DECARBONIZATION OF THE WORLD ECONOMY: IMPERATIVE OR SUPPLETIVE? CHINA VERSUS INDIA

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Abstract

The paper presents general considerations on economy decarbonization, living-environment protection against carbon emissions and greenhouse gases. The paper highlights the most important social and technic traits of the Chinese and Indian economies, correlated with the degree of pollution produced by these countries to the world economies. As known, current production of energy gets through important socio-economic fluctuations due to falling prices of fossil fuels, especially crude oil, and renewable energy production decline amid returning to hydrocarbons. Decarbonization atmosphere scenarios converge to formulate common postulates, namely: energy efficiency, energy from renewable and other alternative energy (eg nuclear energy or biogas) and capturing or storing carbon dioxide. In these scenarios, premises that emerges reveals that on the medium and long term, decarbonization is more effective than the currently system promoted by pollution. Also it is considered that improving energy efficiency, including the use of renewable and other alternative energy, represent another important imperative. The major disadvantage of alternative energies is the necessity for massive investments in infrastructure development for medium and long term green energy scenario.

Key words: Economy Decarbonization, Renewable Energy, Crude Oil Deflation, Climate Change

INTRODUCTION

World economy decarbonization should be one of the better future construct, and in the same time an imperative for pollution and harmful stagnation effects. Carbon emissions and greenhouse gases are important issues of human security and safety. Without concrete measures in balancing the effects of atmosphere „carbonization", propulsion mechanisms for humanity driven are toward to an improbable future. Each person must be conscious that the prospect of space-time system for the mankind requires sustainable architecture for alternative energies, with a decisive role in the present and future human being. Energy system requires establishing a concordance between developments, continuous supply of energy and decarbonization of the world economy. The premise of a sustainable future in terms of energy, focusing on alignment of energy demand dynamics to electricity generation in terms of world economies centralization or decentralization; increasing energy quality by reducing fluctuation and surge voltage energy, including resolving the disruptions in supply; risk prevention of energy islanding and energy systems problems; coordination between control systems for public and private network;

decentralized generation of electricity, which can produce electricity outages and delayed general power-supply recovery. (Tănăsescu, 2014)

The article is structured as follows: the first section presents literature review, including problem formulation for the topic of world economy decarbonization; the second section describes methods and data, adding the importance of world depollution in the context of Paris Agreement Climate Change; the third section shows the importance of crude oil deflation on world economy, with special approach for Chinese and Indian economies; the final section concludes and proposes ways of decarbonization.

LITERATURE REVIEW. PROBLEM FORMULATION

Decarbonization, one of the most important problem of the humanity, has to be done in the spirit of sustainable development idea. According to Laurent (2015) the problems provoked by the electricity generation "has been known to cause important damages to ecosystems and human health" (p.1). Economy decarbonization requires before something else the transition from fossil fuels problems of energy production to alternative energy solutions. Although for the moment crude oil and other fossil fuels prices depreciates considerably, the perspective of decarbonization can shape increasingly better by gradual transition from traditional energy to renewables. However, the premise should not be the increasing of renewables share by the rise or fall in prices for crude oil and natural gas. The drop in crude oil prices is not necessarily the better thing could happen because the reduction of current energy market has to induce the return of crude oil consumption, in order to obtain energy. "Decarbonization of the electricity sector is crucial and must involve considerable increases in the renewables energy rate - in those states that have chosen to use it – and nuclear power rate, as well as the use of CSC systems (carbon capture and storage carbohydrates) and cogeneration systems development, combined heat and electric power plants powered by fossil fuels." (European Commision-Pezzini, 2011, p.41)

At the internationally level, the energy market is in continuous metamorphosis process, each type of fuel in energy generation changing constantly market position. Last year retrospective shows crude oil and natural gas prices in severe decline, while coal and uranium just in relative reduction. Although the trend of reduction of mentioned commodities prices is favourably to energy produced by these sources, renewable energy occupies an important and increasingly position among the world's energy system. Against this background, both industrial consumers and householders are moving toward renewables. On the domino principle, world economy offers stagnation scenarios for fossil fuels, even amid the sharp reduction in crude oil prices. Situation will still present in the same way, standing out a considerable reduction in fossil fuel prices, because

OPEC countries are not willing to reduce production for crude oil prices stem decline. But now, the biggest problem of protecting the environment is the "carbonization" atmosphere, hence of the economy, produced by the most populated countries of the world, namely China and India. Ball (2007), Pomeranz (2012), Topik (2014), Samii (2008), Zhang (2016). The paper presents China and India because these countries produces in 2016 more than 40% of the world pollution, especially carbon dioxide emissions.

In the context of climate change mitigation and Paris Agreement (2016), a list of scientists, Zhou (2015), Bhasin (2007), Gupta (2016), Fontaine (2005), Gutierrez (2012), Hofstede (1991), Hur (2015), proposes not only technical and economical solutions, but behavioural too. Regarding technical resolving of the pollution and climate change problems, Zhang (2016) shows that "more emissions are to occur if coal power additions are completely banned from 2020 as a stringent coal control policy… It is necessary to take account of how to avoid the new lock-in effects of environment action intended to unlock existing infrastructures in the context of required climate change mitigation. The early phase-out of inefficient equipment is not necessarily a green investment" (p.1). Instead, ethic keys for environmental protection, especially in China and India, expect cultural pattern remodelling of thinking constructs and people environmental education. Hahn (2016) points the importance of energy consumption decisions of consumers and economic welfare impacts of behavioural interventions in order to develop a better depollution of the world economy. In the paper The Impact of Behavioural Science Experiments on Energy Policy, Hahn (2016) postulates that "the use of social norms can change energy use" (p.1). Specifically, for China, Yang (2016) consider that "rapid economic growth has resulted in serious environmental issues especially on the urban air pollution, which has caused serious harm to the health of residents and large economic losses" (p.1). In this context, the decisive approach for China is a real reform in environmental protection, especially through renewables. On the same pattern, Sharan (2011), proposes for India the replacement of fossil fuel based energy with one of the most possible solution, respectively solar energy. Whatever the solutions, for humanity and especially these two polluting countries, the aim should be continuous reduction of decarbonization and followed into a persuasive way.

MATERIAL AND METHOD

The paper develops and assesses the decarbonization of the world economy in the context of climate change desiderata. Taking into account decarbonization analysis, the paper offers a current and future situation picture of this sector. The research is exploratory and statistics calculus oriented. In order to cover the dynamics of energy sector, methods present

multi-method approach, utilizing primary and secondary research through exploratory data from official website regarding energy, climate change, decarbonization and pollution, as European Union Statistics (EuroStat), International Trade Centre which is support platform for the United Nations (UN), World Trade Organization (WTO) and United Nations Conference on Trade and Development (UNCTAD). In principal, the analysis for the quantitative part of the paper is univariate, supplemented by bivariate for the qualitative one. In addition, with these types of research, in the paper have been used a variety of secondary sources – particularly journals, books and reports on energy sector.

According to Australian Government – Department of the Environment and Energy (2016), measurement of the pollution has some important indicators, Particulate Matter 10 (PM10) being one of it. PM10 measure particulate matter with 10 micrometers or less. Particulate matter is synonym with dust, inhalable particles, respirable particles, smoke, mist.

Data for pollution indicator Particulate Matter 10 (PM10) shows that carbonization in China and India, among others Asian countries, have significantly values. For example, the level of weighted concentration for air pollution (September 2016) in China (Xinyuan BDA – Hanzhong) is about 485 PM10 and in India (Anand Vihar, Delhi) is about 554 PM10, while in Romania (Bucharest) is about 42 PM10. The pollution indicators values for China and India are immeasurably higher than others countries. High values could be found in some Asian countries, but not so much. Data published in The Guardian (2013) showed that in 2000-2009 period China has increased their carbon dioxide emissions with 170,6%, India with 59,7%, while countries as Romania reduces its carbonization with -13,7%. The data presented for the polluted countries shows that will be difficult to resolve the problems.

RESULTS AND DISCUSSION

The decarbonization of the world economy it is realizing with difficulties, not only in the light of production increasing despite low prices of crude oil, but also due to other important factors, such as: returning of USA energy production through hydraulic fracturing of gas and crude oil clays, returning of Libya to fossil fuels market, which lacked a period in the market because of the social uncertainties, etc. (Crânganu, 2015)

Crânganu (2015) consider that humanity is currently in the process of crude oil deflation, causing serious damage to some economies such as Russia and Iran. The foreshadow scenarios may be encountered in the deflation default, respectively (Lazar, 2015):

- on the one hand, lowering costs employers / employees that will stimulate savings for consumers in proportion to increased investment;

- secondly, the continued decline in prices could lead to unemployment increase on the pattern of the Great Depression (1929-1939).

Crude oil deflation is subject of world economic stability with major pressures, such as currencies depreciation in emerging countries amid dollar appreciation, the relationship between the dollar appreciation and crude oil prices reduction has been demonstrated countless times in the history; the risk of deflation in Europe and Japan, currencies of these areas considerably depreciating against the dollar; financial instability of the crude oil market assets could lead to bankruptcy of the energy market players, the after-effects being the collapse of some banks that financed those players and unbalance other financial markets. (Crânganu, 2015)

As seen reducing crude oil prices is a positive phenomenon for area as Europe and Japan. But, for other countries, as India and Indonesia, diminishing the crude oil price represents an excellent opportunity of gradual shifting from crude oil to renewable energy. While Iran has become a formidable partner in international crude oil trade, amid turmoil in the Middle East, position of this state was strengthened, including in renewable energy.

In the context of deflation crude oil, China - the largest consumer of world energy - becomes one of the major players of the renewable energy system. Being one of the countries generating the largest pollution, China is making considerable efforts in investment for economic growth and sustainable development. Data for 2014, comparatively to 2013, show that China, with over -13% of pollution reduction, became the second largest world power that invests in decarbonization. Echoing Germany (European Union), China may represent a potential world protector of decarbonization and alternative energies. As shown in IEA reports (IEA, 2015a, p.30), along with China the European Union, with a percentage of pollution reduction of over 20%, has become the spearhead for decarbonization. Negative trend in decarbonization it has and Japan, with a rate of over -4%, but the report is favorable to environment protection. Instead, countries like USA or India have positive carbon emission in 2014, respectively +4% and +14%, and the perspectives are not favorable.

In this context, Europe become key actor in decarbonization, the importance of a common energy market in EU being able to guarantee clean energy at low prices under maximum efficiency. Scenarios of common energy market development are realized based on national measures too, taken to reduce climate change. (Papatulică & Pop, 2015). Therefore, empowering governments of the European Union is one of the most important actions needed in decarbonization, Germany's role being decisive because it is considered one of the most influential world countries in promoting green energy.

Long before Paris Agreement alert, EU countries promoted the decarbonization importance of the world economy. In terms of demographic growth of world population, diversification and needs refining of the current humankind, amid resources in continuous decline and socio-economic imbalance, 2040 scenarios emphasize the importance of people informing and education in the atmosphere decarbonization spirit. One of the current generation problem is that runs its existence on credit, a loan made on climate health and safety of future generations. In the best-case IEA scenario, projected at the end of 2015, mankind will experience before 2040 an increased pollution, by more than a third of the current period, India, China, Middle East and Southeast Asia being in the top classification. Non-OECD countries are meant to counteract the effects of policies and actions of OECD countries, even in economic disadvantages conditions due to the decarbonization reduction. It is estimated that by 2040, global actors like the European Union, Japan and the United States will suffer incalculable economic losses in order to reduce its own following scenario decarbonization, respectively -15%, -12% and -3%. If non-OECD countries currently hold a total share of 19% in green energy, the 2040 target is increasing with 25%. Among fossil fuels, natural gas remains the most promoted, being least atmosphere polluting than others. (IEA, 2015a)

In this context, by strategic position at the world economy, China's role in decarbonization imperative is more than necessary. The country with the largest number of people, more than 1.3 billion in 2015, and where the sun rises sometimes only on the big screen in public places, China must impose in the common consciousness his quality of ancient civilizations ex-leader. Authority of world trade over several civilizations, and capable of Silk Road initiation, making the first official broadcast of paper money (the list of major implications in world history could continue), China must take on critical tasks to rebalance planet decarbonization. By positions assumed and proposals made under the Paris Agreement it is deductible that China understood its shoulders responsibility and understand its spearhead status, against environmental deterioration.

Though lately, India had a considerable upswing in economy “carbonization”, still China remains the undisputed leader of the pollution. Although, the United States is the largest energy consumer, in the near future is expected that China's total energy demand will be doubled by 2040. Structural changes in Chinese economy, which tend to develop increasingly more and more in service sector to the detriment of industry (we witnessing to a substantial decline of heavy, steel and cement industry), requires investment policies revision in both sectors. To foster the development of heavy industry, less polluting than coal industry, China proposes for 2017 a development energy system scheme, providing

renewable energy to deserves place. The approaches of the past decade, realized in halting pollution effects, puts China into a relatively ruler position. However, in China the imbalance is meant because energy demand pollution is very high. IEA experts consider that Chinese pace of decarbonization will impose to the world a pollution decreasing curve after 2030, which is considered peak year for global carbon emissions. (IEA, 2015b)

USA and India are two of the "carbonization" atmosphere world's top, with percentages above 4% and 14%. (IEA, 2015a). India dominates world's top polluters, especially because does not make significant efforts to decarbonize. A country of contrasts, India is the country, predicted by 2040, of over 1,6 billion people, going first in the top of the world population. With a breeding population to escape partly out of control - especially among the poor class which does everything for food - Indian administration will hardly achieve steps towards decarbonization. The involvement of developed states in India will have to overcome proposals or imperatives boundary, investments in the Indian economy being the optimal solution, but small steps achievement, especially in decarbonizing the atmosphere.

Noting "carbonization" abuse to the world economy by India, the IEA conducted a survey dedicated to this country, published in the end of 2015, which analyzes the current economic situation of decarbonization and proposing to Bharat mandatory solutions. It highlights the need for investments in infrastructure, new technologies for energy sector clean, realization and implementation of information campaigns on the degree of pollution planet by India, educating people for the purposes of economically and efficiently energy consumption, awareness of the administration regarding the importance of prioritizing the use of renewables to the detriment of classically energy.

Part of the BRICS economically emergence chain, India is 6% of the world's population, the third largest economy, but the country using only 6% of world electricity and 5% of the population having no access to electricity (about 240 million people). Efforts are considerable, especially in modernizing and developing the country through "Make in India" programme, leading to rapid population growth. It is anticipated that by 2040 the urban population of India will increase by more than 315 million. (IEA, 2015a). If the Chinese urban population occupies a total percentage of about 50.6%, the Indian stands at only 31.3%. Intensifying Indian urban population is in rising, some of the scenarios that will unfold over the massive urbanization are not even at the stage of plan. Urbanization rates of the two countries, in 2010-2015 period, about 2.85% (China) and 2.47% (India), is above 1.89% - world average, but below the countries as Burundi

(6.8%), Thailand (6.6%), Liberia (5.6%), Afghanistan (5.4%), etc. (Index Mundi, 2016). Such a degree of urban population growth indicates a rising demand for energy, especially in Asia.

Existing and prospective policies and efforts to accelerate the modernization of the country make India the most exposed country in "carbonization" and pollution. Increased demand for coal in power generation and tidal industry, in India using coal for over half of the energy industry, transforms this country in the most polluting one. Davis (2006), postulates that including rising of the Indian crude oil demand contributes to the environment vitiation. With foreign investments in the higher technologies for classical energy, but also renewable, India made efforts to reduce carbon emissions. Alternative energy investing in India are solar, wind and hydropower. It is estimated that by 2030, India will heavily dependent on renewables, being able to fulfill the commitment made by the Paris Agreement, i.e. increasing the share of non-fossil fuel capacity to over 40%. Problem is not what will carry India by 2030, but the harm has in the present and immediate horizon. In the Indian context, energy security plays a key role in ensuring a clean environment, rather than a facultative, and this is an imperative. World powers are imposing to India environment and energy control. The amount of required investment value in securing India's energy stands at about 2.8 trillion dollars, and needs an extraordinary conceptual framework. It is noted, therefore, that India should make efforts to take over and adapt energy legislation in order to align with the global economy. Indian investments in energy currently amounts to ¾ of the total, necessitates to meet national energy demand which is four times higher. If we add distribution losses due to normal causes or theft, Indian energy demands will explode by 2040, in direct correlation with the deepening financial deficit in the energy sector. Increasing the supply of coal extraction with insignificant costs, particularly by implementing new extraction technologies, make India the second largest coal producer and by 2020 the largest importer, surpassing Japan, European Union and China. The dramatic fall in crude oil production, fossil fuel less polluting than coal, amid increasing demand for energy, converted India into a net importer of crude oil. Forecasts show that by 2040 crude oil import dependency will be about 90%. (IEA, 2015a)

CONCLUSIONS

In a comparative study China versus India conducted by Index Mundi (2016), these countries behave problems relatively similar, namely: significant pollution of air coming from the intensive use of coal in order to produce acid rain, infested waters amid industrialization uncontrolled, emissions caused by the numerous vehicles, etc.; deforestation; loss of

agricultural land due to considerable erosion; desertification; water pollution from untreated waste and pesticide runoff; water shortages in certain areas of these countries; growing population with continuous and irresponsible overuse of natural resources. As specific environmental problems, the study points out to China the extensively trade with animals, especially those endangered; India, however, has problems of overgrazing by paying attention to animals, especially ruminants. Regarding renewable water resources, China had in 2011 a potential of 2840 km3, while India only in 1911 km3. It is denoting that hydro potential of China is considerably better than of India. Regarding the mix of renewable resources, India currently provides a total of 37 GW, while China provides 33 GW only of photovoltaic power. But the potential of Indian solar power is remarkable, which amounts to about 750 GW. The data presented show that the potential of renewable resources of the two countries is huge, using and investing for development remaining in the term of use. In the light of production capacity for both countries, negligible solutions are inclusive shale gas, namely biogas production. (Papatulică & Prisecaru, 2014).

A rapidly expanding energy sector could exacerbate, at both countries and worldwide, the difficulties caused by pollution of water, air and soil. Concrete measures are required, such as integrated policies for the use of urban and rural areas, initiatives such as smart cities, pollution control by all possible measures, technological development, effective investments in energy, ratification of international protocols, etc. However, the pace of climate change is not waiting, China and especially India, being unable to solve their own pollution. China, but especially India have their development on reliability, durability and security of the whole planet. Therefore, priorities imposed upon them are in fact the all blue planet's inhabitants, measures implementation being imperative given that everybody wants a better, safer, and more secure world future.

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