Economics, Law and Policy
ISSN 2576-2060 (Print) ISSN 2576-2052 (Online)
Vol. 1, No. 1, 2018
www.scholink.org/ojs/index.php/elp

Original Paper

Global Energy and CO2s: Defection Risk

Jan-Erik Lane[1*]

[1] Fellow with Public Policy Institute, Belgrade, Serbia

[*] Jan-Erik Lane, 10 Charles Humbert, 1205 Geneva; 559 A, 3rd Floor, Thuya Street, 9th Quarter, Yangon, Myanmar

Received: December 11, 2017 Accepted: December 13, 2017 Online Published: December 22, 2017

doi:10.22158/elp.v1n1p1 URL: http://dx.doi.org/10.22158/elp.v1n1p1

Abstract

It is fair to judge that the UNFCCC's COP23 in Bonn this fall ended in nothing. Thus far, there is no implementation plan or set of management strategies for the COP21 TREATY in Paris 2015. Instead, a new reunion has been called for 2018 in Polish Katowice, with its huge coal mines-Poland relies almost to 70 % on coal. At the same time, Germany acknowledges that it cannot cut back coal as promised, but I will close atomic power stations down! Here, we examine the defection option against the COP21 Treaty. Other nations may be tempted by reneging.

Keywords

global decarbonisation, COP21 Treaty, COP23, compliance against defection, common pool regime, reneging

1. Introduction

The states of the world have been committed by their governments at the Paris COP21 meeting to decarbonize their economies according to a strict schedule for the 21st century. This implies giving up fossil fuels as the chief energy source for the economy in a broad sense. At the same time, nations around the world are eager to continue socio-economic development, emerging economies striving to "catch-up"; having recently "taken-off", while rich countries underline the necessity of economic growth. Thus, they plan for more demand for energy. Is there a policy contradiction here?

Just before the start of the UN global environment reunion COP23 (6-13 November, 2017) in Bonn, the study "Climate Science Special Report: Fourth National Climate Assessment" (USGCRP, 2017): was published in Washington, enquiring into the global warming consequences for especially the US but also the world. Besides rendering a long list of climate change consequences, this major report shows without a reasonable doubt that global warming is linked primarily with the anthropogenic causes of greenhouse gases, especially CO2s. CO2s have increased much the last two decades due to the

augmentation in the burning of fossil fuels as the main energy source.

Decarbonisation implies much less fossil fuel consumption, but nations plan for more energy the coming decades, perhaps 20-30 percent.

2. Decarbonisation according to Unfccc

All countries in the world have formed a Common Pool Regime (CPR) to save the atmosphere from more GHGs, focusing only upon the CO2s. The global decarbonisation plan includes:

i) Halting the rise if CO2s by 2020 (GOAL I);

ii) Reducing the CO2s by 30-40% by 2030 (GOAL II);

iii) Complete decarbonisation by around 2075 (GOAL III);

iv) Decentralised implementation under international oversight, financial support and technical assistance.

These are enormous goals, as only one country-Uruguay—is near GOAL I and GOAL II. Some countries have lately had stalling or even decreasing CO2s, but many other still face an upward sloping curve.

Globally, the energy-emissions conundrum stems from the necessity of consuming energy in all forms of economic activity. We have the following picture for the close link between GDP and CO2s over the recent decades—see Figure 1.

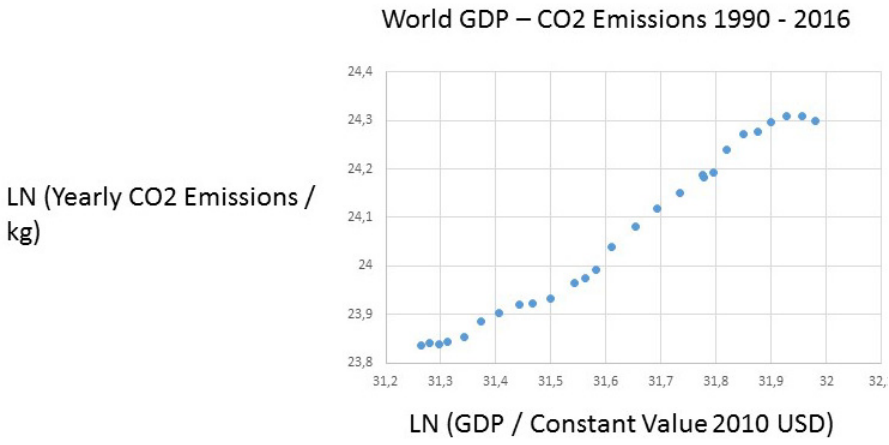

Figure 1. Global GDP-CO2 Link: y=0,75x; R^2=0,98

Source: See references.

Burning fossil fuels is today essential for affluence and wealth, being vital to poor and rich countries. If energy consumption is reduced, economic recession and mass poverty would follow rapidly as well as of course also unemployment writ large social unrest. Planet Earth consumes simply far too much energy from burning the fossil fuels—see Table 1.

Table 1. Energy 2015 (Consumption in Million Tons of Oil Equivalent)

	Total	%
Fossil fuels	11306,4	86,0
Oil	4331,3	32,9
Natural Gas	3135,2	23,8
Coal	3839,9	29,2
Renewables	1257,8	9,6
Hydroelectric	892,9	6,8
Others	364,9	2,8
Nuclear power	583,1	4,4
Total	13147,3	100,0

Source: BP Statistical Review of World Energy 2016.

The hope that the augmentation of CO2s would "stall" has been nurtured widely, but now China reports ominously that its CO2s are set to increase again for a few years. Thus, Figure 1 may lead to the planet not fulfilling even COP21 GOAL I in 2020.

3. APEC Connection: Asia's Future CO2 Dominance

The UNFCCC meetings have huge participation, besides some 190 governments. They are drowned by massive transaction costs. After so many global meetings, an agreement was finally reached in 2015—The Paris climate accord or COP21 Treaty. But the next two reunions failed to deliver anything. As of now, there is no plan for implementing the climate global accord, nor any management strategy or idea how to set up the Super Fund.

The adequate group of countries for handling decarbonisation is the G20 set of big nations, together with international shipping and international aviation responsible for some 80 of the CO2 emissions. Greenhouse gas emissions are huge in large state population wise with a medium to high affluence. Let us look at some of the giants around the Pacific, where economic activity has migrated from the Atlantic, forming the APEG association. In the G20, we have *inter alia* China, India, Indonesia, Brazil, Saudi Arabia, Turkey, Iran, South Korea, Japan, Australia, Russia, USA, Mexico and Canada as well as Germany. Can these countries fulfill the global decarbonisation Treaty? Will they do so? One country has already defected in this ocean PD game that plagues this CPR. Will these other big polluters comply? I doubt so. Without their compliance with global decarbonisation, climate change become unstoppable—Hawking's irreversibility.

4. The Reneging Strategies

The COP21 Treaty under public international is only in fact a promise. And promises are what they are, as they sit in the mount of the contracting parties. The nature of promises was revealed by Hobbes in Leviathan from 1651, stating that it involves a game with two stages: first the words, second the fulfillment of the words or not:

(Q1) "Covenants, without the sword, are but words and of no strength to secure a man at all".

(Q2) Words are wise men's counters, they do but reckon by them; but they are the money of fools".

There is no sword available under public international law to enforce decarbonisation. Only good will respecting the integrity of promises plus selective incentives will be decisive for the implementation of GOAL I, GOAL II and GOAL III. The decarbonisation promise is a complex one, involving two different parts:

i) Allocation: to reduce the consumption of fossil fuels according to the global plan;

ii) Funding: to set up and fund a giant Super Fund to create selective incentives for poor and developing countries to implement the global plan. The phenomenal sum of 100 billion $ per year has been mention for 10 years.

Opportunistic behaviour offers many ways of reneging in both allocation and funding. The new theory of asymmetric information puts cheating the centre of a Hobbesian approach to global governance covenants and word promises. Thus, defection from a huge CPR concerning a giant resource—the atmosphere—with open access can occur in many forms:

a) Reneging ex ante on allocation: making unrealistic promises;

b) Reneging ex post on allocation: overstating accomplishments;

c) Reneging ex ante on funding: not actually paying one's due;

d) Reneging ex post on funding: corruption or embezzlement.

Combining reneging ex with defection ex post, we have the following 2X2 Diagram.

EX POST		
Compliance	Defection	
Compliance	Uruguay, Sweden	India, Australia?, RSA ?
EX ANTE		
Defection		US, Germany?

Figure 2. Compliance and Reneging

When the Trump administration reneged, it was basically an ex ante funding defection, denying to help India decarbonize. When president Macron invites the CPR members to Paris to discuss how to fill up the US funding gap, he may invite more of the same type of reneging. As Hobbes declared, words may be the tongue of fools, promises made may be called void because of unforeseen circumstances. China had promise to halt CO2 aygmentation, but less hydro power calls for more coal power and CO2s anew.

With so many participants in this CPR and so much money promised, the risks of dishonest management must be high. Too many members in a CPR, too heavy transaction costs in global governance?

Let me substantiate these points, derived from the general analysis of PD games, with a few concrete examples from the variety pf countries or economies. Even if the UNFCCC creates an oversight mechanism to steer the giant decarbonisation plan for the 32st century, there will be defections.

5. Take-Off Economies

Several countries in the world have recently started the process of industrialization and urbanization, moving out of poverty and the dominance of agriculture. They emphasize the need for energy in order to develop fast. Typically, they rely upon fossil fuels, especially coal, stone or wood coal. They will only endorse decarbonisation, if supported by the Super Fund to move into atomic power or renewables like solar and wind power.

In general one may say they are likely to renege, if they cannot find alternative sources or funding is not forthcoming.

5.1 India

One may date India's take-off point in time to around 1990, when a heavily regulated economy with socialist planning was transformed into a market economy. Economic growth has since been impressive, but the needs are gigantic from a rapidly increasing on average poor population. Thus, following the approach by Rostow (1960), one must date the take-off point for India to its market transformation with a stock exchange in Mumbai.

From India's side, the position has been clearly stated (Ramesh, 2015): socio-economic development keep up its pace to deliver services to the millions without electricity and the large part of poor people. Coal will be used, if necessary. Figure 2 captures the link between GDP and CO2s.

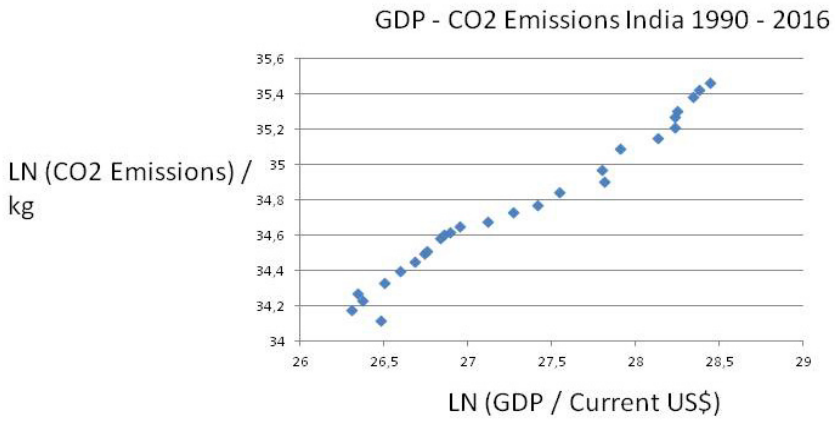

Figure 3. GDP and CO2s: y=0,55x, R^2=0,97

The upward sloping curve is strong for Indian emissions, following its stunning expansion economically. And India will not accept a trade-off between growth and CO2s, putting the emphasis upon electrification of all households and poverty uplifting.

Can and will India honour its dearboniisation promises? Not without foreign assistance! Look at the present pattern of energy consumption (Figure 1).

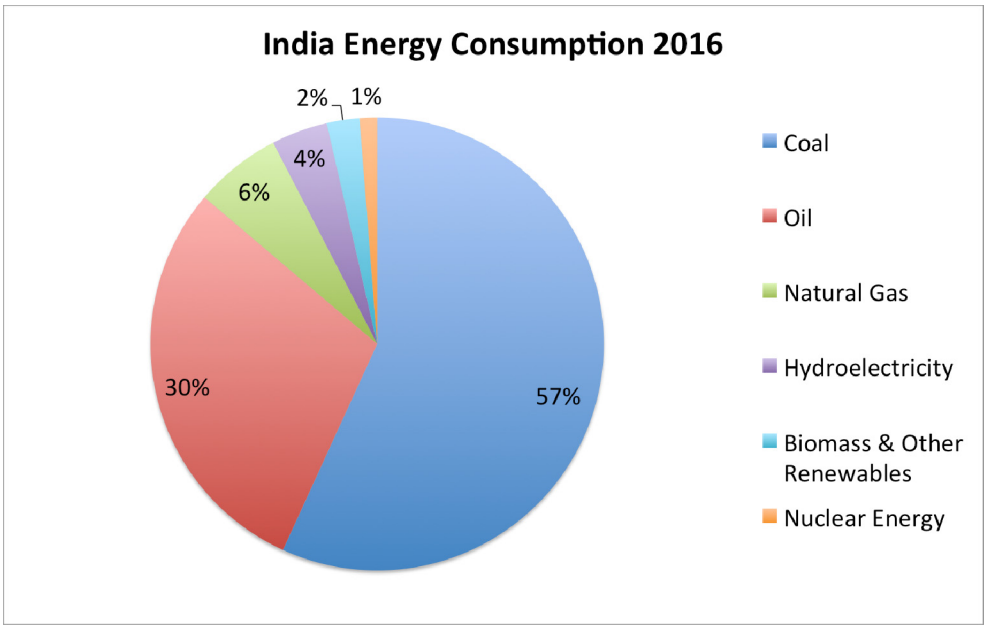

Figure 4. India

Fossil fuels, especially coal, dominate totally. In India, biomass is charcoal, more polluting than coal itself. India is completely out of tune with the COP21 objectives.

The Indian government engages much in energy planning with foreign expertise—see Indian Energy Outlook from 2015 by IEA. One scenario is portrayed in Figure 5.

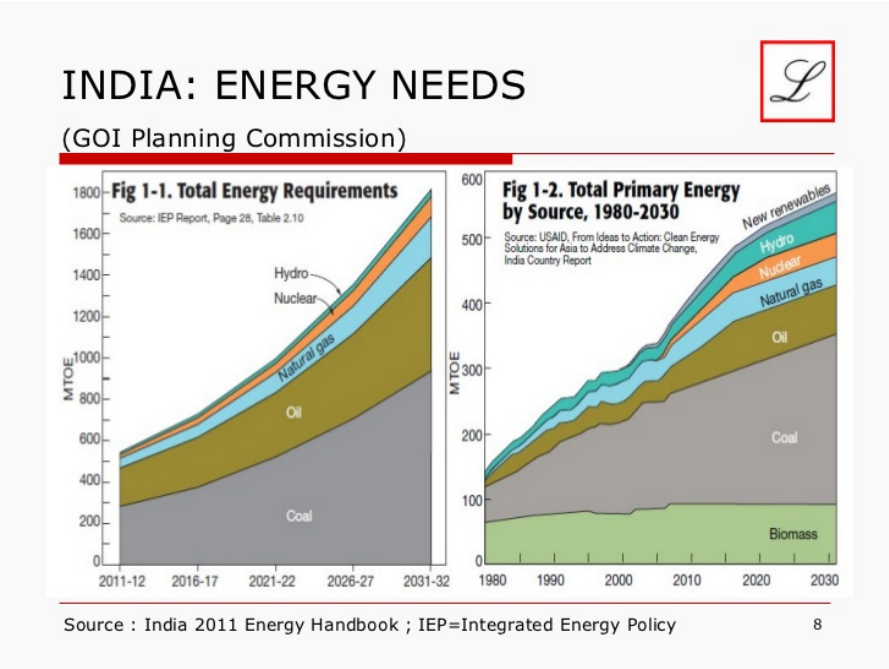

Figure 5. India Energy Policy Plan

Source: https://www.slideshare.net/objectivecapital/india-growing-energy-needs-to-fuel-growth

This enormous hoped for expansion in energy demand is not in agreement with global decarbonisation plans. To reduce c coal and charcoal India needs atomic and solar power. Hydro power requires safe access to water, which global warming may undo.

5.2 Indonesia

Like India, Indonesia is planning its energy policies in cooperation with international experts, e.g., IEA. It has gone through a rapid expansion of its energy production since its take-off data in the 1990s, when Suharto's cronyism regime was done away with. It exports considerable amounts to gas.

Indonesia, being a giant nation with economic growth and enormous forest burning, displays a strong upward trend in CO2s—see Figure 6.

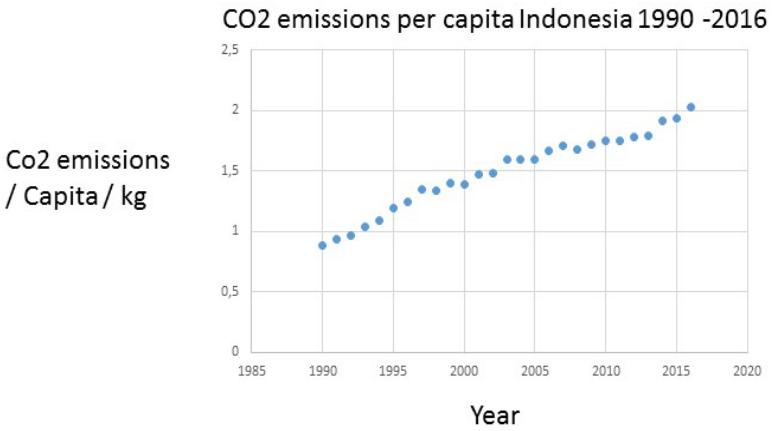

Figure 6. Indonesia

What makes Indonesia so important for the implementation of global decarbonisation according to the COP21 Treaty is not only is mega size in population, but also its rain forests in Kalimantan and Sumatra. The government has not been able to protect these global lungs, as they are cut down and burned for agriculture. This amounts to a tragedy of the commons writ large.

The planning of the expansion of the energy sector—Figure 6—shows little regard to COP21 objectives.

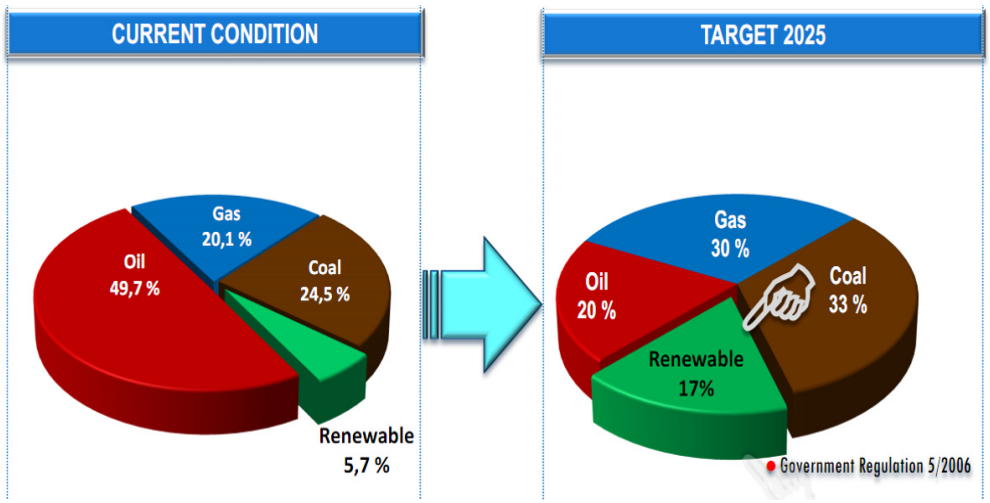

Figure 7. Indonesia Energy Policy

Source:

http://blogs.vertcaptech.com/2014/01/06/renewable-energy-potential-indonesia/#.Wh_p6lWWbIU

It is true that renewables are planned to increase, but so is coal. Together with forest emissions, Indonesia has to renege.

6. Catch-Up Economies

We speak of emerging economies against mature ones. One proper subset of emerging economies are the catch-up nations, who started long ago a take-off but now wants to close the gap to the mature economies. They are very hungry for energy.

6.1 Brazil (not APEC Member)

Even if Brazil is a promising country and will always be so (de Gaulle), it is interesting when compared with Indonesia. It is as giant big a country, aiming to be a regional leader. And it harbours the other lungs of Planet Earth—the Amazons. The big difference economically is that Brazil had an early take-off period in the 1920s, but economic decline in combination with authoritarianism led to a huge set-back for Latin America in the 20th century. The attempts with socialism succeeded nowhere, but only stimulated fascist responses. Today, Venezuela is a new tragedy of failed state intervention.

Brazil has enjoyed a most positive economic development since the 1990s, when democracy was

re-established. As the GDP has increased strongly up until 2015, so have the CO2s augmented sharply (Figure 8), pushed of course by the burning down of the rain forests, or logging parts of it for agriculture.

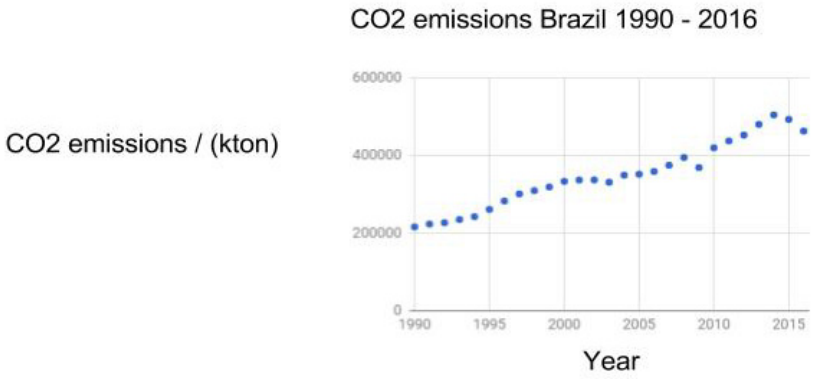

Figure 8. Brazil

As the Brazil economy has stagnated recently, CO2 growth has stalled. However, the plans for energy are stunning—see Figure 9. In a time frame of 10 years or less, energy consumption is to be doubled. Can it be done without destroying the Amazons and increase global CO2s?

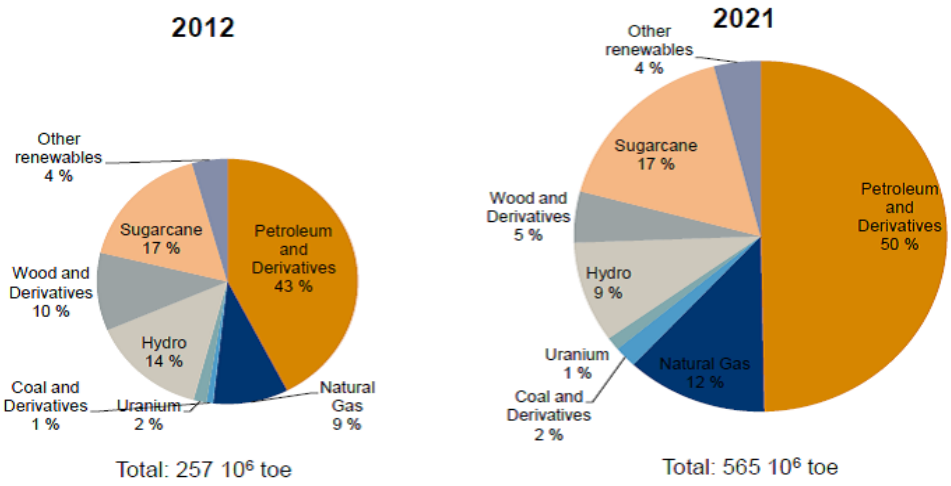

Figure 9. Brazilian Energy Planning

Source: https://www.linkedin.com/pulse/focus-renewable-energy-technologies-brazil-luca-gautero

Energy provision is different from Indonesia's fossil fuel reliance, as Brazil has hydro power and biomass energy. It uses a lot of petrol but little coal. The worry about Brazil is the enormous expansion plans for energy. Involving also exports to other LA countries.

It seems as if hydro power would decline in importance, but that hides the planned double expansion.

Dams have been built in the Amazons, and much more is planned. Together with the cutting down and burning of the rain forest for agriculture, one may predict the demise of the Amazons before 2050, like Boneo and Sumatra.

To fulfill its COP Treaty obligations, Brazil must invest more in solar power. According to the world energy reports, the country has a modest solar power plan, which is strange given its huge territory with so much sun.

6.2 Mexico

Another major catch-up economy in LA is Mexico, which like Brazil is an oil and gas producer. CO2 emissions, like in the rich Middle East countries, tend to be high in countries with heavy oil and gas production. Mexico enjoyed an early take-off start point in the 20th century, but economic and political instability decreased the potential of the country. However, NAFTA meant a new start together with a democratic regime. Thus, Mexico pursues a catch-up strategy, using its vast oil and gas reserves—Figure 10.

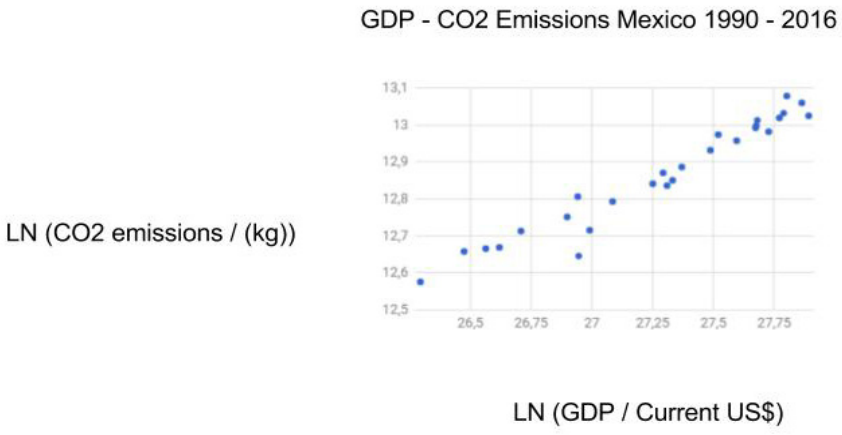

Figure 10. Mexico

The rise in average affluence in Mexico has been a success story, even if the benefits from NAFTA are contested. One cost is apparent in Figure 10, as it documents that Mexico has become a major polluter.

But the country has very ambitious plans to change this. First, we look at the present energy mix in Figure 11. The fossil fuel dependency today is close to 100 percent. But the plan is to accomplish a major transformation that would make the country fulfill the global decarbonisation goals.

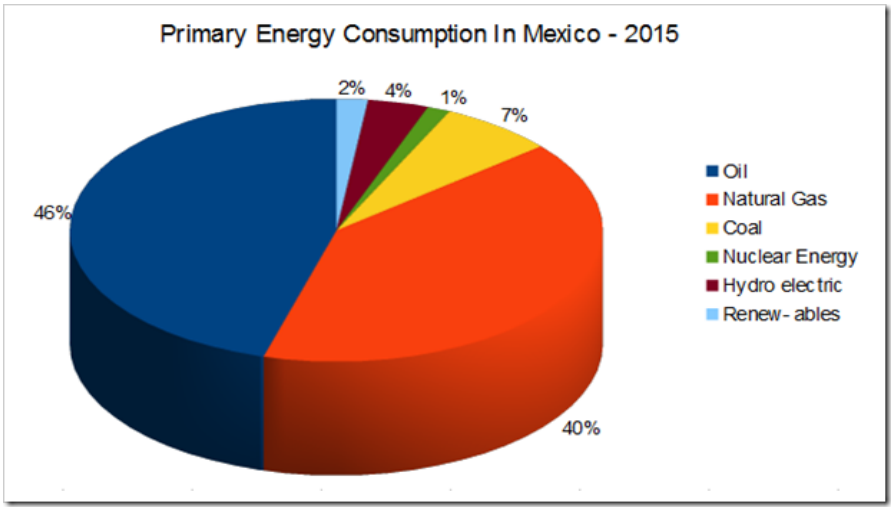

Figure 11. Mexico Energy Consumption

In the plan below, Mexico shows it is one of the first countries to take the COP21 Treaty seriously (Figure 12).

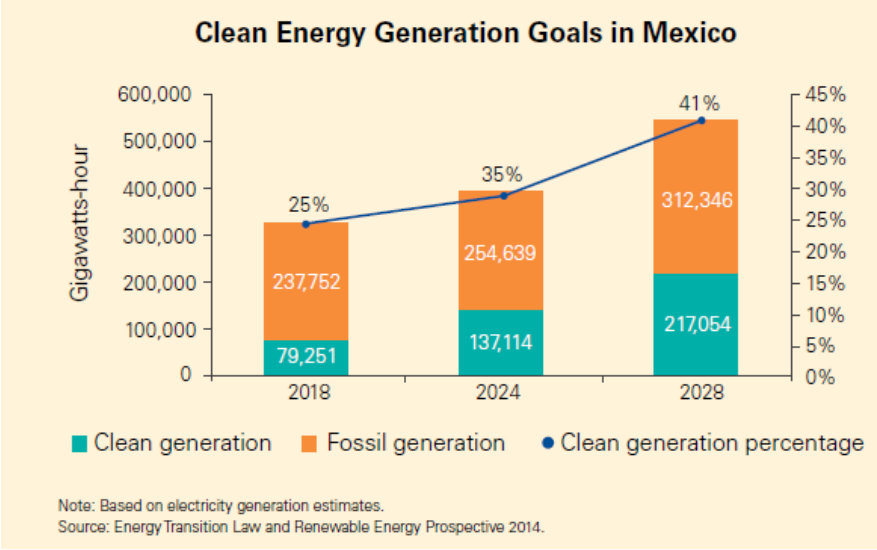

Figure 12. Mexico Energy Policy Plan

The 2028 vision could violate GOAL II in the COP21 Agreement, as it stipulated 30-40 % CO2 reduction by 2030. Mexico is moving into solar power, which is its future.

7. Mature Economies

One should not believe that mature economies can or will implement COP21 objectives. Although several of the large rich countries have halted the CO2 increase, they certainly have to do much decarbonisation so reach the GOAL II. Let us look at two mature economies with large emissions.

7.1 South Korea

South Korea has moved from a Third World to the set of OECD rich nations in a period of 50 years, with the take-off point after Japanese colonialism. The extreme economic growth has been based upon massive imports of energy sources, like natural gas and oil as well as coal. The outcome appears in Figure 13 with massive CO2 emissions.

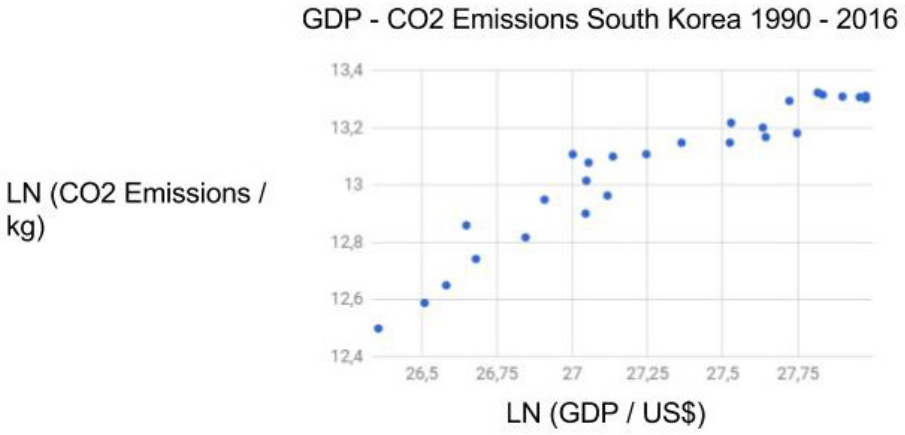

Figure 13. South Korea

The South Korean leaders have understood that 80 percent dependency upon fossil fuels is not in agreement with the global hope for decarbonisation. They bet on nuclear power, given the country's advanced technology assets. But the new government has revised these plans for many atomic power plants. Figure 14 shows the electricity generation picture, where nuclear power is to be reduced proportionately in the 2020s.

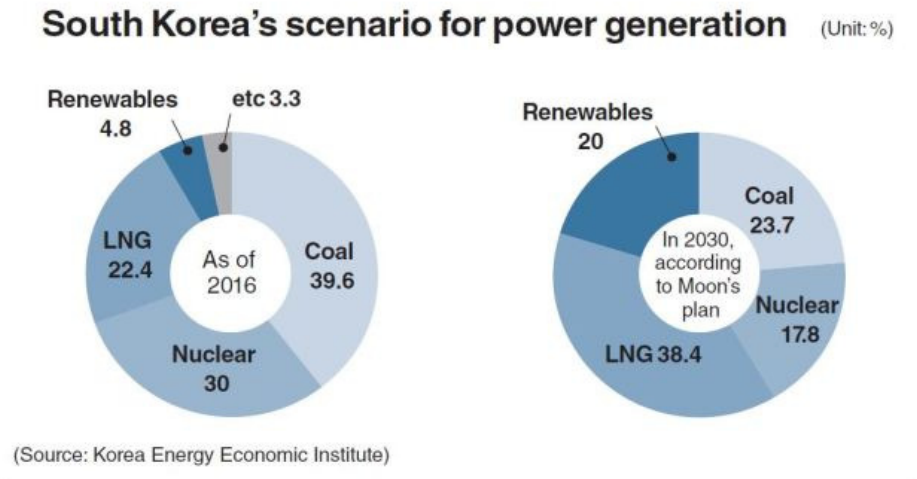

Figure 14. South Korea Electricity Plan

Instead, the government now bets upon LNGs from abroad, transported in gigantic ships. But these plans violate the GOAL II of the COP21 Treaty. And international shipping is one of the worst sources of CO2s. It seems as if South Korea will have to defect, as it provides a small role for renewables.

7.2 Australia

Australia has always been negative to global decarbonisaion, a least according to the prevailing attitude among its leading politicians. This stance reflects the country's total reliance on fossil fuels at home for energy, as well as its giant exports of fossil fuels to other countries, especially in the Asia-Pacific region. Figure 15 present a picture the most addicted to fossil fuels country in the world.

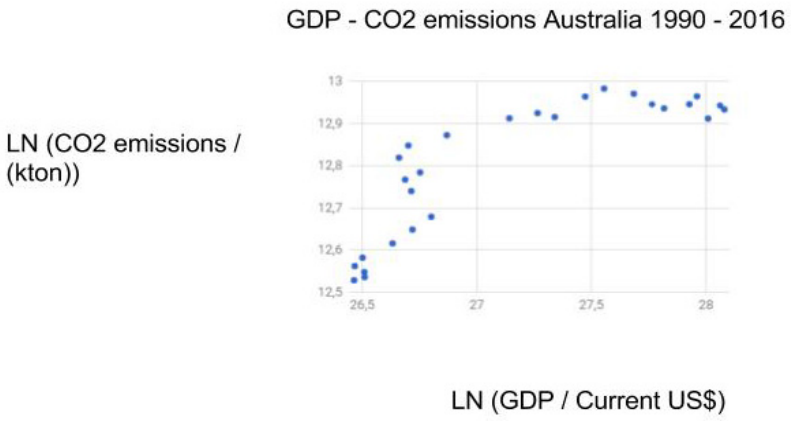

Figure 15. Australia

Without a major energy policy reversal, Australia will be forced to renege upon COP21. "Our future lies in keeping to increase living standards", says PM Turnball, but more important for mankind is a stable environment, generally speaking.

8. Solar Power Revolution in Asia-Pacific Region

Table 2 using the giant solar power station in Morocco as the benchmark, estimates how many would be needed to replace the energy cut in fossil fuels and maintain the same energy amount, for a few selected countries with big CO2 emissions?

Table 2. Number of Ouarzazate Plants Necessary in 2030 for COP21's GOAL II (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 (Note 1)	2100	3200

China	None (Note 2)	0	3300
South Korea	37	260	280
India	None (Note 2)	0	600
Japan	26	460	700
Brazil	43	180	170
Indonesia	29	120	170
Canada	30	230	300
Mexico	25	120	200
Australia	26-28	130	190
Russia	None (Note 3)	0	940
Canada	30	230	300
Mexico	25	120	200
Philippines	70	70	40
World	N/A	N/A	16000

Notes. 1) The United States has pulled out of the deal; 2) No absolute target; 3) Pledge is above current level, no reduction; 4) Upper limit dependent on receiving financial support; 5) EU joint pledge of 40 % compared to 1990.

9. Conclusion

Now, there is urgent cause for alarm, as recent information says that China, the biggest emitter of CO2s, will not succeed to halt its curve for CO2s. Instead, it counts upon some 3 percent increases the nearest years—see Figure 16.

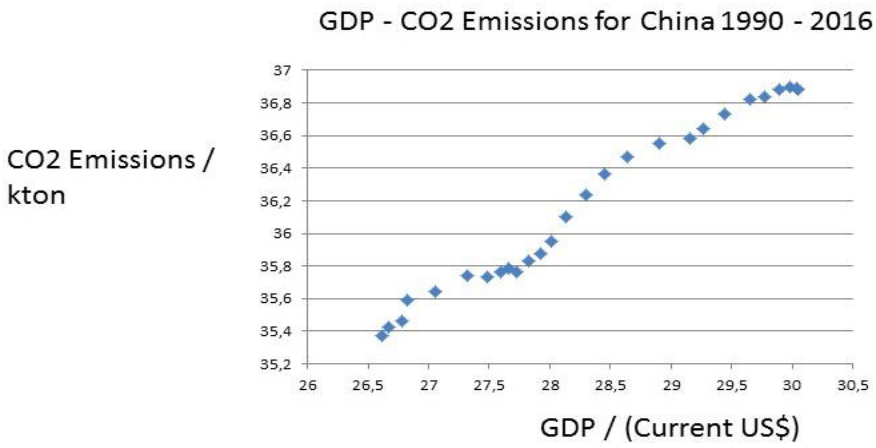

Figure 16. China: GDP and CO2s: y=0,46x, R^2=0,98

China has officially declared that it intends to meet both COAL I, halting the increase in CO2s, and GOAL II, reducing CO2s by some 30 percent. But promises and intensions are one thing, real life developments another matter. All countries in this CPR can at any time renege, the US has already done. If China too defects, then we have Hawking irreversibility.

China promises to reduce is GHGs, especially the lethal pollution in Beijing. But it also has great plans for future energy demands! It is true that China moves aggressively into new power sources: solar, wind and atomic power. Its ambitions for air traffic, car markets and the New Silk Road are daunting.

References

Solar power

Paris. (2015). *Tracking country climate pledges*. Carbon Brief. Retrieved from https://www.carbonbrief.org/paris-2015-tracking-country-climate-pledges

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

CO2 Emission Reduction With Solar. (n.d.). Retrieved from http://www.solarmango.com/in/tools/solar-carbon-emission-reduction

GDP sources

World Bank national accounts data. (n.d.). Retrieved from http://data.worldbank.org

OECD National Accounts data files. (n.d.).

GHG and energy sources

World Resources Institute CAIT Climate Data Explorer. (n.d.). Retrieved from http://cait.wri.org

EU Joint Research Centre Emission Database for Global Atmospheric Research. (n.d.). Retrieved from http://edgar.jrc.ec.europa.eu/overview.php

UN Framework Convention on Climate Change. (n.d.). Retrieved from http://unfccc.int/ghg_data/ghg_data_unfccc/time_series_annex_i/items/3814.php

International Energy Agency. (n.d.). Paris.

Energy Information Administration. (n.d.). Washington, DC.

BP Energy Outlook 2016. (n.d.).

EU Emissions Database for Global Research EDGAR. (n.d.). Retrieved from http://edgar.jrc.ec.europa.eu/

World Bank Data Indicators. (n.d.). Retrieved from http://data.worldbank.org

British Petroleum Statistical Review of World Energy 2016. (2016).

Janssens-Maenhout, G., Crippa, M., Guizzardi, D., Muntean, M., Schaaf, E., Olivier, J. G. J., Peters, … Schure, K. M. (2017). *Fossil CO2 and GHG emissions of all world countries, EUR 28766 EN*. Publications Office of the European Union, Luxembourg.

World Bank Data Indicators. (n.d.). Retrieved from http://data.worldbank.org

Literature

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

Barro, R. J. (1991). Economic Growth in a Cross Section of Countries. *The Quarterly Journal of Economics*, *106*(2), 407-443. https://doi.org/10.2307/2937943

Barro, R. J., & Xavier, X. Sala-i-Martin. (1992). Convergence. *Journal of Political Economy*, *100*(2), 223-251. https://doi.org/10.1086/261816

Barro, R. J., & Xavier, X. Sala-i-Martin. (1995). *Economic Growth*. McGrow Hill.

Climate Science Special Report: Fourth National Climate Assessment. (2017). Retrieved from https://assets.documentcloud.org/documents/4174364/Climate-Science-Special-Report-2017.pdf

Conka, K. (2015). *An Unfinished Foundation*. The United Nations and Global Environmental Governance. Oxford: OUP. https://doi.org/10.1093/acprof:oso/9780190232856.001.0001

Kaya, Y., & Yokoburi, K. (1997). *Environment, energy, and economy: Strategies for sustainability*. Tokyo: United Nations University Press.

Ostrom, E. (1990). *Governing the Commons*. Cambridge: Cambridge U.P. https://doi.org/10.1017/CBO9780511807763

Ramesh, J. (2015). *Green Signals: Ecology, Growth and Democracy in India (2015)*. Oxford: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199457526.001.0001

Rostow, W. W. (1960). *The Stages of Economic Growth: A Non-Communist Manifesto*. Cambridge: Cambridge University Press.

Sachs, J. D. (2015). *The Age of Sustainable Development*. New York: Columbia University Press. https://doi.org/10.7312/sach17314

Stern, N. (2007). *The Economics of Climate Change*. Oxford: OUP. https://doi.org/10.1017/CBO9780511817434

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

Vogler, J. (2016). *Climate Change in World Politics*. Basingstoke: Macmillan Palgrave. https://doi.org/10.1057/9781137273413

Notes

Note 1. The United States has pulled out of the deal.

Note 2. No absolute target.

Note 3. Pledge is above current level, no reduction.