

# The Great Drama, Global Warming and Its Mechanism

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## Abstract

Well-known professor Johan Rockström at Stockholm University claims that we are in control of things, now that the Earth Sciences have proven the biological limits of our existing civilisations. But we do not know or have not begun the necessary large global adjustments towards a sustainable Planet Earth. The failure of the UN COP framework is blatant stating the ends but not the means of reducing significantly CO<sub>2</sub> emissions. All major countries plan for much more energy in coming decades treating renewable energy sources as merely compliment to fossil fuels, not substitutes. To accomplish the Paris Accord objectives (COP 21), coal power should be phased out.

**Keywords:** COP, PARIS objectives, average temperature - CO<sub>2</sub> concentration, energy growth, Hawking irreversibility

## 1. Introduction

The process of climate change is to be regarded as a phase in planet Earth's evolution. It has the Hawking's irreversible property meaning it will get warmer - how fast depends on human activity. There are four functions involved in global warming equations, namely

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1). Energy = Power

2). CO<sub>2</sub> concentration = Energy

3). CO<sub>2</sub> concentration = Temperature

4). Temperature = Global warming outcomes

## 2. Demand for and Supply of Energy

Here we concentrate upon the second and the third equations. The major energy consuming countries in total are the giant with large populations. The major energy consumption per capita countries are the affluent ones. Whatever one produces energy is demanded. However and wherever one lives energy must be supplied.

Governments know that energy is vital whether facing or poor countries. All of them plan for considerable increases in energy consumption. Of course, military might depends upon easy access to oil, gas or uranium. In the Eastern front e.g. the Wehrmacht often lacked petrol for some of the tanks. Hitler took the fatal decision to divide the OSTHEER into 3 armies sending one of them to chase oil in the Baku area. where Nobel's brother had started oil fields. Japanese aggression in East Asia was driven partly by hunt for energy. Today Japan faces a severe stable energy shortage. When the USSR couldn't supply cheap energy to its empire it was a sign of coming collapse. The connection between energy and economic development or growth is similar.

## 3. International Governance and Coordination Failure

The UN has attempted international governance of climate change by means of its COP program and other efforts as well. Max Weber stated that we must analyse action as oriented in terms of ends and means. But the many COP meetings with massive participation has thus far only delivered goals - lower CO<sub>3</sub> emissions - no means. Climate change AFFIRMERS warn of the dire effects of global warming. Climate change DENIERS ridicule this. Global opinion seems to swing in favour of the former now but most Government dirty support the latter. One would like to know when the outcomes of global warming become truly horrific. If it is the case that climate change is unstoppable (Hawking irreversibility), then when will this be undeniably visible? Several ecological disasters occur new weekly around the globe. Are they due to rising temperatures? Ecologists speak of a gigantic crisis for Planet Earth with the

extinction of many species, True ? Gould global warming be indirectly the cause of many disasters?

#### 4. A Tentative Model

The yearly rises in average global temperature are well documented. Diagram 1 has the overall picture for more than one hundred Years, starting from 1880, set as 0. What could account for these ups and downs? Following the discovery or scientific revolution by S. Schneider, we try the amount of CO<sub>2</sub> emissions yearly. Thus, we have:

x=atmosphere concentration CO<sub>2</sub> in ppm

y= change in global surface temperature relative to 1951-1980 average temperatures

(I) Regression line:  $y = -3,4277 + 0,0106x$

Increase by 1 ppm CO<sub>2</sub> leads to increase in global temperature 0,01 degrees

CO<sub>2</sub> concentration has grown from 315 to 410 so temperature has risen with c:a 1 degree as figure shows.

R-squared = 0.913. A spurious correlation ? Self-evident? No. Probably not, as it reflects the rising dependence on energy from fossil fuels. The fossil fuels are in much demand, because they offer cheap energy which is vital for affluence.

Is the planet already at its Hawking irreversibility? The notion of irreversible transformation is very menacing, as policy could only slow down the arrival of a global disaster There is a way to find out about irreversibility, namely to consult the global thermometer CO<sub>2</sub> daily: 28/12 at 412 ppm and 408 one year ago (CO<sub>2</sub>).

#### 5. Energy Today and Tomorrow

The demand for energy is rising rapidly meaning fossil fuels may only diminish relatively. Look at the BP global images in Figure 1 in the conclusion. In this projection energy demand grows sharply as economic growth and development keep rolling on in both rich and poor Countries – unstoppable it seems at least. Renewable are poised to replace coal, but it is Merely a chimera. Coal will be reduced relatively speaking but not much absolute. This is not the place to analyse at length the various policies for alleviating poverty around the globe. What is to be emphasized is that poverty reduction necessarily involves country Economic growth or development. Thus, the enormous economic advances in East Asia have Lifted millions out of poverty. But the price is heavy air pollution. India is faced with the very Same problematic - rapid economic growth versus environmental degradation. Poor countries can NOT bypass the general relationship between socio-economic development on the one hand and increasing CO<sub>2</sub> demand on the other hand. The two horns of this global dilemma are poverty reduction and CO<sub>2</sub> increased where both outcomes are driven by economic growth. It is urgent to invent how development can be promoted by carbon neutral economic growth. Development can be carbon neutral.

Several countries have decided to abandon their nuclear plants for renewables. To shut down and dismantle an atomic station is extremely costly, especially if done prematurely. The Fukushima catastrophe became a starting signal for atomic power close down in Germany and France. However, Sweden began already around 2000 to prematurely abandon nuclear power. One can mention that Sweden is about to replace atomic power with a large expansion of biomass. However, burning biomass also results in CO<sub>2</sub> emissions and other forms of pollution. The thesis that biomass is carbon neutral is flawed, because it requires that forests are cleared, and they may not be replaced. Sweden has much lower CO<sub>2</sub>s than capital than Denmark and Norway, but it may simply be an accounting trick.

Below we make an attempt to calculate how much solar energy would be required to replace coal power. As benchmark the Bhadla Solar Park in India is used, projected to deliver 2255 MW once construction is ready from December 2019. In all, 900 such plants would be necessary to completely eliminate all coal power generated in 2018. Table I illustrates how many solar plants of this size each of the ten biggest coal producing nations would need to install to replace their entire coal power production.

#### 6. Solar Power

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Table 1. Number of Bhadla Solar Park plants required to replace coal power by country (Global Energy Monitor).

Country Number of solar plants

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

7. Sustainability

Cambridge Dictionary lists two meanings of “sustainable”; able to continue over the period of time firstly, and secondly causing no or little damage to the environment. Taking together these two concepts fit well into the environmental framework, but they do not apply to the demand and supply of energy. Here we need a second equation, namely:

(II)  $CO_2 \text{ concentration in ppm} = 267.5 + 10 * \text{Energy in Billion tonnes of oil equivalent};$

R squared equals 0.992.

The regression tells us that one billion energy amounts to ten CO2 ppm.

Now, we can predict using these two equations (I) and (II) that temperature rise will be beyond the Paris Objectives. Look at figure 1 below.

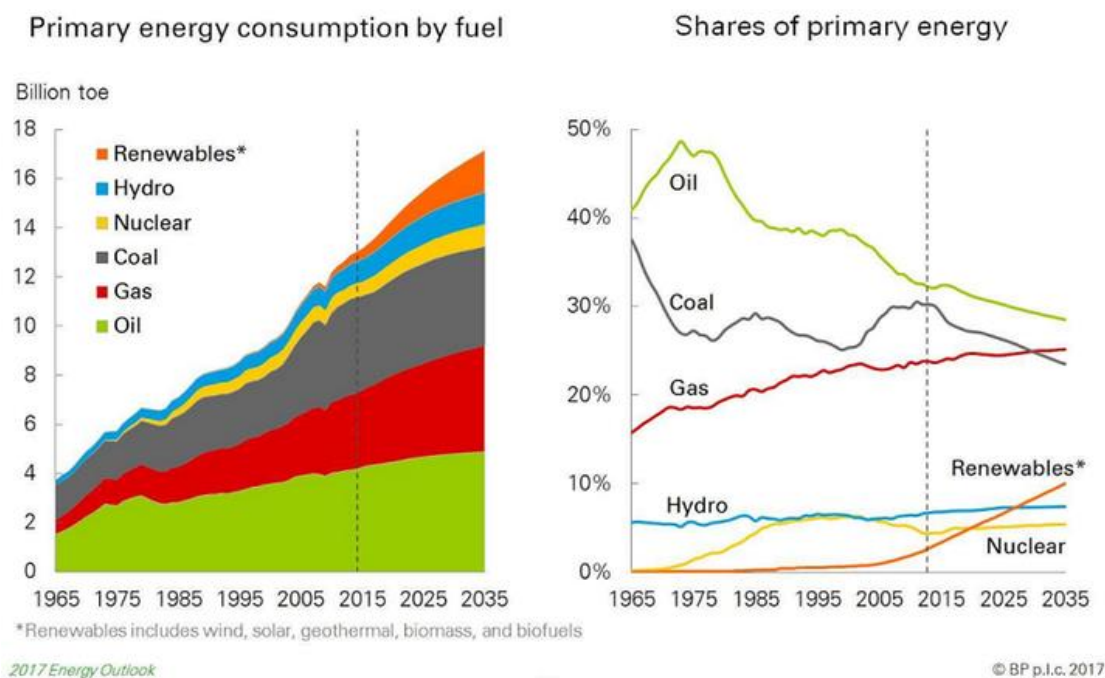


Figure 1. Primary Energy projections (BP)

## 8. Conclusion

Following the logic of the model on (I and II), one cannot but arrive at a sinister future for mankind. At levels of CO<sub>2</sub> 450 ppm the negative outcomes of global warming will be much stronger. The best way to counteract is simply to close all coal plants right now. The global close down of coal fired power and heat would signal the environmentalism is top priority.

Any realist theory of greenhouse gas emissions must target CO<sub>2</sub>s. It predicts the following consequences of CO<sub>2</sub> emissions:

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

Global Energy / btoe	CO <sub>2</sub> 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

In Table 2 the relationship between energy consumption and temperature rise is modelled. Energy consumption is near 16 billion with + 1 degree. Looking at stylised projections, we will move towards 24 billion with + 2 degrees. That would create lots of difficult problems for mankind.

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