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After Paris a new period for mankind

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Abstract. Planet Earth now enters a new era characterized by the fight against global warming and it's consequences. Can countries or individuals adapt resiliently? Or will international governance finally make progress at COP 25 in Glasgow? We will soon reach more than 1.5 degrees plus. .

Keywords. Keeling curve, Greenhdeouse gases, Coal fired power plants, Temperature rise, Irreversible transformation.

JEL. Q10, O31, O33, Q01, Q16, Q18.

1. Introduction

Paris Agreement 2015 has a complex structure with several different mechanismstyles to reduce the pressures upon mankind from climate, change. Thus, it combines promise with market mechanism. Yet, the situation today is worse than 2015.

Interestingly, the inhabitants of the world may follow this unfolding drama day by day. The key is the so-called Keeling curve measuring the global CO2 concentration in the atmosphere. On the 4th of February it stood at 414.5, up.from 410,7 a year ago. It seems that global warming is accelerating. What can the next UN meeting do: COP 25 in Glasgow?

2. Resilience and adaptations

Since the Paris COP 20 general awareness of climate change has spread much among consumers and enterprises. A new management theory is called for with private firms working for reducing their carbon footprint. Once started to find energy alternatives, both companies and individuals can do lots in favour of sustainability

The start of the transformation of the car industry is spectacular. Although, firMs are not fond of carbon charges they fear climate change. So far stock-markets neglect climate change. Perhaps economic life hopes for a successful adaptation from the large resilient countries?

Yet, some day later or rather sooner investors will take into account the risk of climate change, involving higher costs and lower demand. As hoarding money becomes attractive, the economy stops to grow. When? - a pertinent question. It all depends on the pace of global warming, which in turn deposits upon how much greenhous gases mankind puts out.

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3. Non-excludability

Climate change is driven by the force of an externality: the external effect hits people who can not avoid it and benefits the people delivering it. Marfet failure occurs as the external effect can not be internalised as a cost or price. Negative externalities can be reduced only by government interventions like law or imposed charges.

The non-excludability of countries from greenhouse gases is at the core of the global warming problematical: it is advantageous for a country to burn fossil fuels without paying for the pollution damages, but all countries have to take the negative consequences of this pollution. This sets up the mutual interdependence between the countries of the world, to be handled by means of international governance.

For a long period of 30 years the United Nations have attempted a negotiated settlement about the necessary reductions of Co2s involving several steps towards the goal of zero emissions in this century. Thus far global governance has failed, as emissions keep increasing. an Agreement has been signed - Paris 2016, but it has no implement mechanism. The UN COP program has bought out a wealth of information supporting the greenhouse theory that argues that global average will rise with Co2 emissions; resulting in more negative outcomes. Why not cut back the source of the greenhouse gases: the fossil fuels?

4. Energy in global policy discussion

Global emissions cooperation has failed because what is at stake is energy and energy translating into economic and political power. Energy is needed all the time and for a huge variety of purposes. Changes in energy supply are accompanied by macro social transformation This holds true in agriculture; industry; services and military affairs Given the importance of energy in society and political matters, it is not astonishing that governments put a high priority onto having plenty of energy available somehow at a low cost. Our civilisations use energy to get to energy sources and the consumption of energy is a key element in providing for economic welfare in rich countries and economic development in poor countries.

In the industrial period of human existence energy from burning fossil fuels constitute the dominant sources, up 80% on average and more in a few countries. Besides there is atomic power; biomass and renewables as well as water power.

Thus; we arrive at the heart of the matter: Can greenhouse gases like Co2 be cut back without reducing energy consumption? Post Second World War developments have resulted in a dramatic increase in greenhouse gases - see Figure 1 - accompanying the equally conspicuous rise in energy consumption.

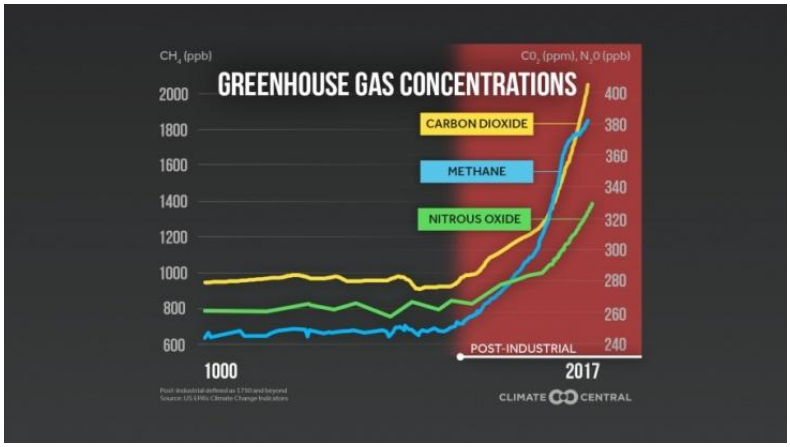

Figure 1. *Greenhouse Gas Concentrations from pre-industrial times to 2017 (Climate Central).*

Most Co2s derive from burning fossil fuels.

5. The policy problem: Reducing CO2s

Global policy coordination has despite 30 years of negotiations and inquiries only come up with a soft goal: a) no Co2s increase from 2020; 30% reduction in Co2s up to 2030; climate neutral energy from 2075. But no concrete measure have yet been taken, as there is little agreement on size of emissions decreases.

Since the emissions are linked with energy, the fear is that reductions of Co2S will hurt economic growth or socio-economic development. Poor countries argue that rich countries should reduce .more or pay compensation. There was talg about a 100 biĺlion $ fund at the Paris meeting in 2016, but it has not been set up yet.

Consider the relationship between GDP and energy over time (Figure 2).

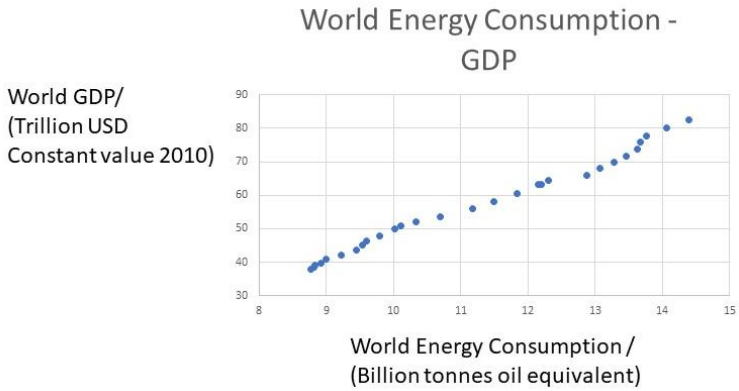

Figure 2. *Link Energy Consumption – GDP. (OECD, World Bank)*

As countries now plan for more of energy, they rely upon renewables. However, the renewables are looked up as supplement or additions to existing energy profile and may not reduce the burning of fossil fuels much.

Let us look at Table 1 that outlines an energy transformation from coal to renewables. The numbers shown represent the number of world record size solar plants each nation would need to replace their entire coal plant setup. As a benchmark, the Bhadla Solar Park near Jodhpur with an output of 2245 MW has been used.

Table 1. *Number of solar plants needed to replace coal by country*

Country	Number of plants
Asia:	
China	475
India	100
Japan	28
South Korea	18
Turkey	9
Americas	
United States	106
Colombia	1
Europe:	
Germany	32
Russia	30
Africa:	
South Africa	14

Table 1 shows the "big sinners" in this global game of climate change. What is a *just* energy transformation? Should the five biggest coal polluters simply remove their plants without compensation? Would this be realistic for China, India and Russia? Under what conditions would developing countries accept such proposals, which would cut Co2 emissions considerably? Perhaps demand that rich countries do the same and pay for the costs of the poor countries? Maybe the US and the EU adduce reservations? Then China may do the same. It's numbers are definitely a Hugh non-excludability for Earth. Surely it is feasible for Japan, South Korea and Germany, the current U.S. administration has reneged.

Dismantle coal power plants? But replacements? Renewables is one alternative as so is natural gas with lower Co2s than coal. Cost? Who pays? Perhaps a colonial compensation?

6. A common pool regime (CPR)

There are a few ways to cut down Co2 emissions such as carbon capture ex ante production or ecological post sequestration. Whatever policy method one may usd:

1) carbon tax
2) emissions market
3) carbon capture and storage
4) voluntary reductions
5) increase in energy efficiency,

One would still need a global accord about ths distribution of benefits and costs. If China should close it's coal business, then the rest of the world would benefit but will it pay compensation? One could argue that energy

transformation is good for Chinese people. Can states be "forced" to give up coal by other countries in a CPR? Hardly. The CPR of the UN - - will not accomplish global governance of climate change due to the oppertunism with guile with players in this ocean PD game. The long series of global reunions serve like a Potemkin village to hide that only energy change can reduce emissions. Most countries plan for huge increase in energy consumption the coming decadeS.

7. Policy confusion

The EU says it will burn no fossil fuels and thus have zero emissions by 2050. Not realistic and too late. Oil and gas will be consumed for the entire century. It is coal that must be stopped as energy source - both stone and wood coal. Germany has declared that it will have closed it's many coal power plants by 2038 - again very late. Will all of Eastern Europe do the same?

Germany now phases out all nuclear reactors by 2022, which is contrary to the EU ambition to become carbon neutral. Will France do the same with some it's many reactors? Then, on what power resources shall the might of EU rest upon? Renewables? Not enough! Biomass? Coal again.

It is remarkable that the use of market mechanisms – carbon taxes and carbon trading - has not succeeded in stopping the rise of CO2 concentration in the atmosphere. Although several countries employ these mechanisms, they simply do not work according to theory, some scholars arguing that they constitute failures (Böhm & Dhabi, 2009). Neither have the presented attempts for carbon capture been successful on a global scale. What is urgent is that national emissions of greenhouse gases are reduced, as was agreed upon in the Paris agreement. It is peculiar that not even the European union has been able to reach a unified position regarding the policy against CO2 emissions.

8. The road into climate change

It is true that some countries have finally begun adapting to climate change. One may mention the transformation in the automobile sector with the coming of EVs as well as the search for more efficient batteries. However, the Keeling curve is still rising, because energy consumption is still dominated by the burning of fossil fuels.

Let us assume that the next decade will be “business as usual”, in the sense that global governmental coordination does not deliver and that adaptation remains rather weak with few exceptions. Then we are on the road to the following global warming scenario.

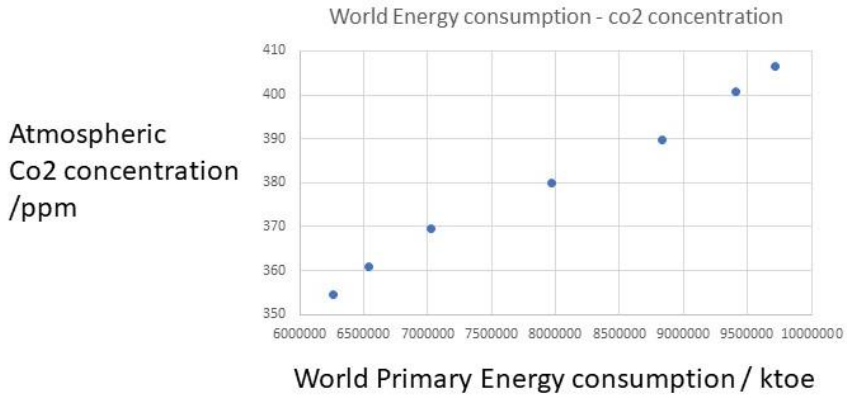

Figure 3. *Link Energy Consumption – CO2 Concentration (IEA, ESRL).*

Figure 3 regresses atmospheric CO2 concentration on global energy consumption.

The fitted linear trendline is: Y=0,00001 * x + 267,51, R2=0,992. The next step is to regress temperature rise on CO2 concentration.

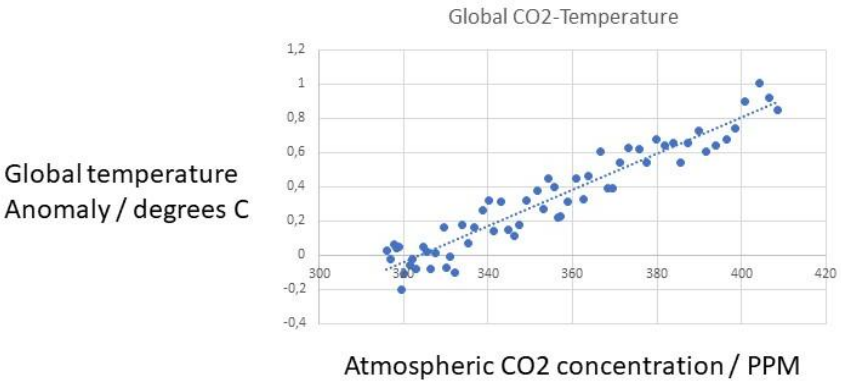

Figure 4. *Link CO2 concentration – Temperature Rise (ESRL, NASA)*

The shown trendline follows the equation:

$$Y = -3{,}4277 + 0{,}0106x$$

By combining these formula, we arrive at the following scenario:

Table 2. *Regression estimates for temperature rise based on energy consumption.*

Global Energy / btoe	CO2 concentration / PPM	Temperature rise / degrees C
16	430	1.1
18	450	1.3
20	470	1.5
22	490	1.7
24	510	2.0

The idea of global warming irreversibility implies that planet Earth will keep getting warmer year by year. There is no going back unless we turn to

massive carbon capture. How fast it will rise depends primarily on energy consumption, but we may reach + 2 degrees already during this decade. As long as the world pours out gigantic emissions, the Keeling curve will keep rising. The idea of zero carbon emissions is a figment of imagination. What happens when we move towards 3 or 4 degrees is entirely unknown. The survival of advanced life is from now on threatened.

9. Conclusion

One may perhaps say that the history of mankind starting 400,000 years ago with the Cro Magnons leaving Africa has entered a new era: the global warming period. It will stick with all countries for as long as they continue this pattern of energy consumption. The underlying reason is the search for affluence (see figure 5).

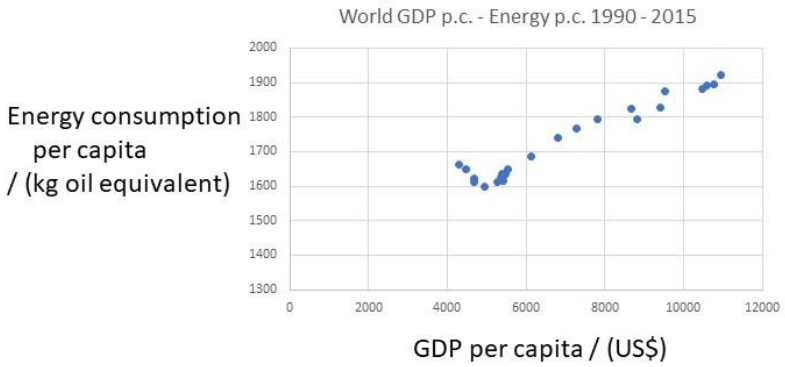

Figure 5. *Link Global GDP per capita – Energy Consumption per capita (World Bank, IEA).*

Some commentators have started talking about major wars as the result of climate change, but this is irrelevant. If the nations of the world fail to stop global warming, then what is the point of conducting global wars?

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