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GLOBAL WARMING AND THE ECONOMIC CONSEQUENCES: SOME SCENARIOS

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Abstract

The coming UNFCCC conference at Katowice – COP24 – faces the call for rapid counter measures against global warming. The economic consequences? We have three main theories: 1) abrupt climate change predicting enormous costs; 2) cornucopian theory forecasting "business as usual"; and 3) sustainable economics covering both national policies and international governance. Which theoretical framework is true or most useful? And are realities close to any of the three major economic approaches to climate change? The current study attempts to explore the above.

Keywords: Abrupt climate change, economic consequences, sustainability, status quo

INTRODUCTION

Financial markets and institutions have hardly developed any anticipations about global warming and its effects, One circumstance is the time horizon of different climate change predictions that run from 10 years to one hundred years. Thus, some climate scientists claim that societies will crumble in a ten years time period, whereas others say that the Earth will be ice and glacier free after 2100 with enormous land losses.

With the increased attention to all kinds of ecological issues, like e.g. biodiversity, and the augmentation in the Keeling curve, the debate between alternative approaches to climate change has aroused more and more fierce conflict among scholars. Some adherents of abrupt climate change theory claim that t is already too late, while a cornucopian like Bjorn Lomborg states that President Trump acted wisely when withdrawing the US from the Paris COP21 Agreement. Finally, some proponents of a sustainable economy demand more and stricter

policies than those advocated by the UNFCCC. Meanwhile, the world economy muddles through in between these approaches by investing in renewables but without achieving decarbonisation. I will compare the three main approaches to climate change below.

THE HOLOCENE AND ANTHOPOCENE PERIODS AS WELL AS NATURE`S REVENGE

In the recent inquiry into climate change, **"**Trajectories of the Earth System in the Anthropocene", published 2018 edited by William C. Clark, we read: "The Anthropocene is a proposed new geological epoch 1 based on the observation that human impacts on essential planetary processes have become so profound that they have driven the Earth out of the Holocene epoch in which agriculture, sedentary communities, and eventually, socially and technologically complex human societies developed."

The proposal that humans can avoid Hawking irreversibility is similar to the COP21 approach. The hope among these scholars is also tied to alternative A in Diagram 1. Despite dire warning about the future dismal state of Planet Earth threatening human survival, the authors state that the COP21 promises may save mankind, as long as they restrict global warming to + 2 degrees Celsius. I quote:

"This analysis implies that, even if the Paris Accord target of a 1.5 °C to 2.0 °C rise in temperature is met, we cannot exclude the risk that a cascade of feedbacks could push the Earth System irreversibly onto a "Hothouse Earth" pathway. The challenge that humanity faces is to create a "Stabilized Earth" pathway that steers the Earth System away from its current trajectory toward the threshold beyond which is Hothouse Earth. The human created Stabilized Earth pathway leads to a basin of attraction that is not likely to exist in the Earth System's stability landscape without human stewardship to create and maintain it. Creating such a pathway and basin of attraction requires a fundamental change in the role of humans on the planet. This stewardship role requires deliberate and sustained action to become an integral, adaptive part of Earth System dynamics, creating feedbacks that keep the system on a Stabilized Earth pathway."

This amounts to mere wishful thinking, because it does not take into account the economic consequences of the policy measures to stabilize Earth and the resistance it will meet from for instance the G20 giant nations.

The basic ideas in the 2018 IPCC and the 2018 Fifth Assessment are the same: lots of warning but few practical counter measures.

SCENARIO ONE: THE TIPPING POINTS TOWARDS ECONOMIC DECAY

In recently launched abrupt climate change theory, several climate and earth scientists now focus upon so-called tipping points as well as the great variability in temperature increases over the entire globe. The dramatic changes in the Arctic have made researchers focus upon the melting of the ice at the poles and Greenland and its repercussions for global weather and the huge methane holdings in the permafrost from Alaska to Siberia, both on land and in ocean.

a) Tipping point 1: Arctic Sea ice; Expected to disappear around 2020, it will not increase sea levels dramatically due to the equivalence between ice and water. But this will affect global oceans streams as well as global weather yet streams.

b) Tipping point 2: Greenland ice; Uncertainty when it will be gone – some say 1940, this will raise sea levels some 6 meters. Major city areas will inundated: Miami, Rio de Janeiro, Venice, Kairo-Alexandria, Mumbai, Hanoi, Shanghai, Tokyo and Singapore, for instance. It would further deteriorate oceans conveyor belt and the slow the global yet stream.

c) Tipping point 3: Antartica ice mass; this enormous mass of ice and glaciers would be finished by some 100-500 years, rising sea levels some 60-70 meters. Mankind stand to loose a lot of land all over the planet Earth – a true catastrophe.

d) Tipping point 4: constant heat increase with draught and potable water scarcity. This would reduce food availability and lead to millions of climate refugees from vunerable low level coastline countries and poor nations along the equator.

e) Tipping point 5: Methane emissions from the melting permafrost. This threat is so huge that mankind would never survive such a major release of a very potent GHG. But the probability is not known.

The idea of so-called tipping points is that it make concrete the Hawking notion of irreversibility. When S. Hawking suggested that climate change was irreversible, he was met wih 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.

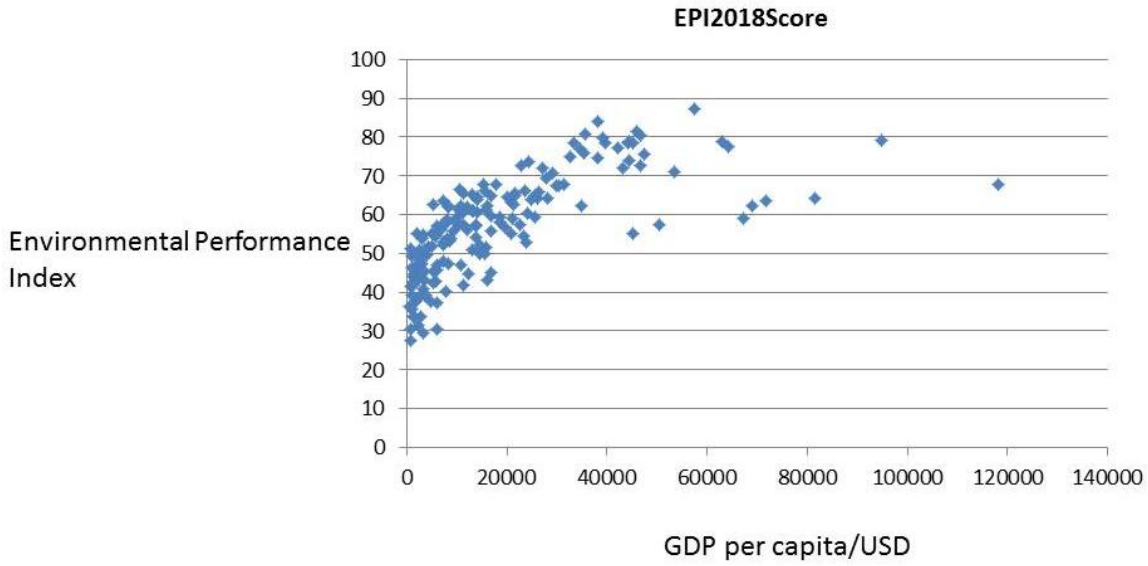
The big unresolved issue in abrupt climate change theory is the time horizon for the positive feedbacks: arctic ice melting, melting of ice and glaciers on Greeland and Antactica, arrival of serious drought in various regions and the start of decline in food and potable water resources. The biggest unknown is though the so-called methane bomb, which would kill mankind if it goes off 100 per cent.

Economic outpout must sooner or later start declining due to immense capital destruction (drought, storms, fires, sea level rise, water shortages) and reduced labour productivity (fewer hours of work, ecology migrants, lack of potable water, ocean acidification).. The economic emphasis in this approach to global warming is cost, which may be estimated in different ways. In the new US report, it is said that the cost could go to 10% of the GDP already by 2030 - . But a few climate scientists speak of the entire demise of mankind in a short period, e.g. G. McPherson. Some sectors of the economy face bigger costs than others – agriculture, fishery. And several countries or regions will be more hurt than others – tropical or arid ones. If glaciers and ice melt, then dams may produce much less electricity as huge rivers start drying up. All these projections assume that nothing is done to halt global warming or that new technologies to stem GHG increase is not found. But maybe all of this abrupt climate change lacks proper evidence?

SCENARIO TWO: CORNUCOPIANISM OR "BUSINESS AS USUAL"

Aaron Wildavsky claimed 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 (Wildavsky, 1988),, he and other so-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 here summarized one index.

Figure 1. GDP and the overall human condition



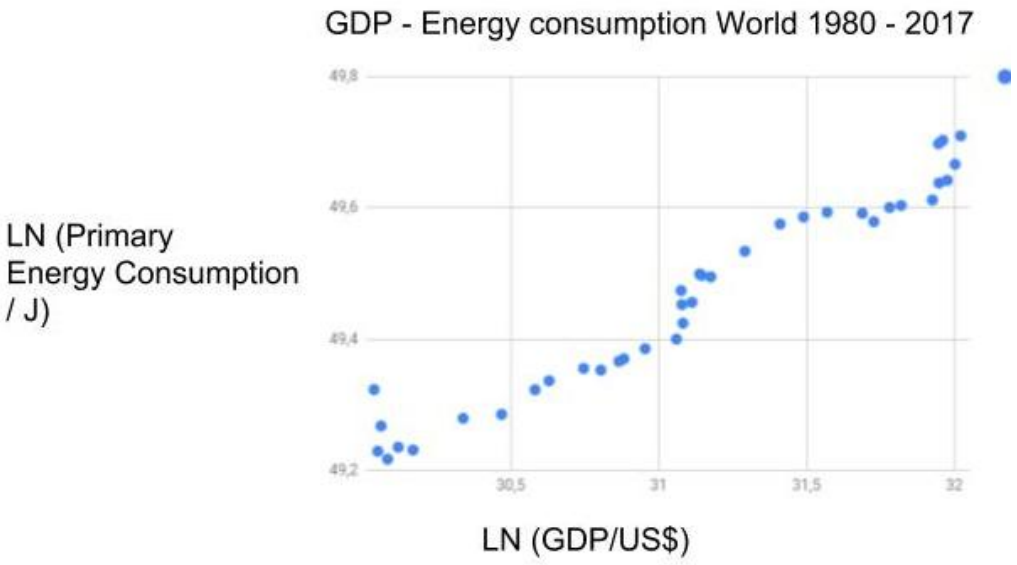
Source: Environmental Performance Index, Yale University, https://epi.envirocenter.yale.
World Bank Data Indicators

And they would say that private property rights protect everyone's environment. Thus, the growth of the market economy and its institutions is highly beneficial for mankind. 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 Hawking irreversibility – the core concept of the ecologists. Let us understand why cornucopianism is so power when it come to the economy and global warming.

Energy, or the capacity to do work potentially or actually, is key in economic growth for enterprises in rich countries. And energy is absolutely essential in socio-economic development in poor nations. The central position of economic growth in rich countries and of socio-economic development in poor countries is much in consonance with basic human drives as well as with the logic of vibrant capitalism in the global market economy. Governments and politicians cherish economic growth, because it makes more policy-making possible.

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 2 shows the tight relation between affluence and energy consumption.

Figure 2. Affluence and energy globally



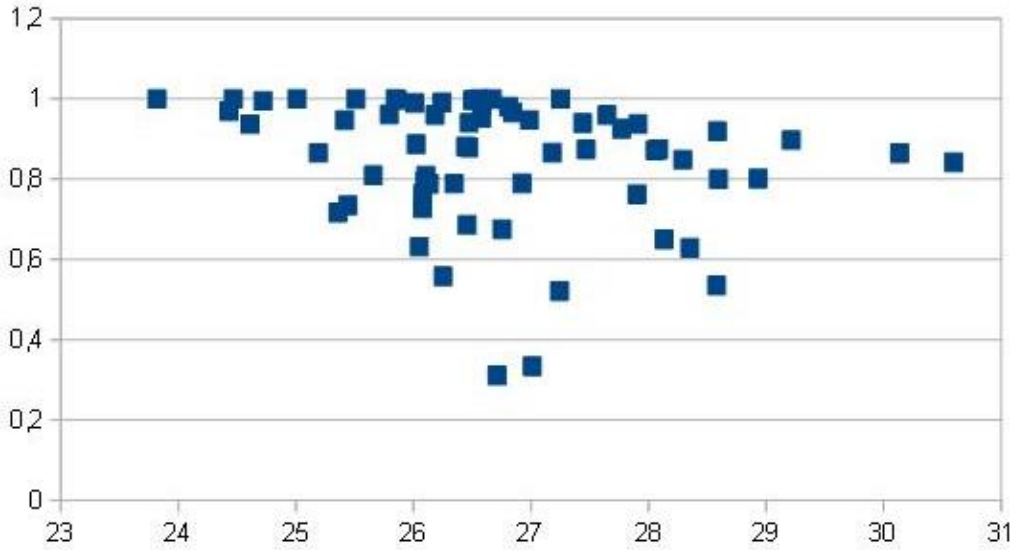
Note: R2 = 0.951

Sources: BP Statistical Review of World Energy

World Bank Data Indicators

The enormous demand for more and more of energy comes with a major drawback, namely the GHG emissions. Figure 3 has the picture for the carbon intensity of energy, resulting in CO2s.

Figure 3. Carbon intensity of energy (fossil fuels/all energy)



Sources: BP Statistical Review of World Energy

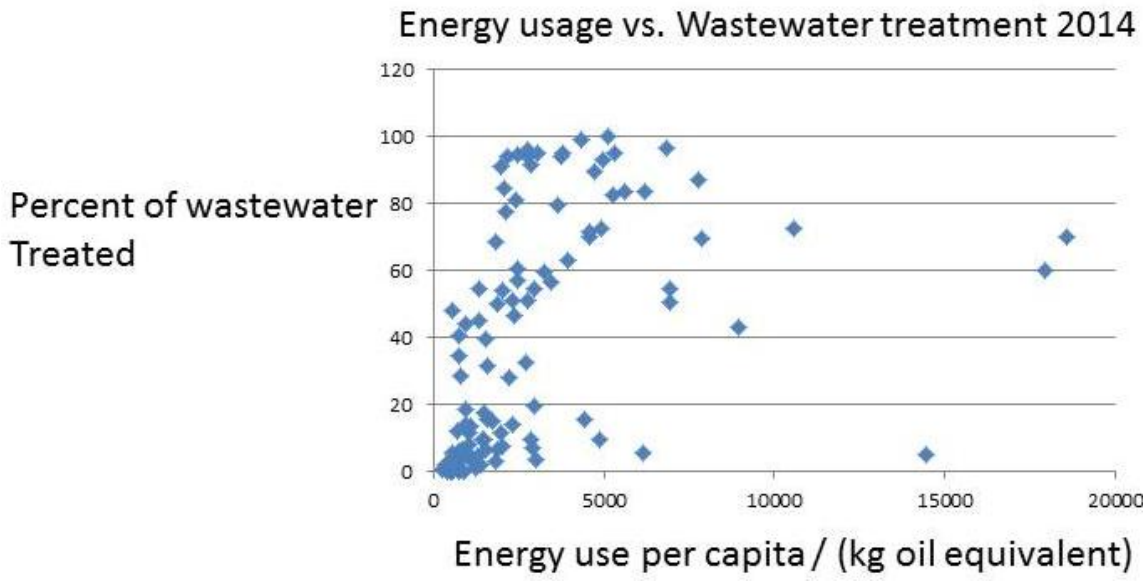
World Bank Data Indicators

Very few countries score under 50 per cent: Norway and Sweden, Switzerland, but several countries score 100% or close: The Gulf States, Algeria, former Soviet Union states = ”STANS”, Turkey, Mexico, etc.

Look at the evidence about the positive effects of energy for poor countries in the Figures below, linking energy consumption with human development indicators. The positive consequences of energy for quality of life and life opportunities, one understand the position of the Third World at the Paris meeting that decarbonisation must be combined with great economic assistance to make fundamental energy transformation. The result was the promise of a giant Super Fund, but it is only a promise too.

We start here with potable water (Figure 4) and wastewater, which are key in the UN developmental program.

Figure 4. Energy and water



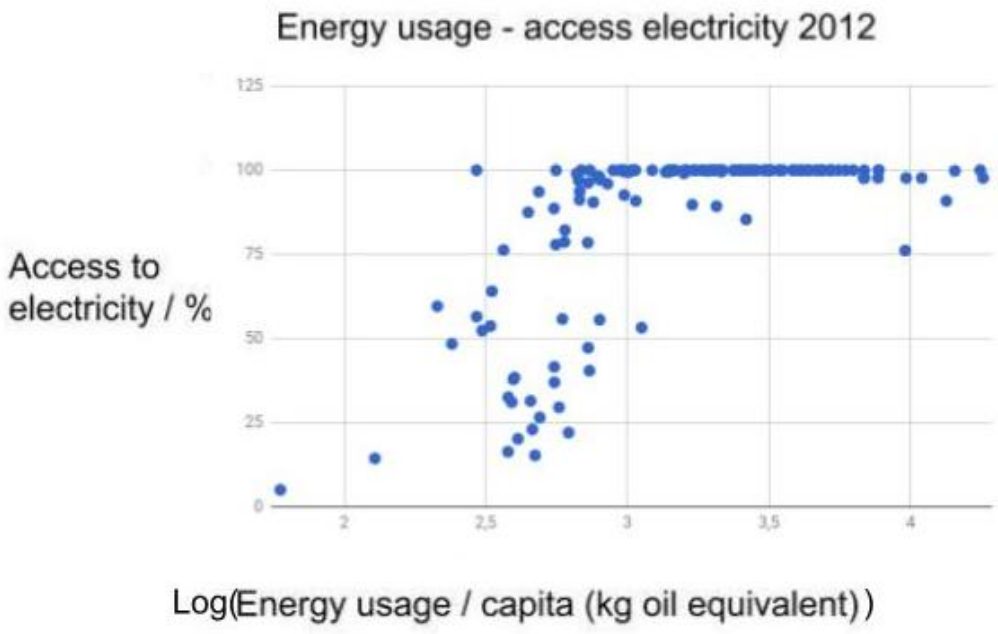
Source: Environmental Performance Index, Yale University, https://epi.envirocenter.yale.
IEA Statistics © OECD/IEA 2014 (http://www.iea.org/stats/inde

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. Hydro power

depends upon water availability that shrinks with global warming. African energy deficit is conducive to a dire environment with enormous damages and risks (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 the global picture.

Figure 5. Energy and electricity access

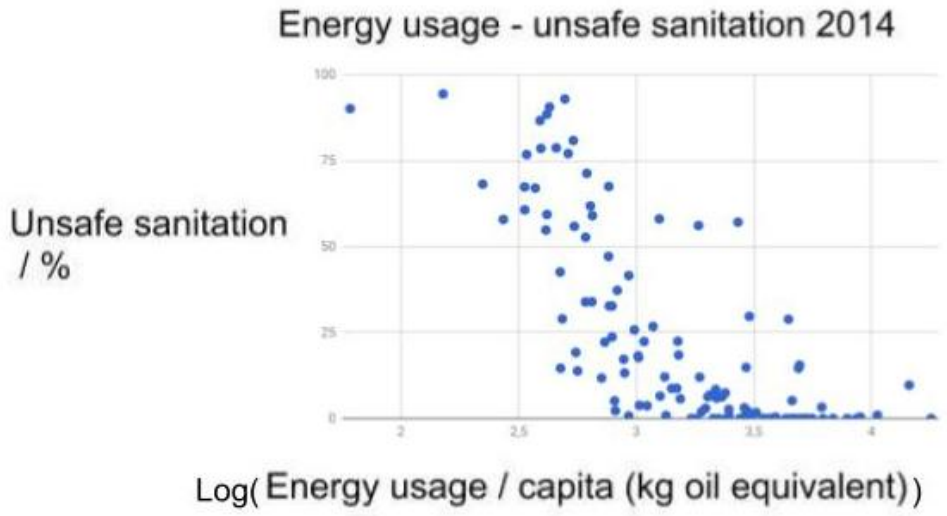


Source: Environmental Performance Index, Yale University, https://epi.envirocenter.yale.
IEA Statistics © OECD/IEA 2014 (http://www.iea.org/stats/inde

The access to safe and stable electricity is crucial for health, schools, food, water, etc. Especially, the rapidly growing African, Latin 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 6 underscores the necessity of more energy in poor countries for proper sanitation.

Figure 6. 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)

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. Cornucopians reject that relevance of decarbonisation because it would reduce affluence. They rely upn a small set of vocal critiques of abrupt climate change theory in the science community, arguing:

a) Temperature rise is exaggerated;

b) GHGs play no role for temperature;

c) Energy transformation is extremely costly and basically unnecessary.

Cornucopians find a few Nobel Laureates in physics holding these views, rejecting any consensus on global warming and cause.

SCENARIO THREE: TOWARDS A SUSTAINABLE ECONOMY

In the third approach to global warming the basic idea is that policies can help reducing climate change and its nefarious consequences as well as that it is worthwhile to pursue these, both nationally and internationally. Here we have framework with a number of hypotheses that start from the assumption that the present climate track of Mother Earth is not sustainable in order to propose sustainability enhancing measures. As the concepts of economic or ecological

sustainability is amorphous and open to moralism, we find several theories of sustainability, which I divide into two groups.

Utopian sustainability

Take the example of Jeffrey Sachs, stating about *SDG* (sustainable development goals):

… the SDGs need the identification of new
critical pathways to sustainability. Moving to a low-carbon
energy system, for example, will need an intricate global
interplay of research and development, public investments
in infrastructure (such as high-voltage direct current
transmission grids for long-distance power transmission),
private investments in renewable power generation, and
new strategies for regulation and urban design.
Source: 2210 www.thelancet.com Vol 379 June 9, 2012

Sachs realizes the gap between desirability and feasibility, but he confronts the gap by almost religious make beliefs

The SDGs will therefore need the unprecedented
mobilisation of global knowledge operating across many
sectors and regions. Governments, international institutions,
private business, academia, and civil society will
need to work together to identify the critical pathways to
success, in ways that combine technical expertise and
democratic representation.
Source: p. 2210, www.thelancet.com Vol 379 June 9, 2012

What is at stake for most people who understand the risks with climate change is not the desirability of decarbonisation in some form or another. They crux of the matter is: How to promote decarbonisation so that real life outcomes come about? The COP21 framework, and its three objectives, are:

a) Halting the increase in carbon emissions up to 2020 (Goal I),
b) Reducing CO2:s up until 2030 with some 40 per cent (Goal II),
c) Achieve more or less total decarbonisation until 2075 (Goal III).

Can SDG achieve really these objectives? But Sachs in addition wants also to promote the accomplishment of the UN sustainability goals (MDG) – a long list of developmental objectives.

Decarbonisation, resulting from the *anthropogenic* causes of CO2:s, can only be done when the fundamental pattern of energy consumption is transformed. At the present, energy comes from mainly fossil fuels and wood coal. Energy is the capacity to do work, which implies that energy consumption is a *sine qua non* for affluence, following A. Smith and J.B. Say among the classics. The utopians like Sachs promises that economic development will not be compromised, as SDG would include the Millennium Development Goals (*MDG*):

The SDGs should therefore pose goals and challenges for
all countries—not what the rich should do for the poor,
but what all countries together should do for the global
well-being of this generation and those to come. Middle income emerging economies, such as Brazil, China,
India, and others, will be crucial leaders of the SDGs,
and will have their own internal challenges of balancing
growth and environmental sustainability..
Source: p. 2208, www.thelancet.com Vol 379 June 9, 2012

Economic growth in advanced nations or economic development in the Third World has been based upon the burning of fossil fuels, besides the fact that extremely poor countries employ massive amounts of wood coal. And most countries, whether it be their governments or their private economies, plan for a sharp increase in energy consumption in the coming decades – hardly Sachs' scenario.

Practical sustainability

The framework of a sustainable economy harbors a multitude of theories like a new measurement of economic growth to take into account environmental costs, zero economic growth and different measures to steer the economy on a sustainable path.

One may turn to economist W. Nordhaus (2015) for a theory of the carbon tax in his "dice model". By making fossil fuels more expensive, a carbon tax would take care of the externality involved in all fossil fuel energy – greatest externality ever stated Stern. The dice model predicts a reduction in GHG emissions. What is contested is the size of the carbon tax necessary to achieve this as well as what the reaction will be by future generations. We cannot enter this technical debate with several participants, also Stern. The basic difficulty lies elsewhere, namely in Nordhaus' simple assumption about a global climate club that would

manage the carbon tax. Sustainable models tend to start from the notion that they can be workable globally – the global club assumption, which lies also at the centre of the COP21 approach of UNFCCC.

The COP21 Treaty introduces a so-called common pool regime in Elinor Ostrom's (1990) theory saying that voluntary cooperation by those concerned by externalities can solve the free rider problematic. The COP21 is an extremely large CPR, instructed to protect a common pool with free access. Ostrom was too optimistic that CPRs that they can handle the PD gaming, as defection is always an alternative (Dutta, 1998)

The threat to any global climate club is reneging, which one big partner already has done. Turkey may follow suit and perhaps also Australia. The relevant model of the management of the COP21 Treaty is the N-person PD game, which offers numerous possibilities for *defection*: goal displacement, insufficient means, information cheating, lack of funding, internal political instability, global super power clash, etc.

The PD nature of interaction in a global climate club like the COP21 Treaty or Nordhaus' climate or carbon club is fragile, to say the least. What is lacking is the instruments of control in global governance, as Hobbes pointed out already 1651 in his Leviathan, saying:

*(a) "*Covenants, without the sword, are but words and of no strength to secure a man at all."

(b)"Not believing in force is the same as not believing in gravitation."

The COP21 Treaty, or any other similar agreement, would have two parts:

i) reduction of CO2 emissions in a certain pace towards zero emissions at some future date;

ii) contributions to the Super Fund yearly according to some scheme and time table.

Both these two actions concern first and foremost the countries in the G20 group of nations, responsible for 70 per cent of the total CO2 emissions. Small poor nations can be left beside, as they pollute little and cannot be required to pay into the Super Fund. Both i) and ii) are just promises, which the COP21 Secretariat or the UN cannot enforce, strictly speaking. When or if a country receives support the Super Fund, there is some leverage to force obedience. However, a big poor country may simply refuse decarbonisation, if no assistance is provided.

Decarbonisation is costly in the short run for all countries, as the must replace existing energy plants with new, hopefully renewable energy resources. Contributing to the Super Fund is also costly in the short run. This sets up an interaction where a government may be tempted to defect from its promises to decarbonise or pay to the Super Fund.

A. *Strategy of poor nations: the N-1 problematic.* Poor or small nations will engage in opportunism with guile in order to avoid too large costs with the COP21 decarbonisation policy, pretending they matter very little for outcomes.

B. *Strategy of the rich country: the 1/N problematic.* Large or rich countries will find sacrifices that cannot be internalised as meaningless gifts to others, who may not be trusted to cooperate. Thus, the US reneged because it did not want to pay for decarbonisation in India.

Scholars have noted that climate policy-making on the UN level in various bodies is characterised by the strategy of delay (Conka, 2015; Vogler, 2016).

Climate sustainability

The only way to reduce the speed of climate change, avoiding inevitability, is to stop pumping GHGs into the atmosphere. This requires inter alia:

i) immediate stop to coal and charcoal in poor countries;

ii) replacing fossil fuel energy with solar panel parks of the Morroccan Quarzazate kind;

iii) initiate now large scale geo-engineering experiments to suck up CO2s or sequestrate CO2s..

Will these measures be taken by the UNFCCC or the G20 group of nations? Probably not. Why? Because of the ocean PD game involved. What matters to all countries and governments is access to *carbon intensive energy,* the culprit of the anthroposcene period Look at Germany and France.

Despite all propaganda about so-called *Energiwende,* Germany remain much dependent upon fossil fuels. High grade coal is imported from Russia and Colombia to add to its own low grade and dirtier coal, besides all the natural gas from Gazprom. At the same time, nuclear power are closing – all up to 2022. France is also closing nuclear plants, despite the fact that they could be used longer and made safer. Both countries should turn to solar power – see Table 1, but may be expected to burn biomass or biotrash, which emits CO2 inter alia.

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
Germany	49[iv]	550	450
France	37[v]	210	220
Sweden	42[v]	30	30
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 current level, no reduction; iv) Upper limit dependent on receiving financial support; v) EU joint pledge of 40 % compared to 1990

The decrbonisation goal of COP21 requires the support of the big countries in the world. But do they really aim at decarbonisation? We look at three examples here.

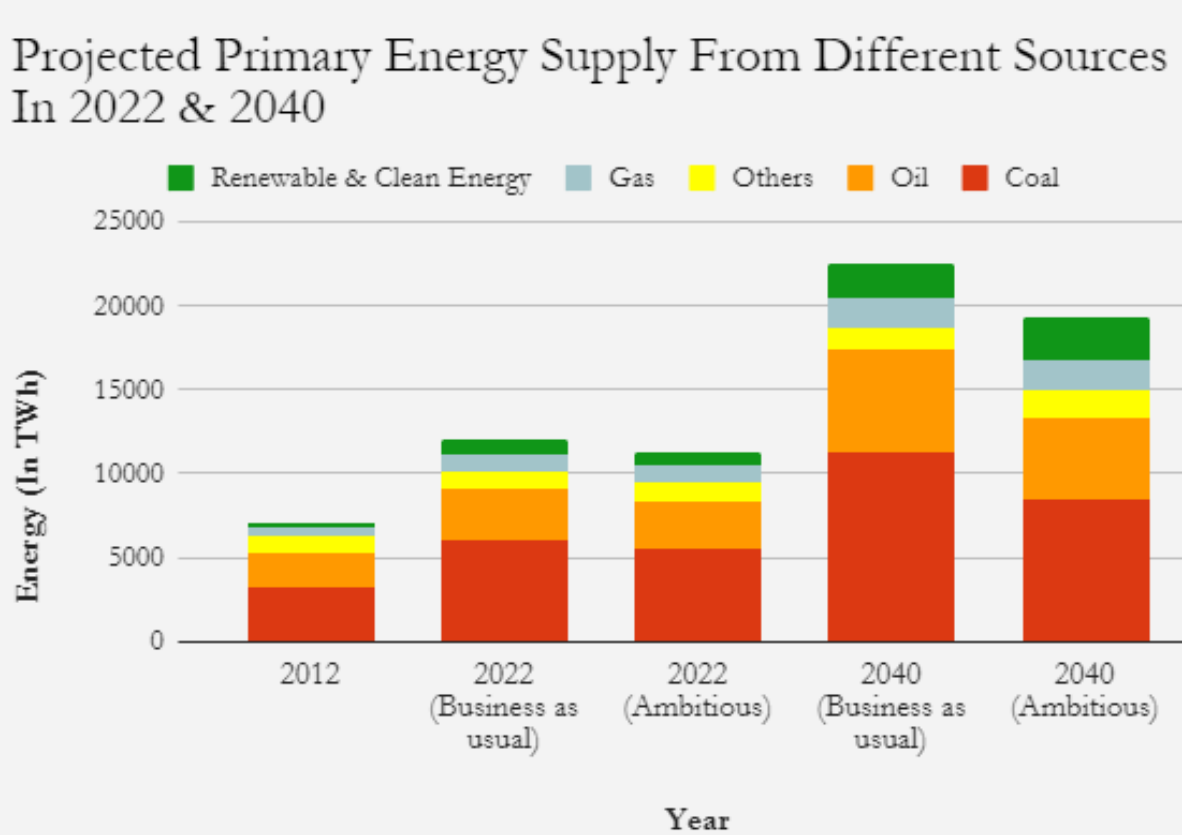
SCENARIO FOUR: GLOBAL ECONOMY TURNING TO RENEWABLES BUT NO DECARONISATION

Real economic developments follow none of the three alternative theoretical approaches above, as the global economy employs more renewables than before and invests in new technology to replace especially coal and oil, but at the same decarbonisation is not getting off the ground. On the contrary, the Keeling curvr increases. We see in a few examples below that huge economies simply add renewable energy to the established structure of fossil fuel dominated supply – no substitution.

India

In Indian energy policies, it is emphasized that developmental goals take precedence over climate change considerations. Thus, all Indian household must 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 7 shows the main features of India’s future planning.

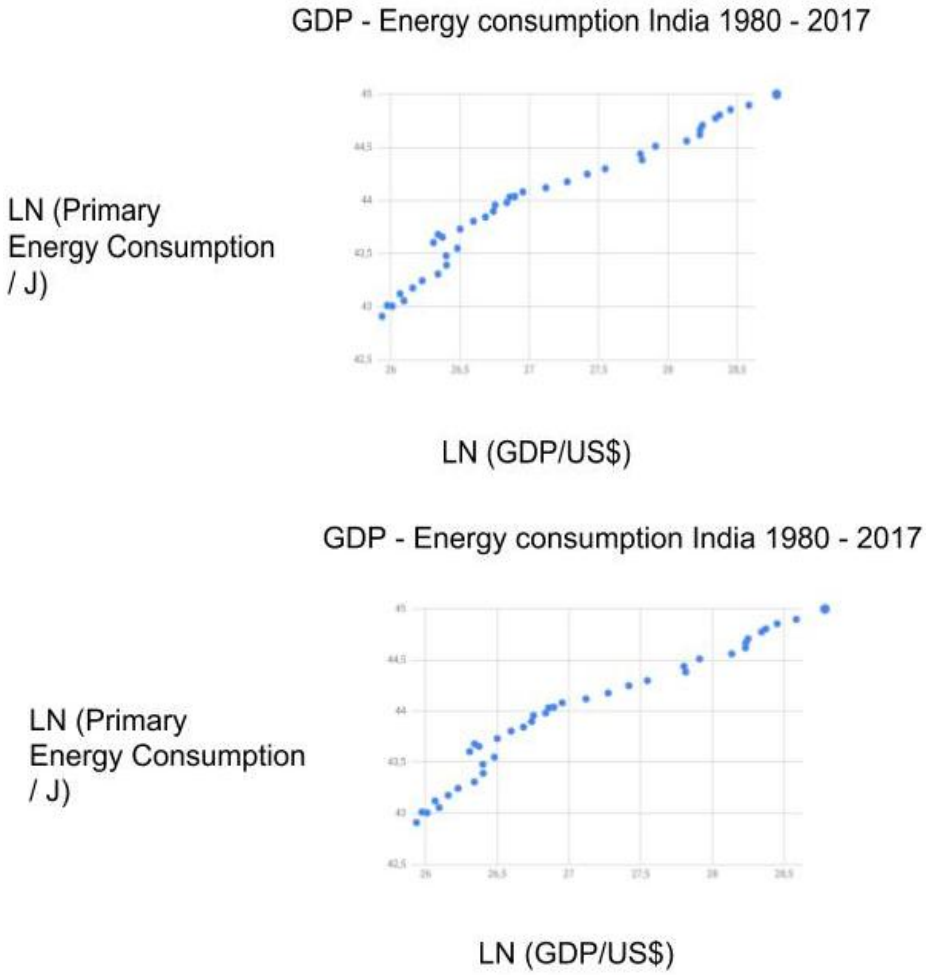
Figure 7. India`s energy future



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 7 indicates the India cannot meet its COP21 promises, as Ramesh (2015) underlines. India shows the same close link betwee GDP and energy consumption (Figure 8).

Figure 8. GDP and energy in India



Note: R2=0.94

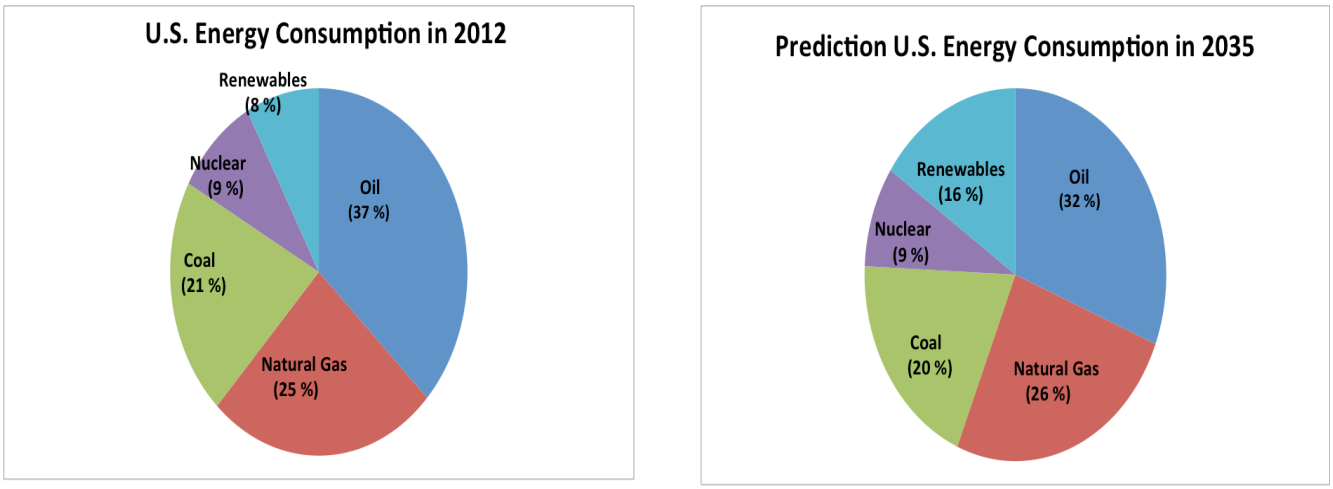
Sources: BP Statistical Review of World Energy
World Bank Data Indicators

Given this close connection between GDP and energy consumption in India, the risk is of course that further socio-economic developments will increase GHG emissions. India is hardly on the decarbomisation road.

USA

The US has reduced its CO2 emissions during the last 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 9 captures some features in US energy plans.

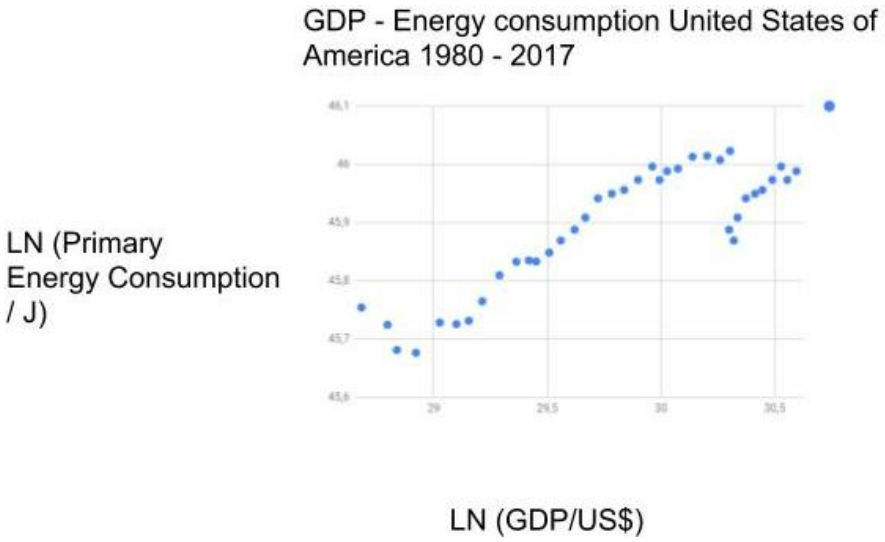
Figure 9. US energy future



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

Although the Figure 10 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 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.

Figure 10. GDP and energy for the USA



Note: R2 = 0.77

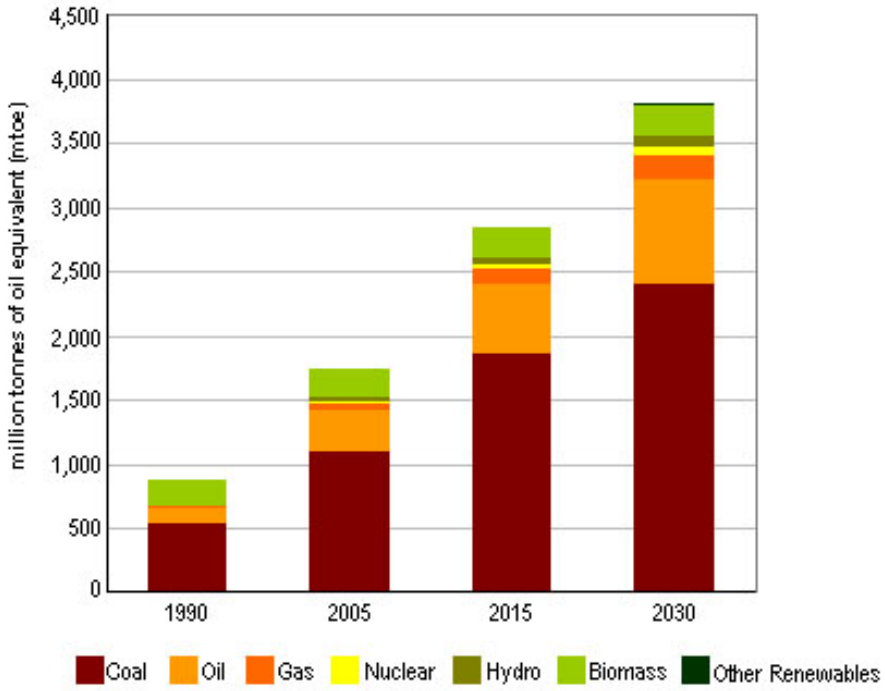
Sources: BP Statistical Review of World Energy
World Bank Data Indicators

Although the link between GDP and energy consumption id less tight for the USA than India (Figure 10) reflecting that economic growth in advanced countries can be achieved without energy increase, it is still the case that the US is not on the road towards major decarbonisation.

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 of fossil fuels, has skyrocketed with GDP, resulting in the largest CO2 emission globally. Figure 11 has a projection for China.

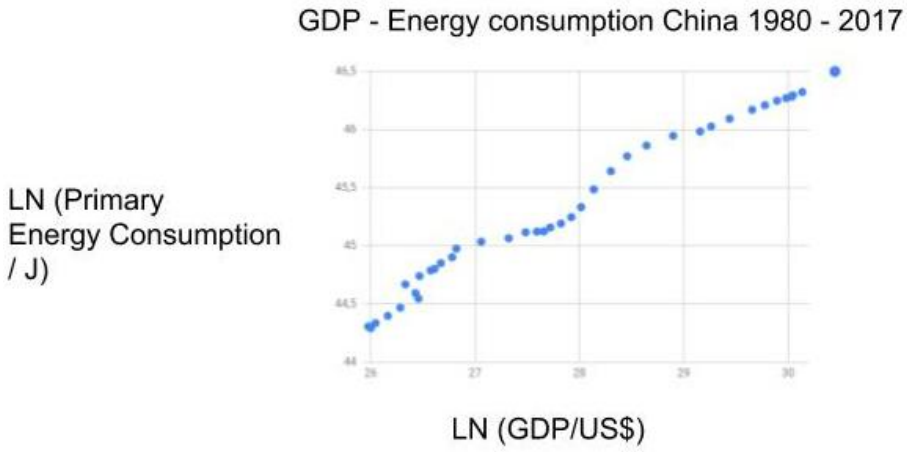
Figure 11. Energy projection for China



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

Decarbonisation 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 (Figure 12).

Figure 12. GDP and energy for China



Note: R2 = 0.98

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

Such a close connection between GDP and energy consumption in China implies that China must turn to renewables massively in order to comply with COP21 goals.

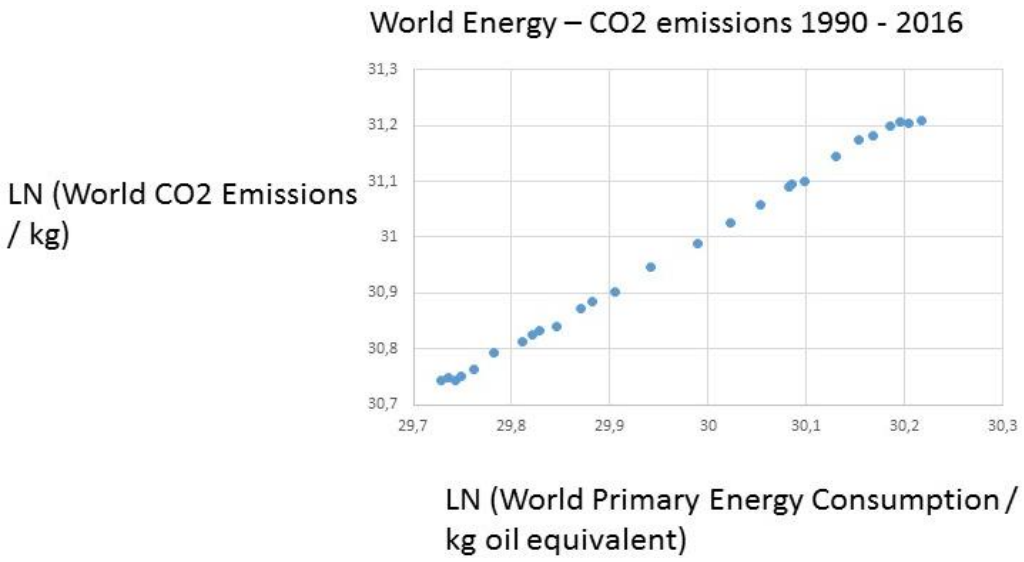
CONCLUSION

Stern's (2007, 2015) calls for a sustainable economy remain unanswered or perhaps not even heard by the decision-makers globally, like the G20 nations.. According to abrupt climate change theory, there will likely be a future dismal predicament with hunger, thirst, child morality, eco-emigrants at many places, fires in the Boreal forest as well as in the rain forest, agricultural failure, drought, enormous storms, and finally massive land inundations. Can war be avoided in such a predicament?

Yet, cornucopian theory asks about the time horizon for the positive feedbacks: arctic ice melting, melting of ice and glaciers on Greenland and Antarctica, arrival of serious drought in various regions and the start of decline in food and potable water resources. The biggest unknown is though that methane bomb, which would kill mankind if it goes off 100 per cent. And cornucopians theorize that these events constitute the climate bluff, an immense exaggeration in order to hurt the market economy, capitalism and the acquisitive spirit.

I will not take stand on these frameworks for analysing climate change from the economic viewpoint, but I wish to emphasize that the basic connection between energy consumption and emissions in Figure 13 is undeniable. If GHGs cause global warming, then planet Earth urgently needs energy transformation and its economics.

Figure 13. Energy and CO2 emissions



REFERENCES

Asian Development Bank (2015) Southeast Asia and the economics of global climate stabilization. Mandaluyong City, Philippines: Asian Development Bank.

BP Energy Outlook 2016.

British Petroleum Statistical Review of World Energy 2016.

Carbon Dioxide Information Analysis Center, Environmental Sciences Division, Oak Ridge National Laboratory, Tennessee, United States.

Clark W. (2018) (ed.) “Trajectories of the Earth System in the Anthropocene”, (https://doi.org/10.1073/pnas.1810141115), the transition from the Holoscene to the Anthroposcene period is launched:

CO2 Emission Reduction With Solar http://www.solarmango.com/in/tools/solar-carbon-emission-reduction

Conka, K. (2015) Un Unfinished Foundation. The United Nations and Global Environmental Governance. Oxford: OUP.

EDGAR v 4.3.2, European Commission, Joint Research Centre (JRC)/PBL Netherlands Environmental Assessment Agency. Emission Database for Global Atmospheric Research (EDGAR), release version 4.3.2. http://edgar.jrc.ec.europe.eu, 2016 forthcoming

Energy Information Administration. Washington, DC.

Environmental Performance Index, Yale University, https://epi.envirocenter.yale.

EU Emissions Database for Global Research EDGAR, http://edgar.jrc.ec.europa.eu/

EU Joint Research Centre Emission Database for Global Atmospheric Research - http://edgar.jrc.ec.europa.eu/overview.php

IEA Statistics © OECD/IEA 2014 (http://www.iea.org/stats/inde

Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II Jay, A., D.R. Reidmiller, C.W. Avery, D. Barrie, B.J. DeAngelo, A. Dave, M. Dzaugis, M. Kolian, K.L.M. Lewis, K. Reeves, and D. Winner, 2018: U.S. Global Change Research Program, Washington, DC, USA.

International Energy Agency. Paris.

IPCC (2018) Summary for Policymakers was formally approved at the First Joint Session of Working Groups I, II and III of the IPCC and accepted by the 48th Session of the IPCC, Incheon, Republic of Korea, 6 October 2018.

IPCC, 2018: Summary for Policymakers. In: Global warming of 1.5Â°C. An IPCC Special Report on the impacts of global warming of 1.5Â°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.

Keith, David W.; Holmes, Geoffrey; St. Angelo, David; Heidel, Kenton (2018). "A Process for Capturing CO2 from the Atmosphere". Joule. doi:10.1016/j.joule.2018.05.006. http://carbonengineering.com/

Lomborg, B. /2007) Cool It: The Skeptical Environmentalist's Guide to Global Warming.

Nordhaus, W, (2017) “Revisiting the social cost of carbon” PNAS: https://doi.org/10.1073/pnas.1609244114

OECD National Accounts data files

Paris 2015: Tracking country climate pledges. Carbon Brief, https://www.carbonbrief.org/paris-2015-tracking-country-climate-pledges

Ramesh, J. (2015) Green Signals: Ecology, Growth and Democracy in India (2015). Oxford : Oxford University Press.

Sachs, J. (August 10th, 2015) “Sustainable Development for Humanity’s Future” (http://jeffsachs.org/2015/08/sustainable-development-for-humanitys-future/)

Sachs, J.D. (2015) The Age of Sustainable Development. New York: Columbia University Press.

Simon, J. (2002) Against the Grain. An Autobiography. Piscataway: Transaction.

Stern, N. (2007) The Economics of Climate Change. Oxford: OUP.

Stern, N. (2015) What are we waiting for? Cambridge, MA: MIT Press.

UN Framework Convention on Climate Change, http://unfccc.int/ghg_data/ghg_data_unfccc/time_series_annex_i/items/3814.php

Vogler, J. (2016) Climate Change in World Politics. Basingstoke: Macmillan Palgrave.

Wildavsky, A. (1988) Searching for Safety. Piscataway: Transaction.

Wildavsky, A. (1997) “Is it Really True”. Cambridge, MA: Harvard U.P.

World Bank Data Indicators, data.worldbank.org

World Bank national accounts data - data.worldbank.org

World Resources Institute CAIT Climate Data Explorer - cait.wri.org