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Greenhouse Gas Emissions: "Potemkin Villages" and Global Resilience

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Abstract

The climate change problematic, becoming more relevant every day, is almost exclusively approached as a natural sciences concern. Thus, scholars debate what drives global warming physically as well as whether a fundamental turn to renewable energy would mean much difference. The point in this paper is that what the social sciences have to say about the possibility and desirability of a global policy must NOT be pushed aside. Of course, the chemical and biological processes inherent in global warming should be identified and measured in an ever more detailed manner, but policy-making is conducted by human beings in social, economic and political settings. Only the governments of the world can engage in global coordination to halt global warming, but the lessons from political theory underlining opportunism as well as self-seeking with guile and moreover game theory with asymmetric information teach humbleness and scepticism about these prospects. The states coordination coin has two sides: talk, meetings, declarations, promises on the one side, and reneging, cheating and opportunism with guile on the other less shining side.

Keywords

GHG: 4-7 Greenhouse Gases, Country Emissions, Developed and Developing Nations, Germany and Sweden as Exceptions, Potemkin Village, The Fundamental Link between Economic Development and Emissions Growth

1. Introduction

As global warming intensifies and its link to man-made emissions becomes ever more evident, one may take a look at how different countries differ in terms of the evolution of emissions during the last two decades. Mapping how the countries of the world vary in terms of the emission of total greenhouse gases is clearly relevant for understanding ecology policy-making today, as for instance with the preparations for the Paris summit in end

of 2015. One may dare to suggest that the policy positions of the various states reflect at least to some extent where the country is at in terms of emissions. Governments would always have to start arguing from the *status quo*.

Yet, how to compare countries? It is a key task in the social sciences. It can be done in several ways, but I will argue that one method of comparison—the total emissions and GDP link over time—is most relevant. There is no measurement or empirical indicator without theoretical deliberations. Here we target the growth in total emissions that varies from one country to another, because what matters for global warming is the total amount of emissions of a country and of all countries taken together. Comparing countries, how do developed ones compare with developing ones? And do developed countries differ amongst each other in terms of the growth of emissions?

The country perspective upon the emission of greenhouse gases may not bee of central importance from the natural sciences' perspectives. There what matters is to measure the global totals correctly, predict the future trends and explain the results by a micro approach, combining physics, chemistry and biology. However, from the point of view of the social sciences, things are very different, because the key actors in global ecology coordination take much consideration of the country position and interests. Here the key concept is strategy in the ensuing games that emerge in all the meetings and talks in coordination efforts. Also the actors in international organisations, public or private, pay much attention to country numbers.

2. Method and Data

One can employ a number of ways to measure the emission of greenhouse gases for the purpose of systematic comparison of countries. What one searches for is a set of macro indicators that tap the pollution of a whole country or nation. Here we find i*nter alia*:

- *total emissions, which is an aggregate of four-seven gases*;
- *per capita emission*;
- *emission per GDP unit*;
- *carbon emission indices or other emission type indices.*

Since the end objective of a global policy against climate change must be to first halt the increase in emissions and second start decreasing them, I concentrate upon the growth in **total** emissions over the last two decades. However, there is a need for a benchmark, or a factor that can be used to analyse the growth pattern. What does growth in emissions entail? Perhaps any form of economic development carries consequences for an increase in emissions? Mankind strives for economic development to satisfy needs, whether necessary for survival or superficial ones—"conspicuous consumption" with Veblen, one of the few and rare early critiques of American consumerism spreading around the globe. Given the connection between economic output, energy consumption and emissions of greenhouse gases, one would like to know whether economic growth goes slower or faster than the increase in emissions. Has any country managed to achieve economic development with the use of mainly non-renewable energy sources, and would that reduce total emissions significantly?

Thus, we need two series of data, to be taken from the following source:

- GHC = World Resources Institute
- GDP = World Bank.

To handle the huge numbers involved in both series, the data has been transformed into LN numbers.

3. Two Perspectives on Climate Change: Natural Sciences versus Cultural Sciences

The classic distinction between the natural sciences and the cultural sciences appears in the debate about climate change, which is heavily dominated by perspective of the former at the expense of the latter. Thus, much is known about the GHC: s and their origins in various kinds of pollution. Similarly, there has been a wide search for methods to reduce or eliminate entirely some forms of emissions, although also science fiction proposals have been put forward.

Yet, hardly ever is there an analysis of the social sciences aspect of climate change. The emphasis here is upon motivation, understanding why there is global warming in the first place, given that it presents a threat to mankind. If, as it seems, these noxious gases stem from population and life styles, then can something be done to change the driving forces—population growth and the steady growth in energy consumption—that is also incentive compatible with the interests of people, business and governments? This constitutes the first fundamen-

tal problem when climate change is approached from the social sciences.

The second equally fundamental difficulty in climate change policy-making is the coordination problem: How can the governments of the states of the world reach agreement upon an effective set of policies, given the omnipresent social choice difficulties in aggregating different preferences into a final group decision, the group being Planet Earth? The fact that coordination upon a global common pool regime CPR for counter-acting climate change has been so slow and transaction cost heavy without tangible results fits well the with the standard models of coordination failure in the social sciences. The nations in the world come to the coordination table with various interests and different preferences. Let us look at a set of countries.

4. The Overall Picture

First we look at the global situation—see **Figure 1**. The curves for global population, total emission of greenhouse gases and total economic output—GDP—are all up from 1990 until today. What matters most for total emissions is the GDP, or general life style, although also more people means more of carbon emissions. In a straight linear regression model using LN numbers, the GDP predictor of total emissions weight more heavy than the total population of the planet.

In **Figure 1**, we see well the sharp rise in years emissions of greenhouse gases since 1990, amounting to some 50 trillion kilos. On average, for 2012 each inhabitant of the planet Earth emits according to the following equation: GHG emissions = 8300 × population: $R^2 = 0.87$. The life style of global people as measured by the GDP is a major contributor to the increase in emissions: GHG emissions = 0.58 × GDP; $R^2 = 0.53$.

Thus, can global ecological meetings among governments devise a policy comprising measures that halt the growth of emissions without affecting the GDP curve? The developmental goals of economic policies of the UN, WB and IMF are connected with economic growth entailing that it is not understood that the GDP curve should start declining at least with many governments and economists. Economic growth delivers the resources to reduce poverty and achieve millennium objectives. But there is another opinion, as with economist Jeffrey Sachs, stating that halting emissions growth would require reductions in global economic output, at least in the short run.

One observes that GDP has a stronger impact upon total greenhouse gases emissions than population, although it is true that more people mean more carbon emissions, GDP stands for life style, and the ever augmenting demand for a higher style pushes emissions upwards. Can governments conduct a global ecology policy with measures that halt emissions but allow for continued economic growth? This would be the highest priority of environmental economist, betting upon renewable energy.

The link between GDP and emissions is mainly energy consumption that has expended enormously since 1990. Energy in all its various forms is necessary for human life and the social systems that men and women operate, often expanding their size. But energy consumption leads to the emission of various kinds of greenhouse gases. Now, energy production is predicted to increase much, perhaps even doubling up to 2050. How could mankind cope with the emissions consequences as well as their consequences in turn?

5. The Country Variations

Emissions tend to be larger, the bigger the size of the country and its GDP. What interests us here is whether

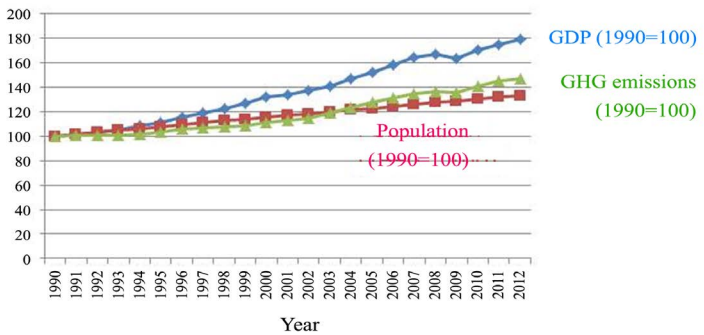

Figure 1. The global picture: Population, GDP and emission 1990. Source: GRI, WB; absolute numbers.

emissions keep growing in the same manner in all kinds of countries, especially if some countries have managed to halt the growth of emissions. It should be pointed out that halting emissions growth is not same as reducing the level of emissions. Even if some countries manage to reduce their emissions somewhat. The level of emissions may still be too high for stopping the process of climate change.

I will look a sample of countries that take into account the level of economic development, given the close tie with GDP, namely

a) OECD countries
b) Gulf States
c) East and South East Asia
d) Developing Countries.

The countries examined below all talk about the perils of global warming, but what policies do they conduct and with which results? In climate change politics, the hiatus between talk and action is crystal clear, with many countries expressing concern but delaying taking concrete measures. Promises are made, intentions are declared, but one does one find in reality?

6. A Few OECD Countries

Developed countries are well aware of the global warming problematic and the threats its poses to mankind and its social systems. Yet, opinions differ much among politicians and pressure groups including civil society. The American government under president Obama is a spokesman for the principle of *precaution*-taking action or conducting policy programs (not always consistently), whereas his support in the American Congress is not a majority. European governments and the EU are favourable to greenhouse emissions policy, but words are not always met by concrete measures. What is the trend for the moment concerning emissions growth?

i) USA

Looking at **Figure 2**, one observes that emissions growth has levelled off recently, and even declined. But the level of total emissions is still very high—the next biggest in the world actually.

The halting of the emissions growth in the US coincides with a stagnating economy due to the financial crisis in early twenty-first century. The decrease in emissions is substantial during most recent years, but it is not enough to stem the global trend, as stated in **Figure 1**. It must be emphasized that the global total emissions may continue to expand despite the fact that some countries experience a late reduction. Moreover, the level of US emissions yearly is still very high, meaning that they contribute significantly to climate change. In no way can we talk about a zero emission economy.

ii) Germany

The distinction between no growth in emission—halting the emissions—and reducing the yearly emissions is very relevant for examining the trends for Germany. This country had early a clear environmental ambition in terms of policy-making, as the Green Party was organised successfully with access to government formation. The ecology preference has been displayed in several forms of environmental policy-making, not only the halting of greenhouse gases. Perhaps the most spectacular decision is the closing of all nuclear power stations in

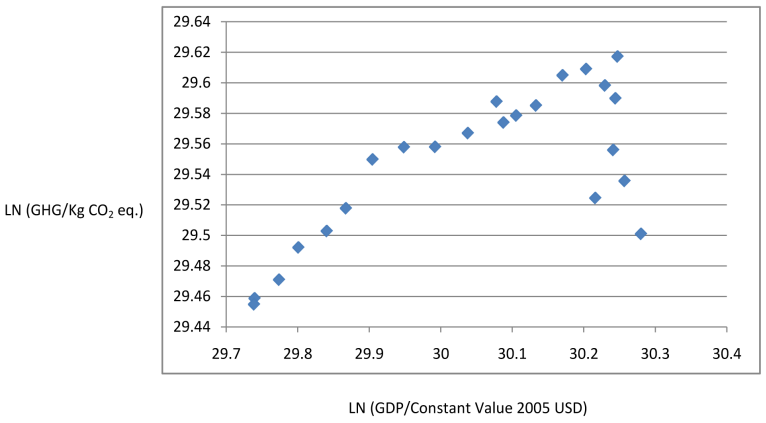

Figure 2. USA: Equa.: $y = 0.1876x$; $R^2 = 0.5076$.

2022, but Germany supported strongly the introduction of the general precautionary principle in the EU and its policy-making generally.

Figure 3 portrays the German developments involving a consistent trend of decrease in emissions.

The key question in relation to **Figure 3** is whether this recent trend is maintainable in the future when nuclear power energy in Germany is stopped. It has been proposed that Germany "beggar thy neighbour", buying French nuclear energy. But it is more likely that Germany will attempt to use wind energy massively, but in reality be forced to increase coal power.

It is true that several EU countries have decreased their country emissions of GHG emissions in the first decade of this century. But it comes from a high level in many countries and they still contribute considerably to the build-up of greenhouse gases. One must recognize that the EU population is hardly big, globally speaking. If the EU succeeds in decreasing the emissions, then it may be offset by increases in other nations—the collective action dilemma.

iii) Turkey

Turkey has become a heavy-weight in the OECD thanks to a rapid economic development of the country with huge population. **Figure 4** supports this picture of Turkey as no longer a developing country.

Comparing the picture for Turkey with that of the US and Germany, one may state that Turkey has the most typical one. Strong economic development is combined with heavy emissions increase. Since the world organisations—the UN, WB and IMF—opt for more of economic growth, one must ask whether emissions growth really can be halted.

7. Some East and South-East Asian Countries

The relationship between economic growth and emissions growth can only be one of increase in both, as this re-

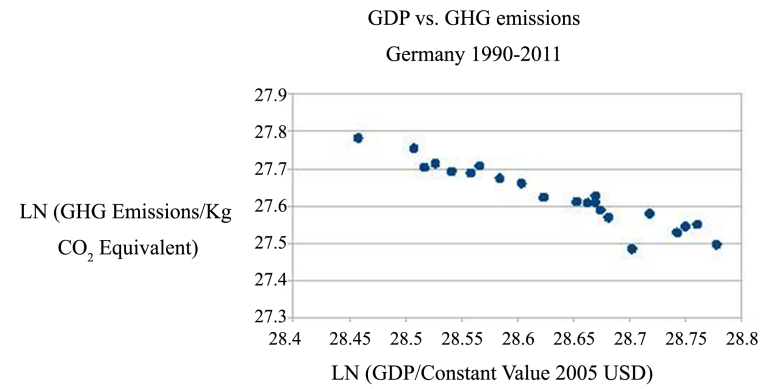

Figure 3. Gerrnany: Equa.: $f(x) = -0.847x + 52$, $R^2 = 0.911$.

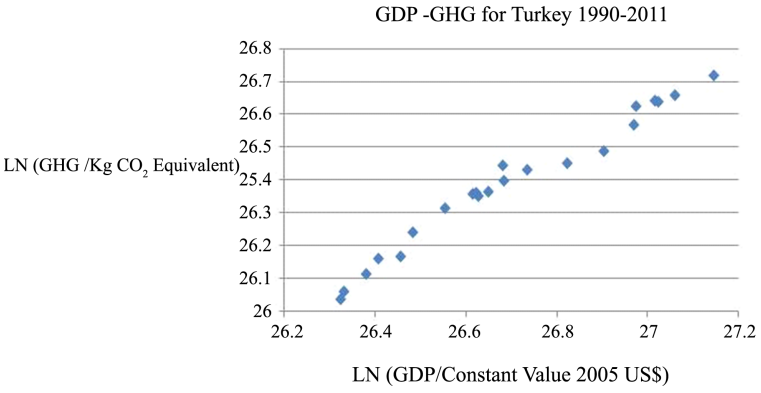

Figure 4. Turkey: Equa.: $y = 0.7837x$; $R^2 = 0.972$.

gion has become "*l'usine du monde*", given the method of analysis chosen here. Although the countries in this region has "*taken off*" at very different time points after the Second World War, in general one finds heavy emissions of greenhouse gases in this growth region: ASEAN plus 3. These nations will be critical in the elaboration of any global ecology policy concerning climate change.

a) Japan

Japan started the Asian growth miracle, although without internal energy resources—The growth curve for its GHC emissions is stated in **Figure 5**.

As the economy of Japan stagnated in the 1990s and the country began using nuclear power massively, Japan managed a dramatic reduction in the emission of greenhouse gases in the first decade of the new century. However, the numbers have gone up again to high levels of emissions, it is hardly a daring guess that the nuclear plat disaster in Japan together with the decision to close all such power plants have further increased emissions, as the country now relies upon fossil fuels much more.

b) China

China today has the largest emissions in the world, speaking about totals. It has "dethroned" the US recently. Relating emissions to population, China used to have rather small per capita emissions, given its enormous population. However, also the per capita figures have gone up for China, although it is not in the top in the world. Look at **Figure 6**.

In China, economic development has been achieved by means employing resources—coal and iron from Australia-that emit much greenhouse gases, like fossil fuels, cement and steel. Especially the many coal-fired power stations are dismal for environment quality, but China also has the largest car market in the world, burning oil and gas.

Chinese ecology policy is hardly much reflected upon by government of developed by officials and bureaux.

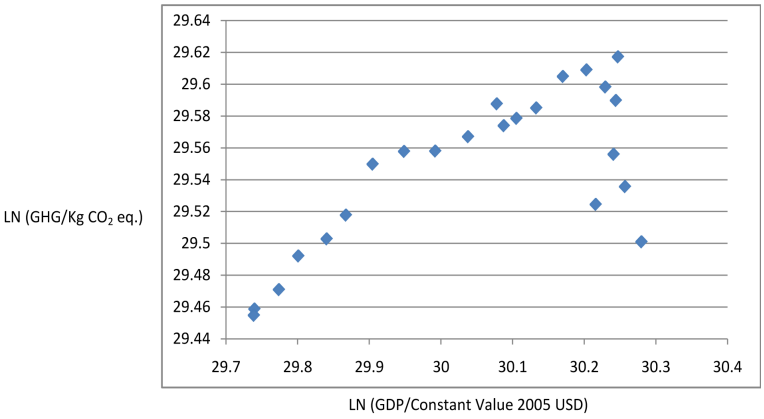

Figure 5. Japan: Equa.: $y = 0.2648x$; $R^2 = 0.194$.

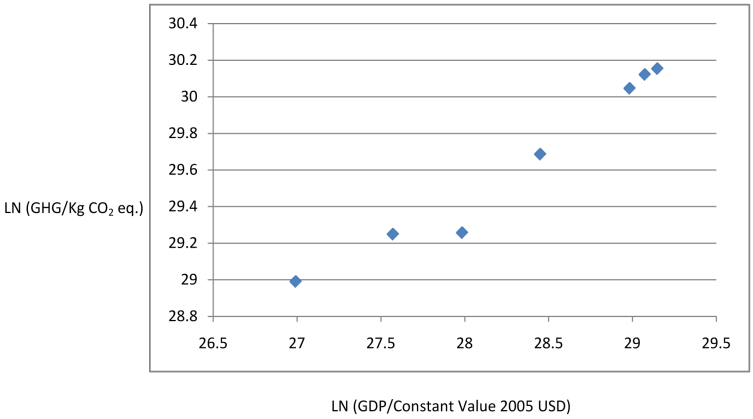

Figure 6. China: Equa.: $y = 0.5658x$; $R^2 = 0.9602$.

Its leaders talk much about "green values", actually more and more every day, but concrete measures are often lacking. The promise of halting in relation to growth after 2030 is a meaningless posture, as economic growth still powers ahead, although not as the same pace as between 1990-2010. A relative target will not do, as it is the absolute totals that must be decreased. The 2030 promise can be reneged upon. And the time table is for such *relative reductions* is too late for global policy-making to be effective in halting climate change.

c) Singapore

This country is not a heavy-weight in world affairs or global ecology concerns. Yet, Singapore is very policy influential, regionally in ASEAN and globally. The Singapore leaders and their public officials as well as the universities and colleges are all well aware of the climate change predicament. Thus, the city-state boats a lot of activities and programs aimed at reducing carbon emissions and the outflow of other greenhouse pollutants. Singapore claims it is a model city for the future, betting upon the use of renewables. Let us look at the facts in **Figure 7**.

The data in **Figure 7** does not support the claims of this ambitious and self conscious city-state. On the contrary, Singapore looks much like the Gulf states—see below. How come? The country is extremely affluent, meaning that it employs massive amounts of energy to run a huge airport, a world harbour and tee omnipresent use of air-conditioners. In addition, it cleans its waste water up to 100 per cent, which requires lots of energy. It also has a big refinery for oil and gas. "Green Singapore" is a *myth*.

8. The Gulf

The emirate of Dubai has made itself world famous by embarking upon a development policy backed by massive employment of energy, steel and cement during the last twenty years. One may mention not only the construction of the tallest building in the world and the supply of winter sport facilities in a desert area, but also the creation of advanced infrastructure and luxurious hotels. In the other emirates, one also finds energy consuming development projects, partly financed by the emirate of Abu Dhabi, boating the erection of a whole "green" town. The result can be read from **Figure 8**, depicting total emissions as a very close function of economic growth. After all, energy consuming projects and cement constructions deliver much in terms of emissions.

One may observe that emissions tend to even outpace economic growth in the most recent years. Yet, the emirate Abu Dhabi produces oil, which leads to big emissions. How, then, do matters stand with regard to Saudi Arabia, the largest oil producer in the world (**Figure 9**)?

Oil production in huge quantities results in the emission of heat and greenhouse gases massively, although one now attempts to capture more of the bi-products in oil refinery. In any case, oil production requires energy that almost always is accompanied by emissions. Saudi Arabia has also boosted with a great engagement for "green projects", but the country in itself remains a major contributor to global warming. Does the same hold for Kuwait—see **Figure 10**?

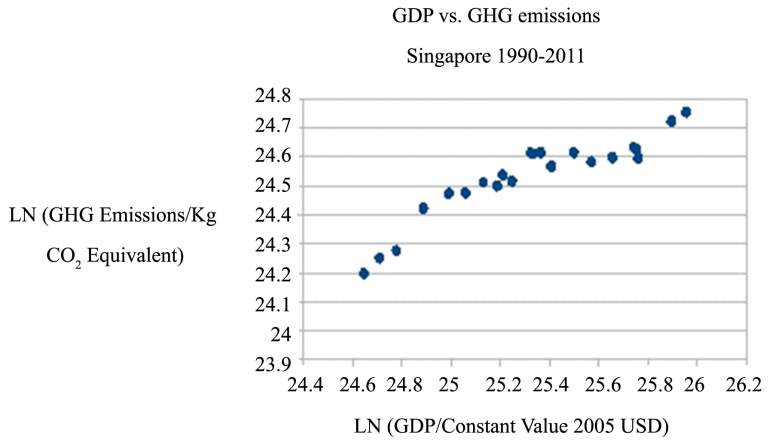

Figure 7. Singapore: Equa.: $f(x) = 0.3405537446x + 15.9083597208$ $R^2 = 0.8479952876$.

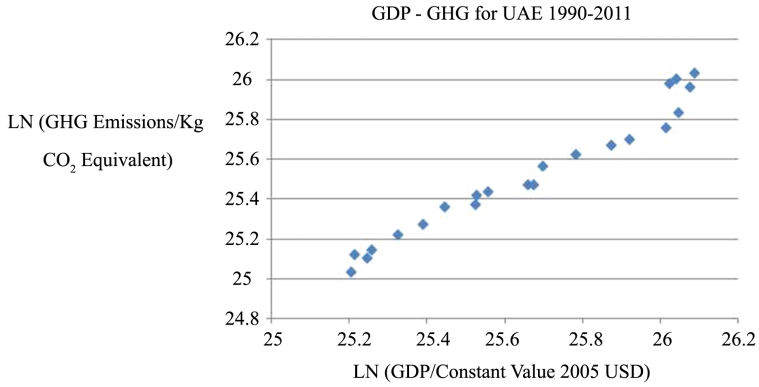

Figure 8. The United Arab Emirates: Equa.: $y = 0.9824x$; $R^2 = 0.9646$.

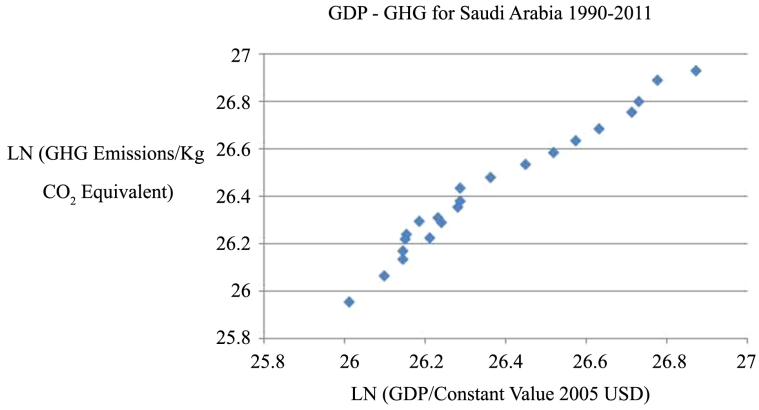

Figure 9. Saudi Arabia: Equa.: $y = 1.0671x$; $R^2 = 0.9704$.

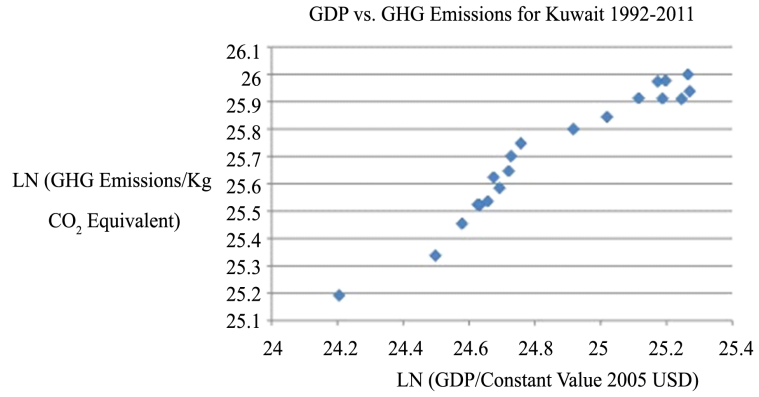

Figure 10. Kuwait: Equa.: $y = 0.7345x$; $R^2 = 0.94225$.

It appears from **Figure 10** that Kuwait has been far more successful than Saudi Arabia when it comes to controlling the emissions in an oil producing country. Can we say the same about another major oil and gas country, like Qatar?

Figure 11 has the GDP-emissions development for this small peninsula. It shows somewhat better outcomes than Saudi Arabia.

However, also for Qatar it holds that total emissions are sharply up for recent years, following the GDP evolution in the short run. Interestingly, Oman performs even worse in spite of the fact the country has no oil or gas any longer—see **Figure 12**.

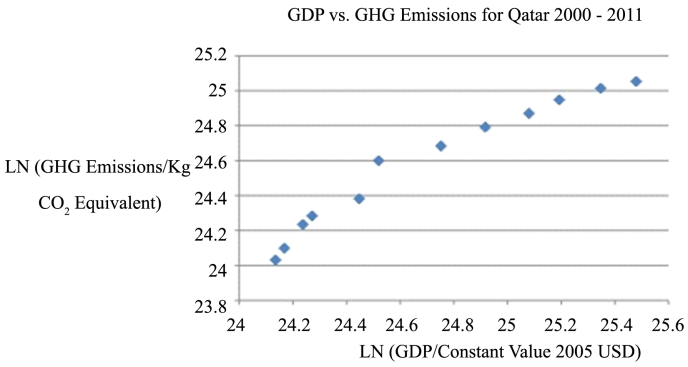

Figure 11. Qatar: Equa.: $y = 0.7392x$; $R^2 = 0.95352$.

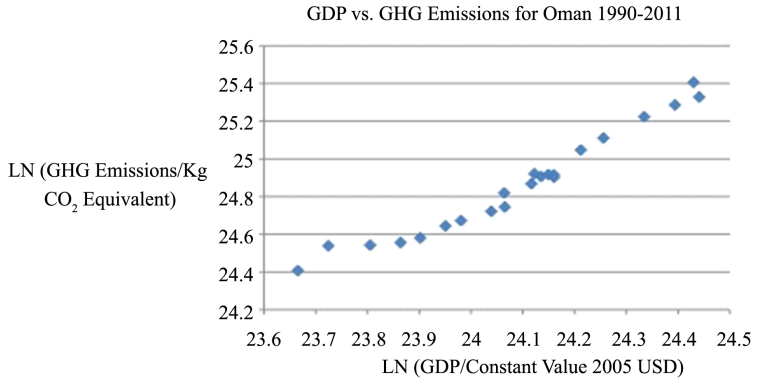

Figure 12. Oman: Equa.: $y = 1.2718x$; $R^2 = 0.95551$.

Despite having used up its oil and natural gas resources some time ago, Oman emits lots of emissions of greenhouse gases, considerably more than what its GDP and economic growth entails. Oman now gambles upon tourism, but even this form of consumption requires the use of various form of energy.

9. Some Developing Nations

The results above should be compared with outcomes for a few developing countries in order to come up with a global picture. Generally speaking, the higher the affluence of a country, the more this nation emits. Thus, one would find lower total levels for major developing countries, although the connection to GDP would still apply. How about a giant like India, predicted to overtake China in the size of population?

I. India

Ecological policy-making has not received much attention in India, except very recently. The overarching preference is for economic development, driven by energy consumption like coal and oil. India also has a rapidly expanding car market, which besides the huge number of highly polluting scooters creates sometimes breathing problems in the mega-cities—see **Figure 13** for how pollution follows economic development.

There is for sure no tendency to any form of halting or decrease of emissions growth, as one seen in this Figure. The government of India has a clear preference for economic growth > 5 per cent, which is necessary for lifting all the millions out of abject poverty, on the one hand and the employment of cheap energy. Thus, cutting emissions must involve reducing economic growth rates—so the argument goes.

The preoccupation of the Indian government and several economists, dreaming about the great "*catch-up*" with China and the West, is to negotiate an exception for India, if a global ecology policy is enacted. Redistribution looms large in India's strategy, arguing that affluent countries should cut back the most.

II. Brazil

The largest South American country is known for its ecological skill when it comes to energy production, because it makes massive use of ethanol. Bio-fuels are always said to be more environmental friendly than coal

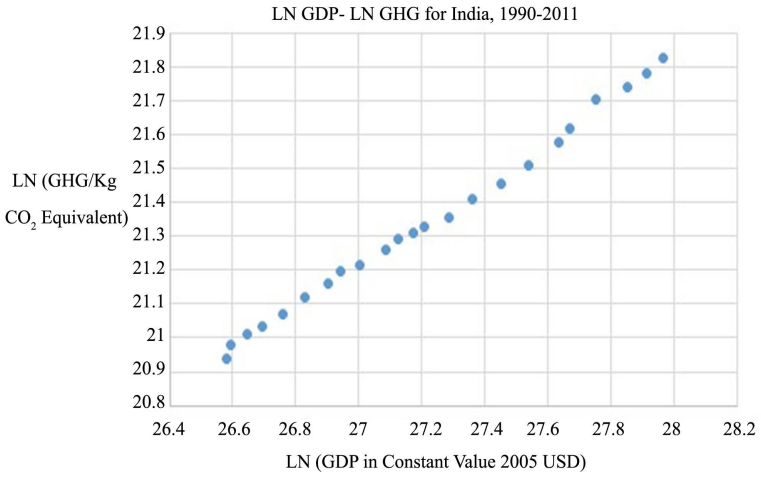

Figure 13. India: Equa.: $y = 0.6093x + 4.7605$; $R^2 = 0.9954$.

and oil for instance: fewer emissions and more uptake of carbon dioxide. Yet, this may be more economics than ecology, as this nation is also well-known for its policy failure concerning the Amazon basin.

Allowing for the successful ethanol industry in Brazil, we must though check the numbers on the increase in total emission of greenhouse gases—see **Figure 14**.

The trend in **Figure 14** hardly supports the standard image of Brazil as a nation who cares about greenhouse gases. The strong increase in emissions lately follows the GDP growth, corroborating the basic idea in this paper that economic growth trumps the concern for ecology, even when a great opportunity exists in the form of ethanol. Brazil is in dire need of an environmental policy with several program legs.

It must be underlined that the production and consumption of ethanol as energy results in emissions, although not so much as the burning of fossil fuels. In no way is ethanol carbon neutral, but if a country has lots of sugar canes, it is good business to develop this source of energy. A practical example is the islands of Fiji where know-how is lacking for ethanol production. Its traditional industry besides tourism is ineffective and uncompetitive since many years, but the governme3nt cannot handle a transition to ethanol production, the country importing all its oil—a combined economic and ecological foolishness.

10. Conclusions

Among the findings in this small paper, one may emphasize the following points:

- in almost all the nations analysed the development of emissions of greenhouse gases follows the yearly rate of economic growth;
- there is only one exception among large nations, an exemplary or model country, namely Germany, displaying a negative trend consistently for the emissions during a decade;
- for only a few countries holds that the emissions growth process *seems* to level off;
- for Sweden and Germany holds that the trend is consistently one of decrease;
- in a few countries that boast about their green consciousness" there is no real decrease of emissions, as these follow the economic growth process closely;

It is not astonishing that most findings above constitute a negative for the prospects of stemming the climate change processes. When a country succeeds in halting the increase in emissions, then it is far from likely that they may also succeed in reducing total emissions. Most countries appear to prefer economic development whatever its composition to ecological precaution. Amazing, the two "green policy" countries—Singapore and Brazil—do not better than the rest. Ecological policy-making in the Gulf states is merely a so-called "*Potemkin village*".

One finds one large country—Germany—that is a major exception, the economy growing positively but the emissions decreasing consistently. Can the other nations in the world achieve the same? This is not the place to discuss the enormously technical problems in moving the economy towards a trend of decreasing emissions year

by year. Perhaps it can be done but it will be "tricky" to say the least of such a complicated endeavour. First, however, the political leaders of the world must decide whether they want to try at all, seriously (Bourg & Papaux, 2015; Latour, 2015; Kolbert, 2015).

Paradoxically, even if other countries could copy the example of Germany, it would not halt climate change, only delay it. Why? Because Germany still emits much too much emissions, which stay a long time in the atmosphere. Halting emissions growth is a laudable objective, but avoiding severe global warming will require difficult policy coordination where all countries start decreasing very soon in order to stay at plus 2C and avoid plus 4C or even worse plus 6C.

In the policy process both nationally and globally, the governments of countries will take the present trend into account: increasing or decreasing emissions. Although policy standpoints do not follow national interests in a logical manner, the perceived interests of states start from the actual position of the country, the *status quo*. All big countries in this small enquiry except Germany are on the increasing side. How to halt that and also start moving to the decreasing side?

The standard energy projections for the coming decades reflect not ecological concerns but the requirement of economic development and the always relevant quest for economic growth. Consider a mainstream projection from Energy Information Administration in **Figure 15**.

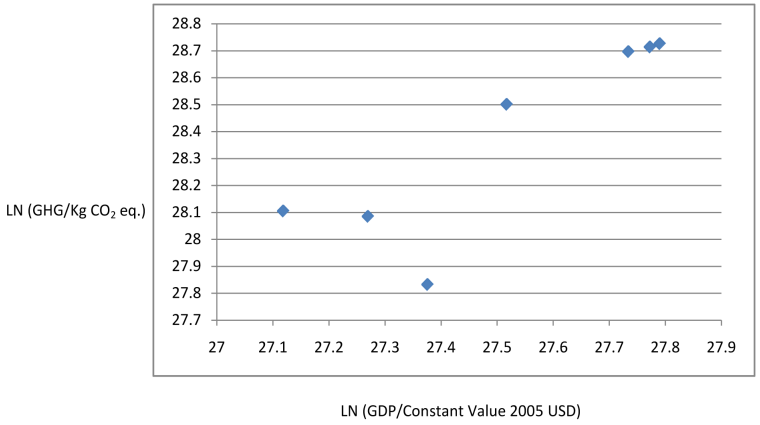

Figure 14. Brazil: Equa.: $y = 1.1915x$; $R^2 = 0.749$.

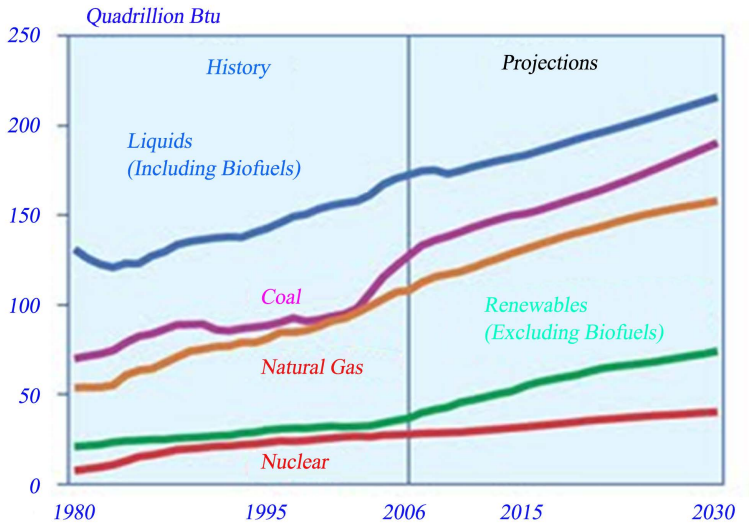

Figure 15. Energy projections. Sources: History: Energy Information Administration (EIA), Washington DC, International Energy Annual 2006 (June-December 2008), web site www.eia.doe.gov/iea. Projections: EIA, World Energy Projection Plus (2009).

Given these dire predictions, how can global GHC emissions be reduced? It is argued that the close links between emission, energy and GDP will be undone in the future, but is just wishful thinking.

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DATA

GHG: World Resources Institute (Washington DC).
GDP: World Bank (Washington DC).
Population: (1) United Nations Population Division. World Population Prospects; (2) United Nations Statistical Division. Population and Vital Statistics Report (various years); (3) Census reports and other Statistical publications from national statistical offices; (4) Eurostat: Demographic Statistics; (5) Secretariat of the Pacific Community: Statistics and Demography Programme; and (6) US Census.
Bureau: International Database.
BP Energy Outlook 2915.