is carbon sequestration or capture, but it is hardly viable at the moment.

Climate engineering may add to the basic means: abolition of coal and big solar power parks.

Theory: The basic hypothesis is the strong link between CO2 emissions and global temperature – Keeling' curve. Only by halting CO2 emissions first and then start reducing them can global warming be stopped and the methane bomb avoided. This is the foundation of the COP21 project and the possibility of geo-engineering may be an option as time goes by.

Implementors: The COP21 secretariat comprises some 450 persons, planning new global reunions, and monitoring the development of the country engagement for the Treaty as well as negotiating the promised reductions in CO2s. It could be turned into a management agency assisting countries cut CO2s on the basis of interaction the Intergovernmental Panel for Climate Change (IPCC).

Management Tasks: Each country needs to develop a decarbonization strategy, involving the crucial steps in the necessarily giant energy transformation from fossil fuels to renewables, given the most recent information available about energy and its presuppositions. The COP21 secretariat could be helpful in designing the best projects and come up with cheap funding avenues, guaranteeing loans below market rates. It could make a recommendation about the carbon tax and renewable energy subsidies.

Competencies: A reinforced COP21 developing into the management of global decarbonization would act as an agency of first the UNFCCC and second as the agent of the principals of the UN, viz. the member states. Its tools of management would be persuasion, oversight, recommendations, negotiations, but not authority or interference.

ABRUPT CLIMATE CHANGE DANGERS

Among some climate scientists, there is recently a new urgency. The melting of the North polar ice is advancing so quickly that all projections about temperature rise on the Earth must be revised upwards. Quicker warming sets in motion very positive feedbacks that threatens human survival. The goal of COP21 – limit global warming to + 2 degrees Celsius – is no longer achievable. Instead, climate chaos seems more likely. A few predict that mankind has no more than 10 years before things become unmanageable. When the Northpole ice is gone, global warming goes much higher than + 2.

The theory that climate change is now becoming irreversible is based on new hypotheses concerning the consequences of global warming:

- sea level rise and Arctic ice meltdown is quicker than believed;
- climate refugees may rise to 100 million people;
- food and water shortages come earlier than believed;
- the + 2 degrees Celsius target is misplaced as the Earth warms differently at various regions, i.e. still much hotter at the poles;
- the release of methane from the permafrost and the frozen ice at the North pole will bring a temperature rise to + 10 degrees Celsius; The COP21 policy is too slow and uncertain.

The idea of so-called tipping points is crucial in abrupt climate change theory, as it makes concrete the Hawking notion of irreversibility, but when S. Hawking suggested that climate change was irreversible, he was met with sharp criticism. The notion of an irreversible process of change comes from the theory of scientific laws of nature with their universality and empirical necessity. If global warming is unstoppable or inevitable, then the survival of the human race is at stake.

ENERGY, EMISSIONS AND ENVIRONMENTAL DESTRUCTION

I suggest we analyze energy in a wide sense. The need for energy is obvious in all the human sources of GHGs – see Figure 3.

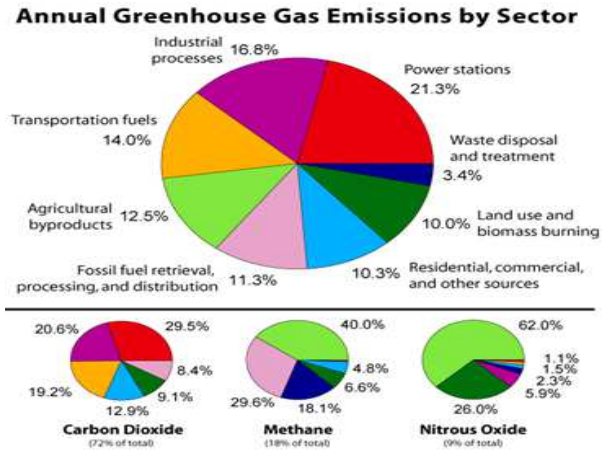


Figure 3: Human Sources of GHGs, Globally

Source: https://en.wikipedia.org/wiki/Climate_change_mitigation

What Figure 3 shows is that the GHGs stem from all vital sectors of society, not merely energy production itself. Energy is the capacity to do work. And work is the source of human welfare. The growth in energy consumption since the industrial revolution and especially after the Second World War has been just immense, especially the supply of fossil fuels. In poor countries, the demand for energy is huge for economic development, whereas rich countries are heavily dependent of fossil fuels for economic growth.

The majority of countries in the COP project are in poverty, as they need more energy. Thus, they can only decarbonize when renewable energy sources become available. This is the redistribution task of C0P21. The living conditions in the poor countries in Latin America, Africa, and Asia, as well as the Pacific, reflects the low level of energy employed. This basic fact determines life opportunities in a most dramatic fashion. The low access to energy has consequences for the environment and the life situation of people, including health, schooling, work, food, and potable water.

For instance, African countries are poor because they have too little energy. Thus, they have much less GHGs than Asia. Yet, they need the COP project of the UNFCCC to renew their energy sources and move from fossil fuels and traditional renewables to solar power. Hydropower depends upon water availability that shrinks with global warming.

African energy deficit is conducive to a dire environment with enormous damages and risks. Consider the following global figures. Figure 4 shows how low energy leads to being unsafe environmental.

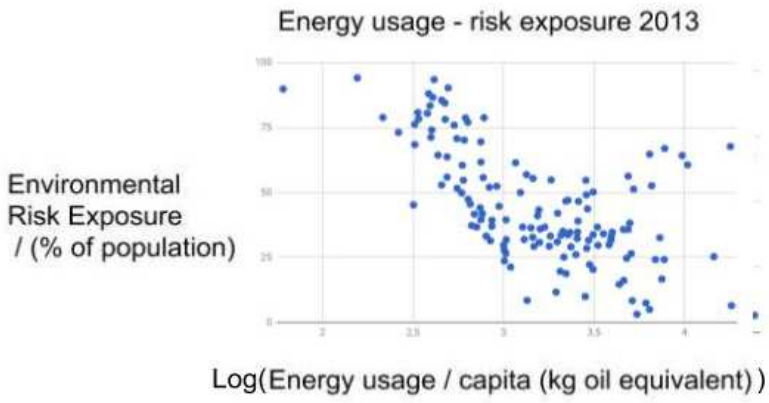


Figure 4: Energy and Environmental Risk Exposure

Source: Environmental Performance Index, Yale University, https://epi.envirocenter.yale. IEA Statistics © OECD/IEA 2014 (http://www.iea.org/stats/inde

Low energy use leads to poverty, malnutrition, deceases, lack of potable water, insufficient sanitation, etc. Typical of many Latin American, African and Asian nations is the lack of stable electricity, which hampers everything and reduces environmental viability. Figure 5 has a global picture.

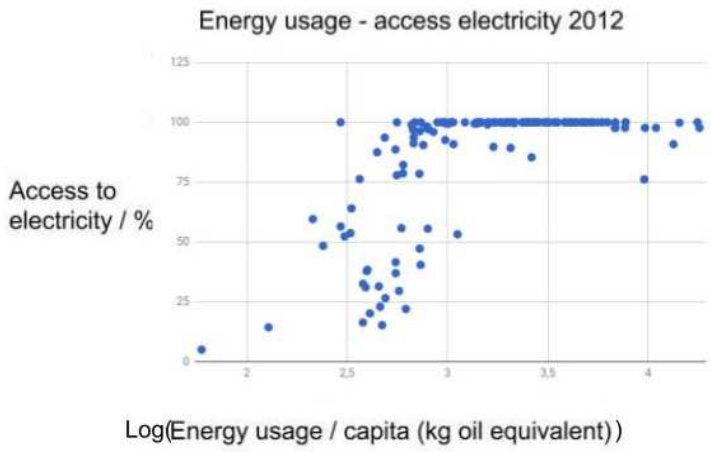


Figure 5: Energy and Electricity Access

Source: Environmental Performance Index, Yale University, https://epi.envirocenter.yale. IEA Statistics © OECD/IEA 2014 (http://www.iea.org/stats/inde

The access to safe and stable electricity is crucial for health, schools, food, water, etc. Figure 6 links energy with proper sanitation.

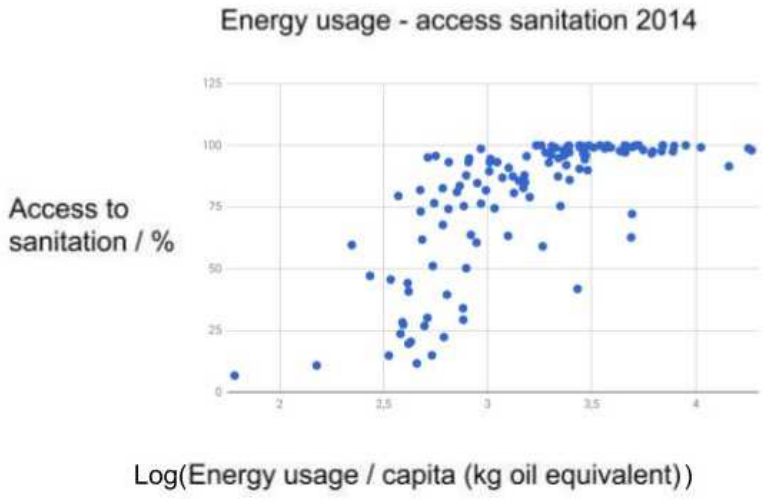


Figure 6: Sanitation and Energy

Source: Environmental Performance Index, Yale University, https://epi.envirocenter.yale. IEA Statistics © OECD/IEA 2014 (http://www.iea.org/stats/index)

Especially, the rapidly growing African, Latn American and Asian mega-cities lack entirely proper sewage plants. Thus, dirty water is put into the big rivers where other cities downstream take their potable water.

The access to safe and stable electricity is crucial for health, schools, food, water, etc. Figure 7 links energy with proper sanitation.

Figure 7: Sanitation and Energy

Source: Environmental Performance Index, Yale University, https://epi.envirocenter.yale. IEA Statistics © OECD/IEA 2014 (http://www.iea.org/stats/inde

Figure 8 underscores the necessity of more energy in poor countries for proper sanitation, without which the life of humans is "*sale*".

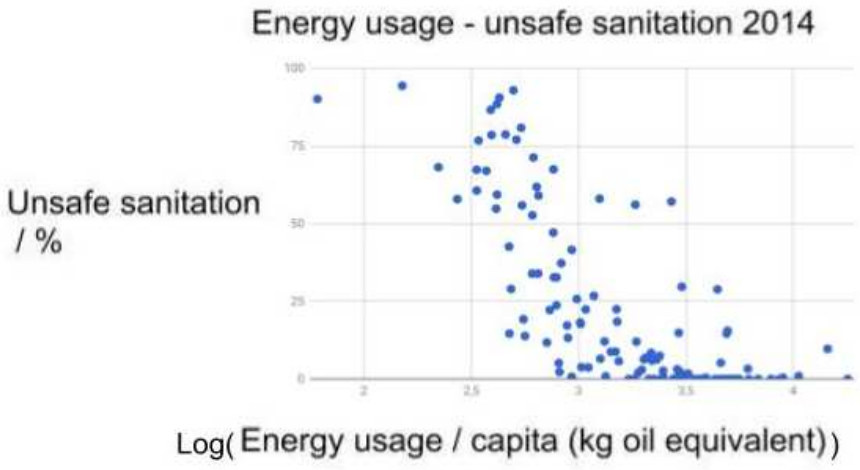


Figure 8. Energy And Unsafe Sanitation

Source: Environmental Performance Index, Yale University, https://epi.envirocenter.yale. IEA Statistics © OECD/IEA 2014 (http://www.iea.org/stats/inde

Air quality to depends upon energy access (Figure 9).

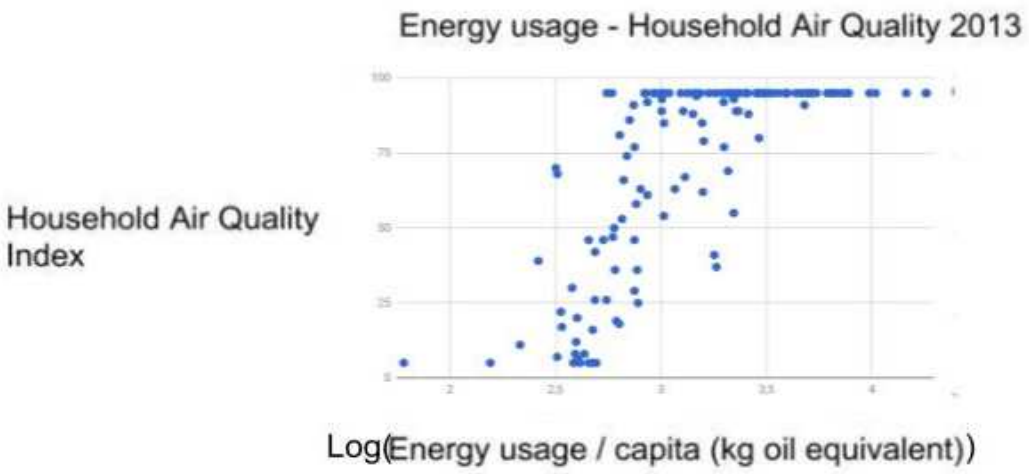


Figure 9. Energy and Air Quality

Source: Environmental Performance Index, Yale University, https://epi.envirocenter.yale. IEA Statistics © OECD/IEA 2014 (http://www.iea.org/stats/inde

Typical of many poor nations – Latin America, Africa, Asia - is the lack of predictable access to safe electricity, which hampers work and reduces environmental viability. The access to safe electricity is, it must be emphasized, absolutely central for health, schools, food, potable water, etc. Given the lack of enough energy in poor countries being conducive to-the above bad living conditions, one understands the hopes of the poor countries for help with energy transformation leading to better access to just energy!

Thus, energy consumption is closely related to country affluence. The poor countries can only improve the living condition by increase energy supply. Their energy demand can only go up because energy supply is highly skewed to the

advantage of the rich countries – see Figure 10. Poor countries need much more energy, but of a new kind. They need assistance to move to modern renewable, as they will give up fossil fuel only if there is compensation by other new energy sources. In rich countries with an economy in balance more or less, domestically and internationally, the Baptiste Say perspective upon economic motivation entails the idea of balanced economic growth, supported strongly by financial markets. Even if real economic growth fluctuates, the emphasis upon yearly economic growth is typical of modern capitalism or the market economy, but so far it has necessitated a constant augmentation of energy. Figure 16 shows the tight relation between affluence and energy consumption.

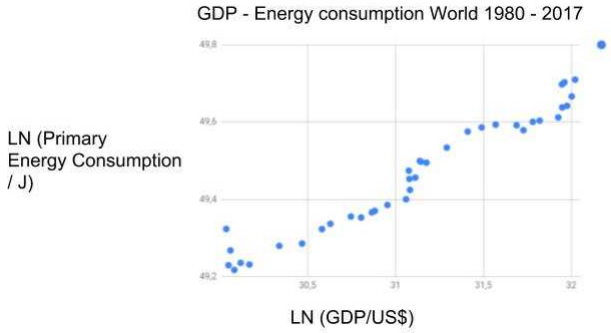


Figure 10: Affluence and Energy Globally0

Note: R2 = 0.951

Sources: BP Statistical Review of World Energy World Bank Data Indicators

COUNTRY MANAGEMENT: GIANTS AND DECARBONIZATION?

Every single country has its energy consumption pattern that must be taken into account in both domestic and international energy supply transformation.

India

In Indian energy policies, it is emphasized that developmental goals take precedence over climate change considerations. Thus, all Indian household musts have access to electricity and only sustained rapid economic growth can reduce poverty. India has a "take-off" economy that delivers affluence for the first time since independence. But it is based on fossil fuels. India looks into other sources of energy, as long as socio-economic development is not hindered. Figure 11 shows the main features of future planning.

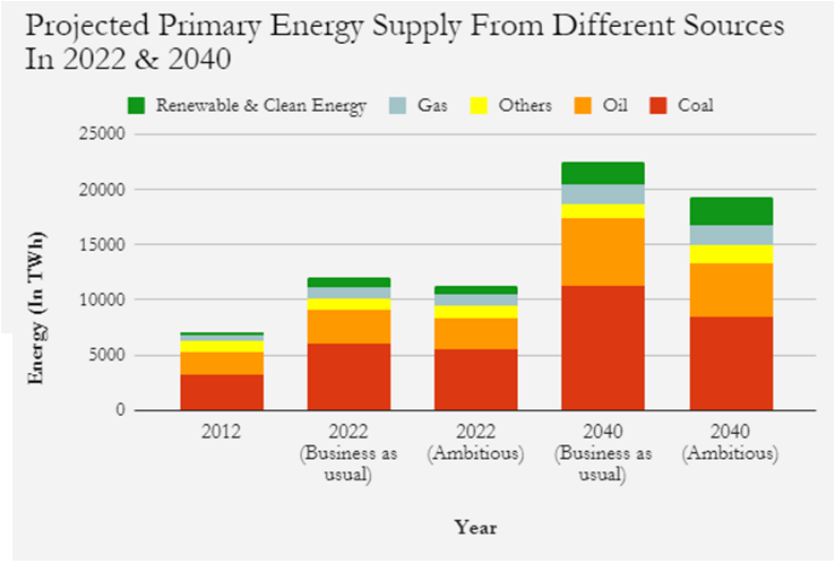


Figure 11: India's Energy Future

Source: Https://Scroll.In/Article/843981/Indias-New-Energy-Policy-Draft-Projects-Coal-Fired-Capacity-will Double-by-2040-is-that-Feasible

India has rapidly become a major CO2 emitter due to its high growth rates since 1990. It uses lots of coal, stone or wood. Charcoal is bad for households and results in forest destruction. India tries to broaden its energy supply to modern renewables, like solar, wind, and hydro power. Yet, it will remain stuck with fossil fuels for decades. It needs assistance from the COP21 project, especially for solar power parks. Building more dams is very risky, as global warming reduces water assets. Figure 11 indicates India cannot meet its COP21 promises, as Ramesh (2015) underlines.

Brazil

Brazil is a "catch-up" with its "take-off" point long ago in the 20th century. Compared with India, but it never really succeeds to close the gap to North America, tumbling now and then into dictatorship or recession. Figure 12 shows its stylised energy plans – are they in agreement with COP21 hopes of decarbonizaton?

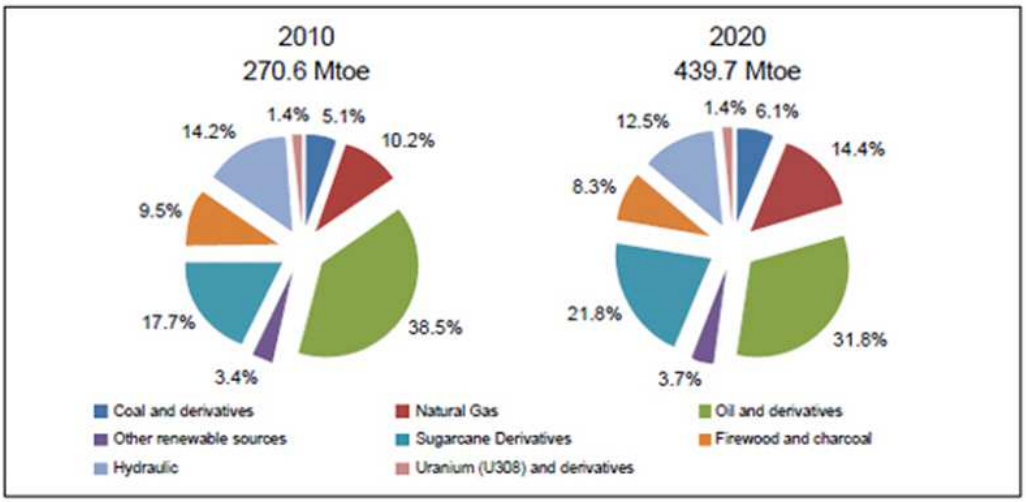


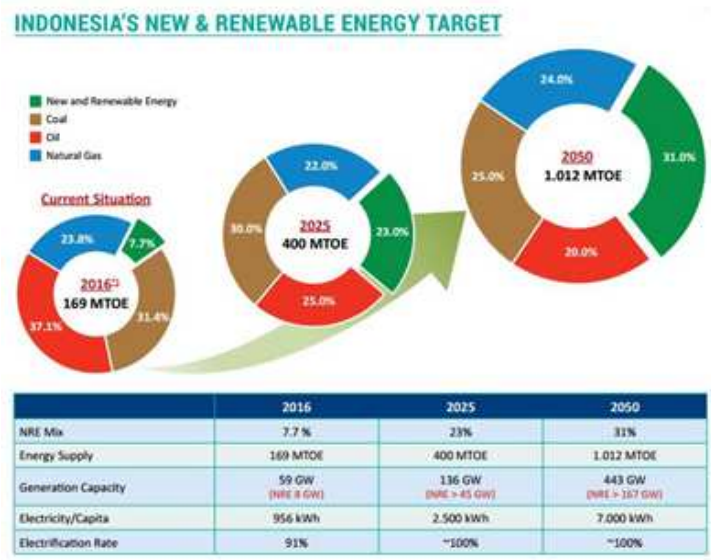
Figure 12: Energy Plans in Brazil

Source: http://www.scielo.br/scielo.php?pid=S0103-40142012000100017&script=sci_arttext&tlng=en

Brazil has already a diversified supply of energy. However, since the country plans to almost double its energy supply, its dependence upon fossil fuel will grow, also upon coal. It dreams about building many more dams in the Amazons, but future water shortages due to climate change may make these plans unrealistic. The country needs COP21 assistance to turn to solar power massively, in order to eliminate first and foremost coal and charcoal. The rain-forest is part of Brazil' s emission picture where burning and logging reduce its carbon uptake.

Indonesia

Indonesia is like India a "take-off" country, enjoying rapid economic growth with attending augmentation in energy consumption. The outcome is that this giant nation has quickly become a major GHG emitter. What makes the situation worse is the burning down of the rain-forest in parts of Indonesia.



	2016	2025	2050
NRE Mix	7.7 %	23%	31%
Energy Supply	169 MTOE	400 MTOE	1.012 MTOE
Generation Capacity	59 GW (NRE 8 GW)	136 GW (NRE > 45 GW)	443 GW (NRE > 167 GW)
Electricity/Capita	956 kWh	2.500 kWh	7.000 kWh
Electrification Rate	91%	~100%	~100%

Figure 13: Energy Future for Indonesia

Such a phenomenal augmentation of energy is out of line with the aim of global decarbonization.

USA

The US has reduced its CO2 emissions during the lasts years, mainly by a shift to natural gas. Actually, several mature economies have been able to halt the rise of CO2 emissions, either by more energy efficiency or a shift to natural gas or renewables. Figure 14 captures some features in US energy plans.

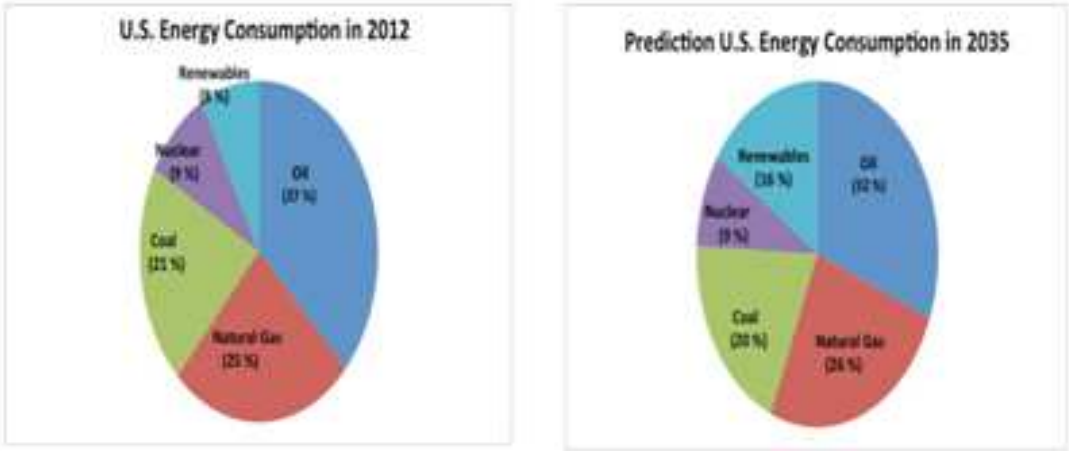


Figure 14: US Energy Future

Source: https://www.e-education.psu.edu/egee102/node/1930

Although Figure 14 predicts a doubling of renewable energy, the dependency upon fossil fuels, including coal energy, will not be much reduced. We are talking here about relative numbers, but if the US increases the total amount of energy supply – fracking!then there may even be more fossil fuels. The reduction in CO2s during recent years seems to be coming at a reduced rate. The hope is for economic growth without energy increases, but we are not there yet. And most countries demand more energy for the future.

China

China now enters the First World, as it has long passed its "take-off" point in time around 1980 and has pursued a successful "catch-up" policy for a few decades. Its energy consumption, especially fossil fuels, has skyrocketed with GDP, resulting in the largest CO2 emission globally. Figure 15 has a projection for China.

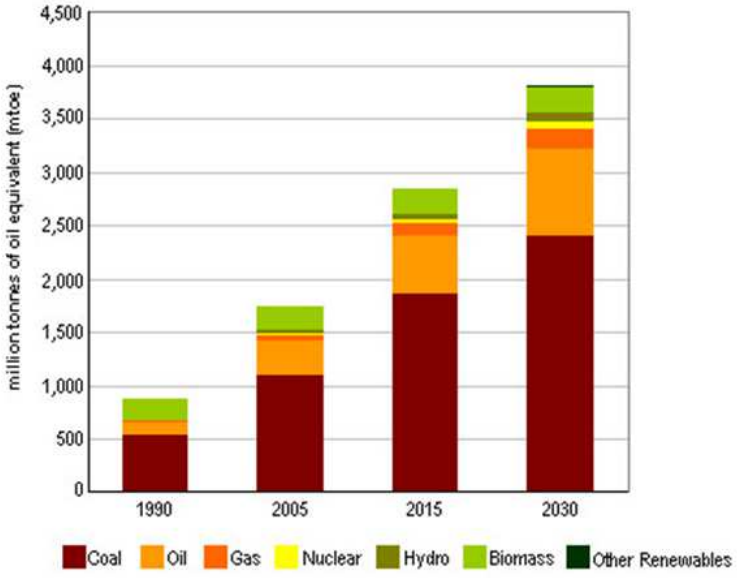


Figure 15: Energy Projection for China

Source: http://www.wrsc.org/attach_image/chinas-projected-energy-growth-fuel

Decarbonization does not seem highly probable. Much hope was placed at a recent reduction in CO2s, but water

shortages forced China to revert to coal in 2017 with attending augmentation of CO2s. China is investing in both renewables and atomic power, but it also plans for large energy increase in the coming decades with lots of energy consuming new projects.

POLICIES AGAINST CLIMATE CHANGE

As the potentially huge methane emissions enter the climate change debate, one fully understands the mounting pessimism. And the entire time scale for fighting global warming shrinks considerably, from 100 years to 50 years or even less.

Yet, only improved COP21 policy-making could help. The Keeling must be stabilized as soon as possible, having reached 412 recently. The release of methane depends upon that. Thus, one may outline a more radical COP21 policy and ask for its implementation to start now:

- Close down of all coal power plants in 2020; replacement of charcoal in poor countries by mini gas stoves;
- Massive investments in solar power parks – see below; subsidies for solar installations in private homes;
- Accelerated experiments with carbon capture to find the accurate cost-benefit calculation for all forms of geoengineering.
- Halt the closing down of atomic power stations.

Here comes the solar power revolution that will allow a massive reduction in fossil fuels. Let us see what it entails in terms of management tasks for global coordination, assisted by for instance the COP21 Secretariat and the IPCC.

Table 1: Number of Ouarzazate Plants for 40 Per Cent Reduction of CO2 in Some Giant Countries (Note: Average of 250 - 300 Days of Sunshine used for All Entries except Australia, Indonesia, and Mexico, where 300 - 350 was used)

Nation	Co2 Reduction Pledge / % of 2005 Emissions	Number of Gigantic Solar Plants Needed (Ouarzazate)	Gigantic Plants Needed for 40 % Reduction
United States	26 - 28[i]	2100	3200
China	none[ii]	0	3300
EU28	41 - 42	2300	2300
India	none[ii]	0	600
Japan	26	460	700
Brazil	43	180	170
Indonesia	29	120	170
Australia	26 – 28	130	190
Russia	none[iii]	0	940
World	N/A	N/A	16000

Note: i)The United States has Pulled out of the Deal; Ii) No Absolute Target; Iii) Pledge is above the Current Level, No Reduction; Iv) Upper Limit Dependent on Receiving Financial Support; V) EU Joint Pledge of 40 % Compared to 1990.

It will, of course, be argued against such a 40 per cent speedy reduction in CO2s that it leads to economic recession. So may it be! But it would reduce future much higher costs. After all, economies adapt and will recover due to all new investments needed in a decarbonized world. Ramesh (2015) emphasizes that India needs much economic assistance for decarbonization – a giant task for global coordination to assist poor nations!

Let us look at the American scene in Table 2.

Table 2: Number of Ouarzazate Plants Necessary for 40 Per Cent Reduction in CO2 (Note: Average of 250 - 300 Days of Sunshine per Year was used for Canada, 300 – 350 for the others).

Nation	Co2 Reduction Pledge / % of 2005 Emissions	Number of Gigantic Solar Plants Needed (Ouarzazate)	Gigantic Plants Needed for 40 % Reduction
Canada	30	230	300
Mexico	25	120	200
Argentina	none[ii]	0	80
Peru	none[ii]	0	15
Uruguay	none[ii]	0	3
Chile	35	25	30

Some Latin American countries have lots of hydropower, but it may dwindle rapidly due to abrupt climate change. Solar power would be excellent energy for Mexico and Brazil for example. Table 3 has the data for the African scene with a few key countries, poor or medium income. As they are not in general energy consuming on a grand scale, like Asia, decarbonization should be feasible with Super Fund support.

Table 3: Number of Ouarzazate Plants Necessary in 2030 for 40 Per Cent Reduction in CO2 (Note: Average of 300 - 350 Days of Sunshine per Year was used).

Nation	Co2 Reduction Pledge / % of 2005 Emissions	Number of Gigantic Solar Plants Needed (Ouarzazate)	Gigantic Plants Needed for 40 % Reduction
Algeria	7 - 22[iv]	8	50
Egypt	none[ii]	0	80
Senegal	5 - 21	0,3	3
Ivory Coast	28-36[iv]	2	3
Ghana	15 – 45[iv]	1	3
Angola	35 – 50[iv]	6	7
Kenya	30[iv]	3	4
Botswana	17[iv]	1	2
Zambia	25 – 47[iv]	0,7	1
South Africa	none[ii]	0	190

Note: I)The United States has Pulled Out of the Deal; Ii) No Absolute Target; Iii) Pledge is above the Current Level, No Reduction; Iv) Upper Limit Dependent on Receiving Financial Support; V) EU Joint Pledge of 40 % Compared to 1990.

Table 4 shows the number of huge solar parks necessary for a few Asian countries.

Table 4: Number of Ouarzazate Plants Necessary for 40 Per Cent Reduction in CO2s. (Note: Average of 250 – 300 Days of Sunshine was used for Kazakhstan, 300 - 350 Days of Sunshine per Year for the others).

Nation	Co2 Reduction Pledge / % of 2005 Emissions	Number of Gigantic Solar Plants Needed (Ouarzazate)	Gigantic Plants Needed for 40 % Reduction
Saudi Arabia	none[ii]	0	150
Iran	4 – 12[iv]	22	220
Kazakhstan	none[ii]	0	100
Turkey	21	60	120
Thailand	20 - 25[iv]	50	110
Malaysia	none[ii]	0	80
Pakistan	none[ii]	0	60
Bangladesh	3,45	2	18

Given the economic advances in Asia, most countries need a lot of solar power parks for decarbonization. The COP21 management would be able to help.

Finally, we come to the European scene.

Table 5: Number of Ouarzazate Plants Necessary for 40 Per Cent Reduction in CO2s (Note: Average of 250 - 300 Days of Sunshine per Year was used)

Nation	Co2 Reduction Pledge / % of 2005 Emissions	Number of Gigantic Solar Plants Needed (Ouarzazate)	Gigantic Plants Needed for 40 % Reduction
Germany	49[v]	550	450
France	37[v]	210	220
Italy	35[v]	230	270
Sweden	42[v]	30	30

Note: I) The United States Has Pulled Out of the Deal; Ii) No Absolute Target; Iii) Pledge is above the Current Level, No Reduction; Iv) Upper Limit Dependent on Receiving Financial Support; V) EU Joint Pledge of 40 % Compared to 1990.

The turn to renewables in Europe occur at the same time as atomic power stations are going to be closed, at least in some countries. This makes solar power plants even more relevant, a coal power must be abolished, rather sooner than later.

CONCLUSIONS

I believe that time has come for halting and reducing CO2 emissions by real implementation and not Utopian dreams of a sustainable economy (Sachs, 2015). There is nothing to wait for any longer (Stern, 2015), as the COP23 must set up the promised Super Fund. No time for politicking in the UN any longer (Conca, 2015; Vogler, 2016). It must be underlined that the ultimate responsibility rests will the state and their governments (Stern, 2007). There is no one single policy approach that "W*E*" must take. Each government has to present its plans and specific situation to a Cop21 managing board, in collaboration with markets and financial institutions.

Yet, the prospects for decarbonization halting climate change seems grim, especially if abrupt climate change theory is correct. The crux of the matter is energy, which still comes with a high carbon intensity in most countries. Energy is the capacity to do work, which is the foundation of affluence (Figure 16).

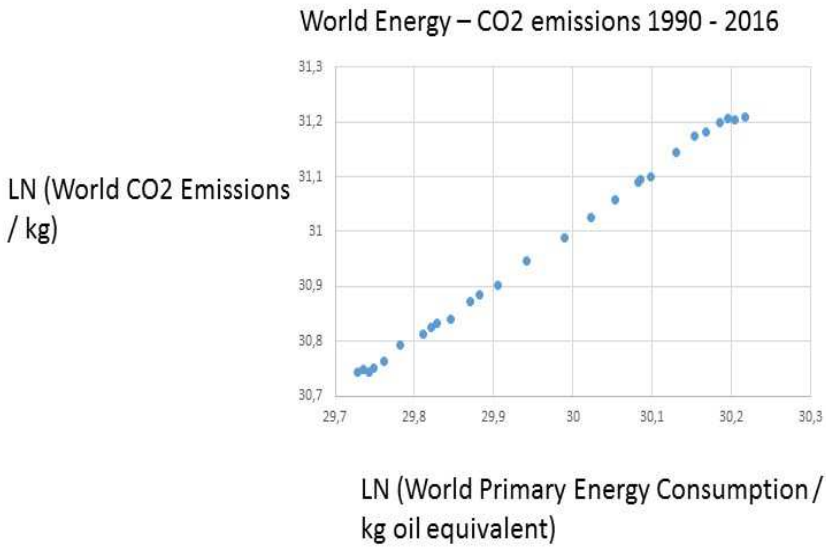


Figure 16: Energy and CO2 Emissions

Source: Bp Energy Outlook 2017.Eu Emissions Database for Global Research Edgar, Http://Edgar.Jrc.Ec.Europa.Eu/

Wildavsky died prematurely in 1993, but as long as the spirit of his attack on environmentalism and global warming looms over today's debate, little will be achieved in halting the risk of the Hawking irreversibility. It is true that renewable energy is on the increase, but it does not result in global decarbonization.

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