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The New Silk Road: Fossil Fuel Eldorado?

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ABSTRACT: The New Silk Road project must be examined from the perspective of the COP21 Treaty. What the countries from Turkey to China along the Old Silk Road need is decarbonisation.

Keywords: ***COP21Treaty: GOALS I, II, III. New Silk Road.Fossil fuel dominance with some hydro power.***

1. INTRODUCTION

The political economy of Asian countries has focused upon one value the recent decades, namely economic growth and resulting affluence and cumulative wealth. It is a liberal economic miracle a la Hayek – the blessings of open economies, export orientation and market liberalization, i.e. laissez-faire. Despite all talk about market socialism, crony capitalism, state capitalism, South Asia, South East Asia as East Asia stand for much of capitalist dynamics today. As the greatly underestimated French economist J.B. Say stated: Supply creates demand, which entails that this part of the world has seen living standards markedly improved. Will the New Silk Road, projected by China and supported by countries concerned, bring affluence and wealth to the emerging market economics of Central Asia?

The Old Silk Road created wealth from China to Turkey, over *Kurdistan* by mean of slow trade. Now the gigantic plan to renew the Silk Road aims at fast trade like by mean of railroad and autostradas, besides the sea-link. The planners and governments concerned, all supporting the Chinese initiative, speak of a green road, an environmental friendly link from East to West. But could it be true?

The long land slice from Turkey to China over the countries of Turkistan, Iran and Pakistan is not often mentioned in debates about global warming and climate change as well as environmental threats. But in reality, it is a fossil fuel hotspot. Here we find several pipelines, enormous gas resources and an almost complete reliance upon fossil fuels, with much coal. Let us look at three of the largest nations: Turkey, Iran, Pakistan and Kazakhstan, all vital to the New Silk Road for success economically.

II. THE BASIC MODEL

To understand the real role that energy plays for the economy and CO2:s, we turn to the Kaya model. The basic theoretical effort to model the greenhouse gases, especially CO2:s, in terms of a so-called identity is the deterministic Kaya equation (Kaya and Yokoburi, 1997).

In theories of climate change, the focus is upon so-called anthropogenic causes of global warming through the release of greenhouse gases (GHG). To halt the growth of the GHG:s, of which CO2:s make up about 70 per cent, one must theorize the increase in CO2:s over time (longitudinally) and its variation among countries (cross-sectionally). As a matter of fact, CO2:s have very strong

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mundane conditions in human needs and social system prerequisites. Besides the breading of living species, like Homo sapiens for instance, energy consumption plays a major role. As energy is the capacity to do work, it is absolutely vital for the economy in a wide sense, covering both the official and the unofficial sides of the economic system of a country. The best model of carbon emissions to this day is the so-called Kaya model:

(E 1) Kaya's identity projects future carbon emissions on changes in Population (in *billions*), economic activity as GDP per capita (in *thousands of $US(1990) / person year*), energy intensity in *Watt years / dollar*, and carbon intensity of energy as *Gton C as CO_2 per TeraWatt year*." (http://climatemodels.uchicago.edu/kaya/kaya.doc.html)

Concerning the equation (E 1), it may seem premature to speak of a law or identity that explains carbon emissions completely, as if the Kaya identity were a deterministic natural law. It will not explain all the variation, as there is bound to be other factors that impact, at least to some extent. Thus, it is more proper to formulate it as a stochastic *law-like* proposition, where coefficients will be estimate using various data sets, without any assumption about stable universal parameters. Thus, we have this equation format for the Kaya probabilistic law-like proposition, as follows:

(E2) Multiple Regression: $Y = a + b_1X_1 + b_2X_2 + b_3X_3 + ... + b_tX_t + u$

Note: Y = the variable that you are trying to predict (dependent variable); X = the variable that you are using to predict Y (independent variable); a = the intercept; b = the slope; u = the regression residual.

Note: http://www.investopedia.com/terms/r/regression.asp#ixzz4Mg4Eyugw

Thus, using the Kaya model for empirical research on global warming, the following anthropogenic conditions would affect positively carbon emissions:

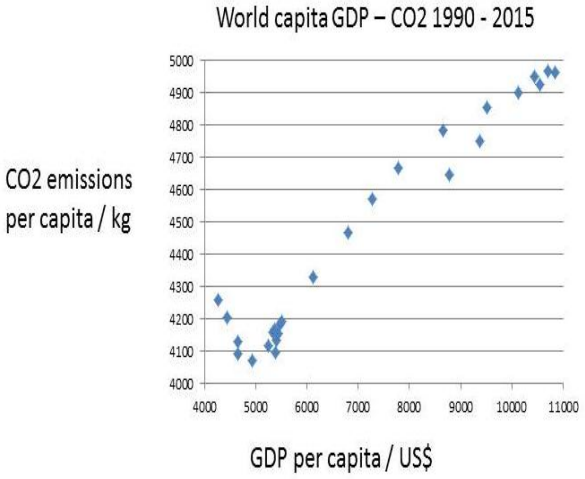
(E3) CO2:s = F(GDP/capita, Population, Energy intensity, Carbon intensity).

I make an empirical estimation of this probabilistic Kaya model with a *longitudinal* test for 1990-2014, i.e. World data 1990 - 2015:

(E4) Ln CO2 = 0,62*LN Population + 1,28*LN(GDP/Capita) + 0,96*LN(Energy/GDP); R2 = .90.

The close link in the Kaya model may be visualized in Figure 1.

Figure 1. GDP and CO2, 1990-2015:y = 0,15x , R^2 = 0,95



Source: World Bank Data Indicators, data.worldbank.org

The findings show that total GHG:s or CO2:s go with larger total GDP, i.e. GDP per person * population. To make the dilemma of energy versus emissions even worse, we show in Figure 2 that GDP increase with the augmentation of energy per capita. This makes the turn to a sustainable economy (Sachs, 2015) unlikely, as

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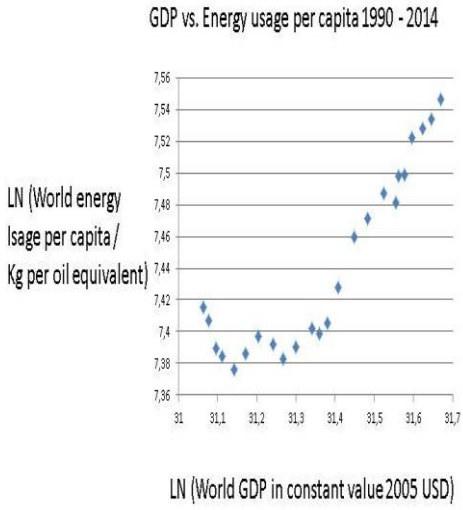
nations plan for much more energy in the coming decades.

Figure 2. GDP and energy per person 1990-2014



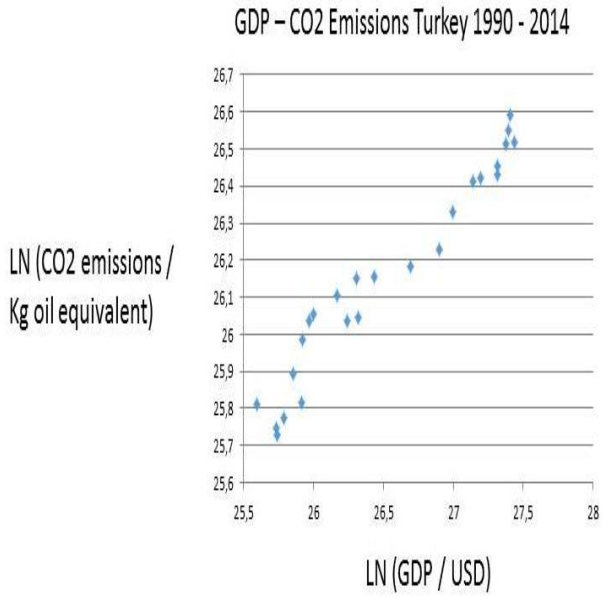
Decarbonisation is the UNFCCC policy promise to undo these "dismal" links by making GDP and energy consumption rely upon carbon neutral energy resources, like modern renewables and atomic energy. Thus, the upward sloping curves must be reversed but still slope outward. Let us apply this model to three big countries along the new Silk Road, focussing upon affluence, energy, emissions and environment.

III. TURKEY: Awakening Giant

The political economy of Turkey has concentrated upon the political stability of the polity, bypassing its huge leap in affluence and economic development. As a matter of fact, Turkey has never been politically stable, neither today nor historically speaking.

The Ottoman Empire is an example of oriental despotism, namely *sultanismus*. It was plagued by the instability of harem politics. When the Young Turks set up modern Turkey, they failed to stabilize the country with a permanent constitution. Thus, there have been many changes to the first Basic Law of 1921 and the second in 1924. The many constitutional changes reflect not only *coup d'état* but also a weak tradition of the *Rechtsstaat*. Economically, things are entirely different, as Turkey is one of giants of the global economy, especially important with connections to the West and dominance in Turkestan.

Figure 1. Turkey: GDP – CO2: y = 0,4092x, R^2 = 0,9449



Turkey has become a heavy-weight in the Asia Minor thanks to a rapid economic development of the country with huge population. Figure 1 supports this picture of Turkey as no longer a poor developing country. Comparing the picture for Turkey with that of "catch-up" nations, one may state that Turkey has the typical GDP-GHG link, despite lots of hydro power. 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. Figure 2 supports this picture of Turkey as a developed country..

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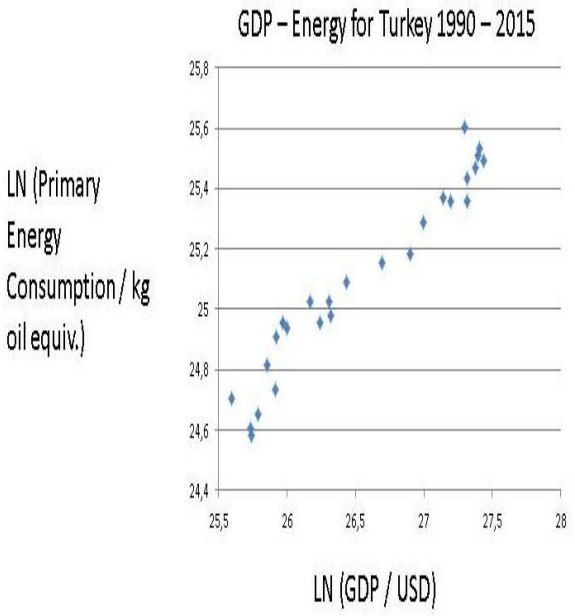
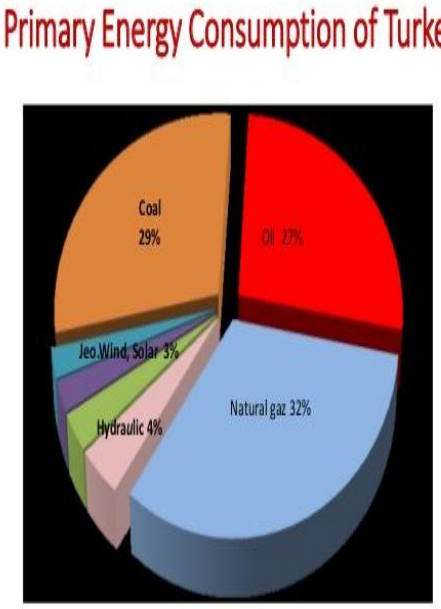
Figure 2. Turkey: energy-GDP link



Comparing the picture for Turkey with that of France and Germany, one may state that Turkey has the most typical curves. 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.

Turkey needs economic growth and lots of exports to pay for its energy needs, where oil and gas are imported from the East. Only hydro power is a large internal source of energy. Wind energy has become fashionable, but solar energy would be an ideal solution. Figure 2 shows how energy goes along with GDP growth. And Figure 3 displays the heavy reliance of Turkey on fossil fuels, mostly imported. Decarbonisation according to the COP21 Treaty implies that Turkey must change drastically, as it now depend at 90% on fossil fuels.

Figure 3. Energy mix in Turkey



Source:https://www.slideshare.net/omerfarukgurses/world-energy-outlook-2015-presentation

Turkey is completely at odds with the goals of the COP21 Treaty. It must start fundamental energy transformation towards the use of renewables.
As a matter of fact, Turkey, Iran and Kazakhstan are responsible for huge CO2 emissions, we may say. As they pursue the ”catch-up” strategy in relation to the advanced capitalist countries (Barro, 1991, Barro and Sala-i-Martin, 1992, 1995), they are not very eagre to take on the burden for global decarbonisation, especially if it hurts economic development. They would demand compensation from the promised Super Fund. Turkey has threatened to regene upon its COP21 promises.

IV. IRAN: Out of Isolation

Countries may rely upon petroleum and gas mainly – see Iran. CO2 emissions have generally followed economic development in the giant

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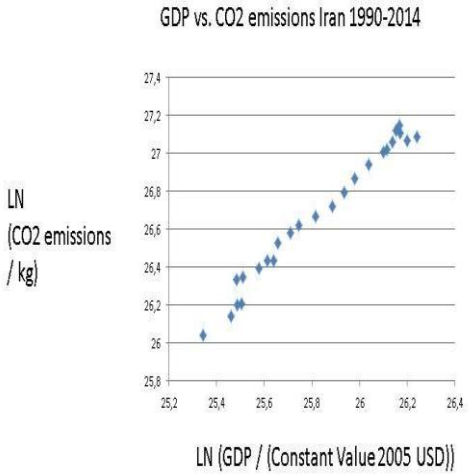
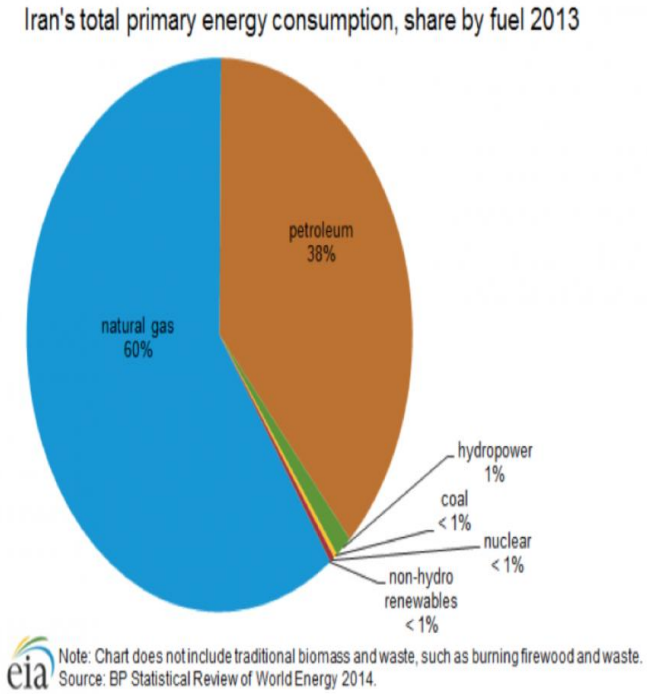
carbon rich countries. In Iran though, there seems to be a planning out recently, perhaps due to the international sanctions against its economy. Iran has made considerable economic advances, despite international sanctions, but its CO2:s have also increased much (Figure 4).

Figure 4. Iran: GDP-CO2 link (y = 1,2229x - 4,91; R^2 = 0,98)



Iran is together with Russia and Qatar the largest owner of natural gas deposits, but also Turkmenistan and Ouzbekistan have enormous gas reserves. But despite using coal in very small amounts, its CO2 emissions are high. Natural gas pollute less than oil and coal, but if released unburned it is very dangerous as a greenhouse gas. Iran relies upon its enormous resources of gas and oil (Figure 5) to support the "take-off" of its economy (Rostov, 1960).

Figure 5. Iran: Energy mix



Iran is far from the goals of the COP21 Treaty, relying to 95% upon fossil fuels. It face difficulties with all three major objectives of the UNFCCC: GOAL I, II and III. Iran needs foreign exchange to pay for all its imports of goods and services. Using nuclear power at home and exporting more oil and gas would no doubt be profitable for the country. And it would also help Iran with the COP21 goals achievement. Solar power parks are the best solution.

V. PAKISTAN: Colossus on clay feet

The same upward trend for emissions holds for another major developing country with huge population, namely Pakistan (Figure 6). China relies much upon this country for its East-West plans. Pakistan needs high economic growth to feed its huge population, but economic development comes with Co2 emissions, despite much hydro power.

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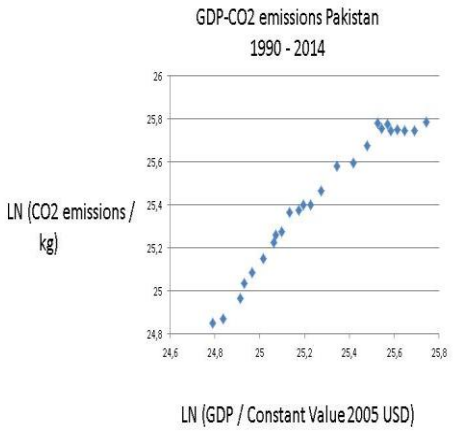
Figure 6. Pakistan GDP-CO2 link: y = 1,045x - 0,973; R^2 = 0,96



The amount of GO2 emissions is not so large for Pakistan. Viewed aggregately, Pakistan is reliant upon fossil fuels up to almost 70% (Figure 7). But its hydro power is impressive as its nuclear power.

Figure 7. Present energy mix in Pakistan

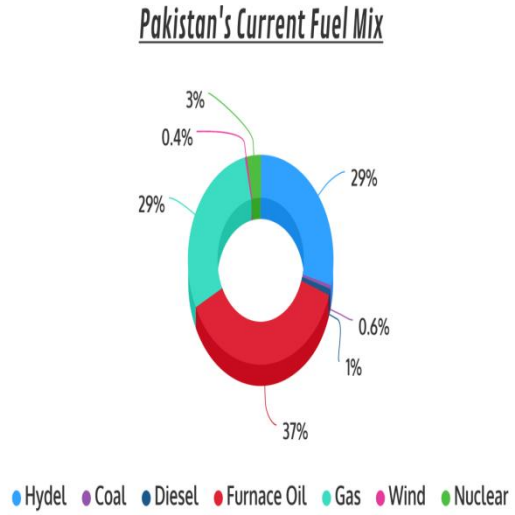
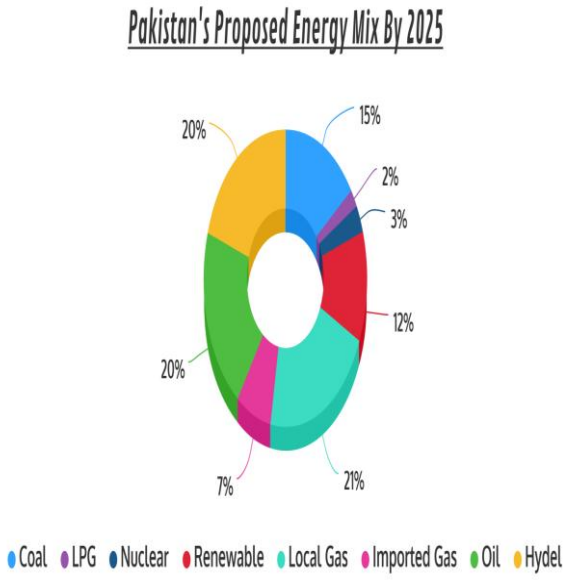


Figure 8. Pakistan: Future energy mix



As Figure 8 indicates, whether Pakistan aims to take the COP21 Goals seriously can be question, as coal is going to come in in a major supply way. Yet, Pakistan employs a considerable portion of hydropower – 13 per cent – and a minor portion of nuclear power, which is a positive.

VI. Kazakhstan: Global powerhouse in Turkestan

Here, we have a nation very much occupied with the catch-up strategy, as its exit from the Soviet Union worked like a "take-off" stage. It wants to copy the Asian miracles, moving to affluence in a few decades, using its immense fossil energy resources (Figure 9). But this picture is far from the obligations under the COP21 Treaty.

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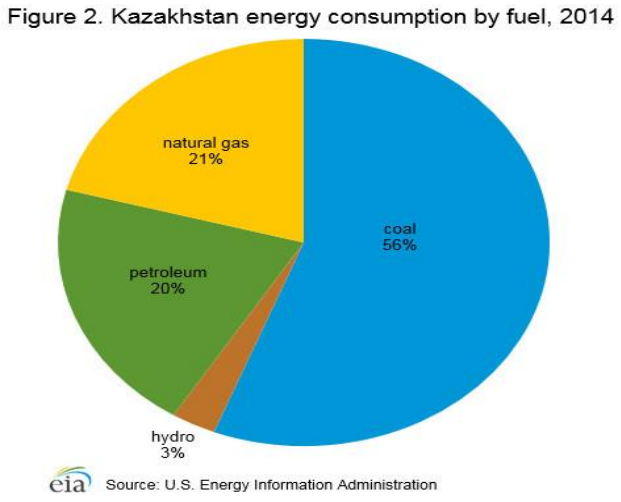
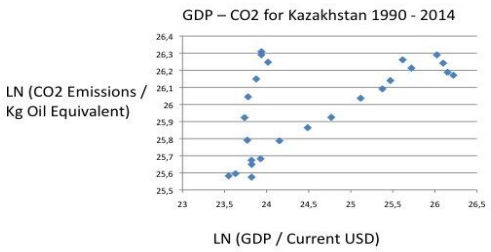
Figure 9.



Kazakhstan's energy consumption leads to enormous emissions (Figure 10). The stunning economic development, including the great project of a modern Silk Roan from China to Germany through Kazakhstan implies that the CO21 goals cannot be accomplished here. Catch-up strategy and huge infrastructure trump climate change. Countries with no hydro power often display increasing trends for emissions. Consider this strategy and gas rich country in Asia – Figure 10..

Figure 10. Kazahkstan's link (y = 0,1671; R^2 = 0,38206)
strategy

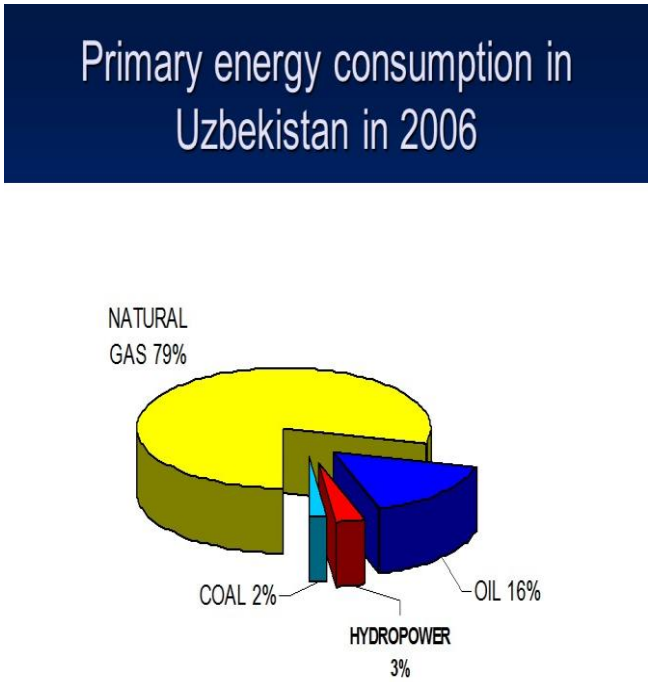


Kazahkstan employs its vast fossil fuel resources for energy consumpton besides exporting a lot. But it has to start energy transformation towards renewables.

VII. THE OTHER "KHANATES"

The New Silk Road will affect also the other so-caled Khanates. They are poor and small in population. Their energy situation is generaly one-sided. One the one hand, we have Ouzbekistan with fossil fuel dominance – see Figure11.

Figure 11. Energy mix in Ouzbekistane



Source:http://slayd.arxiv.uz/index.php?do=files&op=download&file

Turkmenistan looks the same, drawing upon the huge gas resources in relation to the Caspain Sea. On the other hand, Tadjikistan and Kyrgistan has a completely different mix, relying mainly upon hydro power.

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VIII. THE SILK ROAD AS CARBON OVERLOADED

Despite the rhetoric about the new green silk road connecting the East with the West, we find evidence of fossil fuel dominance in the social systems of the four key countries: Turkey, Iran, Pakistan and Kazakhstan. Thus, one may mention:

a) Energy with fossil fuels
b) Pipelines for oil and gas, train, road and infre structure development on a gigantic scale.

a) All countries analysed above are far away from the COP21 GOALS I, II and III.

We have noted the contribution to energy consumption by hydro power in Turkey, Tadjikistan and Pakistan. Pakistan also has nuclear power, whereas Turkkey possess wind power. But otherwise, it is all fossil fuels. Decarbonisation is necessary in the countries along the New Silk Road, as it is not a Green Road at all.

b) Pipelines and infrastructure

West Stream: An Intergovernmental Agreement was signed 1984 and natural gas imports started 1987. The Russia -Turkey Natural Gas Pipeline, which enters the country from the Malkoçlar on the Bulgarian border, following the route Hamitabat, Ambarlı, Istanbul, Izmit, Bursa and Eskişehir and reaches to Ankara, is 845 km long.

Blue Stream: Within the scope of the 25-year Natural Gas Purchase-Sale Agreement signed between BOTAŞ and Gazexport on December 15, 1997, natural gas is transported from the Russian Federation through a transit line under the Black Sea to Turkey. According to the agreement, 16 billion cubic meters of natural gas per year is supplied to Turkey.

Eastern Anatolia:A Natural Gas Purchase-Sale Agreement was signed between Iran and Turkey on 8 August 1996 in Tehran for the purpose of supplying 10 billion m3 per year of Iranian natural gas to Turkey via pipeline. The Eastern Anatolian Natural Gas Main Transmission Line.

Baku-Enzerum: The Baku-Tbilisi-Erzurum Natural Gas Pipeline, which aims to supply natural gas to be produced on the Shah Deniz field in the southern Caspian Sea region of Azerbaijan to Turkey, was realized under the Turkey-Azerbaijan Intergovernmental Agreement signed on 12 March 200. The BTE pipeline, 980 km long, uses the same corridor as the Baku-Tbilisi-Ceyhan Crude Oil Pipeline (BTC) in the territories of Azerbaijan and Georgia.

Turkey-Greece: The first phase of the South European Gas Ring, which was developed within the context of the European Union INOGATE (Interstate Oil and Gas Transport to Europe) Program, is the pipeline that will interconnect the Turkish and Greek natural gas systems and enable to transport natural gas to Greece from and/or through Turkey. This natural gas supply has been started in 2007.The Project has been planned to extend to Italy.

Trans-Anatolia: In order to meet the rising natural gas demand of Turkey, negotiations were held with the Azerbaijan Government and Shah Deniz Consortium, which has developed Shah Deniz field of Azerbaijan, and an agreement was signed on October 25, 2011 envisaging the supply of 6 billion m3 Azeri gas annually to Turkey starting from 2018. The first gas flow to Turkey via the pipeline is planned to be achieved in 2018. As for Europe, it is projected that gas supply will start at the year 2020.

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Turkstream: In order to provide political support for the TurkStream Gas Pipeline Project and to determine the technical, economic and legal framework, The Intergovernmental Agreement between the Government of the Republic of Turkey and the Government of the Russian Federation on the TurkStream Gas Pipeline was signed in Istanbul in 2016. TurkStreeam Gas Pipeline Project is a new pipeline system running from Russia through Black Sea to receiving terminal on the Black Sea coast of Turkey.The project has an offshore section and an onshore section, which will be constructed to supply the natural gas to Turkey from Russia as well as to supply the Russian gas to Europe through the territory of Turkey. One of the lines in the onshore section will solely supply natural gas to Turkey. The second pipeline on the onshore section will supply gas to Europe.

Turkmenistan-China: Stretching from Turkmenistan to Xinjiang, the 3,666km pipeline was built before the new Silk Road project but forms the backbone of infrastructure links between the two countries. The pipeline is Chinese-built and cost US$7.3 billion.

Pakistan-China: The US$57 billion corridor to connect China's western provinces to the sea via Pakistan's Gwadar Port is the biggest project under the belt and road banner. It includes the China-Pakistan highway, railways, pipelines and power lines. One key project is the US$1.65 billion Karot hydropower plant in Pakistan, sponsored by China Three Gorges Corporation, reducing power shortages in Pakistan.

Iran-China: The first freight train from China arrived in Tehran, Iran, last year, making the 10,400km journey in 14 days. Tehran hopes the rail services will turn the country into a major Eurasian trade hub.

Kazakhstan-China: China plans to turn Khorgos in Xinjianginto a trade hub. Beijing aims to use the border city to link China with neighbouring Kazakhstan, and on to East Asia and Europe.

Summing Up: This small overview of plans and activities for the New Silk Road countries – Turkey, Iran, Pakistan and Kazakhstan – shows that it is not a question of a Green Road. On the contrary, fossil fuel dominated besides some hydro power.

IX. DANGERS AND RATIONAL EXPECTATIONS

Central Asian countries now face the conditions for implementing the COP21 goals:
a) Halting the increase in CO2:s by 2020 – GOAL I;
b) Reducing CO2:s by some 30-40 per cent - GOAL II;
c) Complete or near total decarbonisation by 2075 – GOAL III.

Decarbonisation is the policy promise to undo these "dismal" links by making GDP and energy consumption rely upon carbon neutral energy resources, like modern renewables and atomic energy. Thus, the upward sloping CO2 curves must be reversed and start sloping downward (Stern, 2007, 2015). Thus, each nation and its government and private sector as well as third sector partners have to develop their specific policy to promote the goals of COP21: rapid decarbonisation.
The damages from climate change are visible in Asia now:

a) Land losses along the costs (Bangladesh, the Philippines));

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b) Too high temperatures for men and women to work outside (India);
c) Food production decline (Pakistan, Sri Lanka);
d) Fish harvest decrease (China, Malaysia Pacific);
e) Droughts and starvation (Pakistan, India, Bangladesh);
f) Lack of fresh water supply (India);
g) Drying up of rivers (India, China);
h) Ocean acidification and species extinction (Australia);
i) Highly volatile climate with tremendous damages (Sri Lanka, Thailand, the Philippines, Malaysia);
j) Deforestation (Indonesia).

Among the dangers loom worse much outcomes, like the transformations of warm and cold currents in the oceans.

X. THE ONLY REMEDY: Renewables – solar plants OUARZAZATE Size

Let us examine what this hoped for reduction of fossil fuels implies for the augmentation of renewable energy consumption, here solar power. The use of atomic power is highly contested, some countries closing reactors while others construct new and hopefully safer ones. I here bypass wind power and thermal power for the sake of simplicity in calculations. But wind power is highly relevant and would substitute for solar power. Geo-thermal power is country specific. Actually, every country has its specificities when it comes to energy resources and energy consumption. Consider now Table 1, using the giant solar power station in Morocco as the benchmark, it asks: 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 very big CO2 emissions?

Table 1. Number of Ouarzazate type solar plants for decarbonisation GOAL II in 2030

Nation	Co2 reduction pledge / % of 2005 emissions	Number of gigantic solar plants needed (Ouarzazate)	Gigantic plants needed for 40 % reduction
Turkey	21	60	120
Iran	4 – 12	22	220
Kazakhstan	None	0	100
Pakistan	None	0	60

Sources: Paris 2015: Tracking country climate pledges. Carbon Brief, 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. Emission Database for Global Atmospheric Research (EDGAR), release version 4.3.2. http://edgar.jrc.ec.europe.eu, 2016 forthcoming;
CO2 Emission Reduction With Solar
http://www.solarmango.com/in/tools/solar-carbon-emission-reduction

XI. CONCLUSION

The long land slice from Turkey to China over Turkestan and the Old Silk Road will most likely be developed into an energy hub for the New Silk Road. It is good news for these poor countries, but bad news for the global energy transformation that must come now, if we are to avoid Stephen Hawking's dire that climate change could become irreversible. Solar power parks are the solution for Turkey and Central Asia.

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