



ORIGINAL RESEARCH PAPER

Economics

ENVIRONMENTAL COST OF ECONOMIC GROWTH IN INDIA

KEY WORDS: emissions of CO2, GDP, growth, population

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ABSTRACT

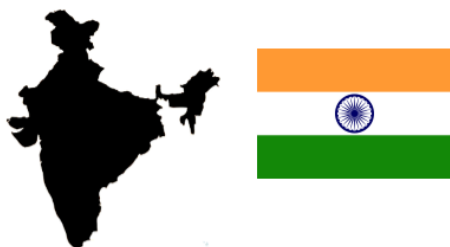
India is a country with a government committed to the goals of economic growth to achieve a better welfare for its population. However, the foregoing leads to a high level of pollution because of the use of fossil fuels in a 72.4 per cent of the times to try to reach to supply electrical energy and better levels of quality of life to the Hindus. The projected figures show that India is at an early stage of economic growth according to the level indicated by the curve of Kutznetz (Kuznets, 1955), India therefore must pay a high social cost, the contamination. The growth of the population and of the vehicles will also be a key factor in this topic. India also represents a global environmental risk and is in the worst conditions of environmental efficiency in the use of fossil fuels for the achievement of economic growth. This is evidenced by the results presented here.

Introduction

India today, is one of the countries with the largest presence in the global environmental news. Their levels of pollution achieved in some cities put it in third place on countries with the greatest amount of emissions of CO2, just after China and the United States, countries that have seen reflected the pollution in higher levels of economic growth which in turn generate better levels of economic welfare in its inhabitants, not the case of India where their macro economic figures show a different situation.

According to the magazine datosmacro.com Expansion (Expansion, 2016), India, is located in the south of Asia, with a geographical area of 3.287.260 Km2, therefore, of the largest countries in the world. The population that appointment for the 2016 reaches 1'311,050,527 people, is one of the most populous countries in the world with a high population density of 399 inhabitants per km2. Its capital is New Delhi and its currency are the Indian Rupees that have a current exchange rate of 1 EUR= 70.93* INR (rupees). India belongs and continues the economic guidelines and international trade of some international agencies such as the IMF, the G20, BRICS, among others.

Figure 1. Geographical map and economic data of India



President: Pranab Kumar Mukherjee
First Ministre: Narendra Modi
Capital: New Delhi
Population: 1,311,050,527 (2015)
Area: 2,973,190 (2015)
GDP per capita: 1,582 (2015)
GDP, current US\$: 2,073.5 (2015)
GINI index: 33.601680369 (2012)
Ease of Doing Business Rank: 130 (2015)
Currency: Indian Rupees (1 EUR 0 70.6425)

Languages: Hindi 41%, Bengali 8.1%, Telugu 7.2%, Marathi 7%, Tamil 5.9%, Urdu 5%, Gujarati 4.5%, Kannada 3.7%, Malayalam Oriya 3.2%, 3.2%, Punjabi 2.8%, Assamese 1.3%, Maithili 1.2%, other 5.9% Note: English enjoys the status of subsidiary official language but is the most important language for national, political, and commercial communication; Hindi is the most widely spoken language and primary tongue of 41% of the people; there are 14 other official languages: Bengali, Telugu, Marathi, Tamil, Urdu, Gujarati, Malayalam, Kannada, Oriya, Punjabi, Assamese, Kashmiri, Sindhi, and Sanskrit; Hindustani is a

popular variant of Hindi/Urdu spoken widely throughout northern India but is not an official language (2001 census)

Belongs to: ACD, BIMSTEC, BRICS, G20, IMF, MGC, UN, PIF

Source: (Expansion, 2016); (Atlas, 2016) And image of (Clipartsbest, 2016)

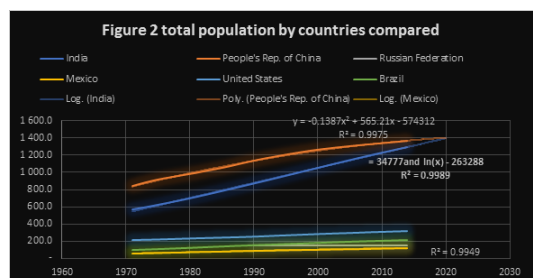
Population Growth

The population growth of India is a problem that exercises strong pressure on energy needs in general and of course, in the energy consumption associated to the use of fossil fuels to generate economic growth. India, although it is not of the highest rates of growth in the world according to records of 2014, if recorded a rate higher than the 1.25% (Factbook, 2016), a figure which shows a growing trend of concern (Figure 2) for their government leaders to address the lag that already presents the population of this country in the field of welfare. While the birth rate has fallen in the last seven years (2007-2014) to spend 22.7 to 19.89 percent and the crude death rate in 2014 was maintained in 0735 deaths per thousand inhabitants, a figure with a tendency also decrease.

The rate of growth of India in 2014 is even greater than the compared with that recorded in emerging countries included in our analysis as Mexico with growth rate of 1.21% and Brazil of 0.81%. Do not compare much less the trend registered in India of the 1.21% in relation to countries such as the United States with a rate of growth of 0.8 per cent, China with rate of 0.44% or Russia with negative rate of -0.03% (Factbook, 2016).

The significant population growth of India is really worrying in relation to the attention of their future needs of economic growth because before 2020 according to the projections made (Figure 2), will have similar number of registered population to China today in better conditions of well-being.

While the United States and Brazil also will continue to have a positive population growth almost linear, Russia for its part shows a negative trend as noted in the same graph. Mexico for its part will maintain the same growth of exponential type when you register a population growth rate of 1.21 very close to that which presents India of 1.25%.



Source: own elaboration based on data from (Factbook C. W., 2015) And (IEA, 2016), Paris, 2016

Economics Indices

India was the 6th world economy in relation to the volume of GDP in the year 2015, growing by 7.2% in relation to the previous year according to data of macro- (Expansion, 2016), however, the public debt in 2015 was of little more than 69 per cent of GDP is to say what should pay the state of GDP to pay his debt, was 1.290.366 million euros, which represents a per capita debt of 984 euros per inhabitant.

The GDP per capita as an indicator of the quality of life in the case of India, in 2015, was 1,425 , therefore it is with this figure in the place 147 of the 196 countries considered. Therefore, their inhabitants have a very low level of life in relation to the 196 countries of the ranking of per capita GDP despite the fact that this figure is higher at 601 registered barely 10 years ago in 2005. So far in 2016, the per capita GDP registered a growth of 6.8% in the third quarter of the year (Expansion, 2016).

In comparison with other countries in 2015, India is in a medium level of the percentage of the public debt of GDP in relation with other countries whose economies have grown significantly as China (42.92%), United States (105-15%) and Japan (249.11%). While by its part Brazil, which has the most similar percentage of public debt (63.31 per cent) to India (69%) in 2015, shows a debt per capita increased compared with the EUR 5,680 represent in Brazil against the 984 Euros per capita of India.

The last rate of annual variation in the Consumer Price Index (CPI) published in India of July 2016 was 6.5% . which represents a high level of inflation accelerating the level of prices of products and services and therefore the loss of purchasing power.

The registered unemployment rate in 2014 was 8.8 per cent which is kept at the same level of 2002, however, with a certain recovery in relation to the rate of 10.8 per cent in 2009-2010, a period marked by the global crisis arising from the decline of economic activity in the United States.

The national estimates of the percentage of the population living below the poverty level in 2010 was 29.8%, this represents 4.8% more than in 2007, therefore, a high level of incorporation of weightings in each sub-group and region in just 3 years. It is important to take into account that the definition of poverty in India is referred to a lower level of welfare in relation with other nations. For example, poverty in the United States in a nation rich generally uses more generous standards of poverty that poor nations or emerging. In the case of emerging countries to be poor is to be below the poverty line to earn less than US\$ 1.25 dollars per day according to the definition of the United Nations (Nations, 2016) And India has the figure of 32.9 per cent of the poor of the 1,200 million in the world, i.e. the third party according to a report presented in New Delhi on 17 July 2014 by the Minister for Minorities Affairs of India Najma Heptulla (Spain, 2016), who claims that he is a challenge which can overcome the Prime Minister Narendra although it is not explained how.

With regard to the contents of the Human Development Index (HDI) of the United Nations to measure the progress of a country with regard to level of long and healthy life, knowledge (level of education) and to a decent standard of living (income), for the case of India was of 0,609 points in 2014, with which stood in the post 130 table of 187 countries. Comparatively are lagging behind between the last places in relation to developed countries such as the USA (0.915) or China (0.727) and of countries considered emerging as Brazil (0.756) and Mexico (0.755), among others. However, India has evolved in this index when going from 0.554 in 2008 to 0.609 in 2014, with a marked tendency to increase (Expansion, 2016).

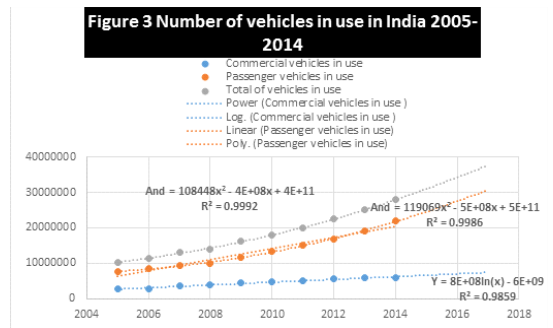
The theme of the vehicle transport and the generation of CO2

India is the country with the third largest number of vehicles in the world according to data of the Universal (Universal, 2015), it is estimated that in 2013 there were 120 mlls cars in India that

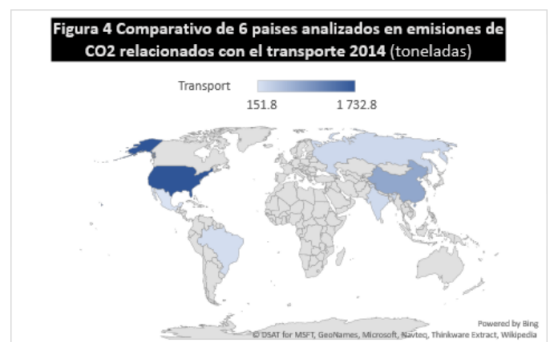
registered that same year a population of 1'210,193,422, dividing just gives a figure of 18 cars per thousand inhabitants. The first is used with 309.5 mlls of vehicles when driving in the streets for a total of 316, 017,000 inhabitants according to the last census of 2013. This gives a total of 965 vehicles per thousand inhabitants, i.e. each inhabitant would have an own vehicle. The second site corresponds to China with the largest populations in the world and with a large number of vehicles circulating within its borders. The Asian giant with 1,339,724,852 inhabitants, has a total of 146,000,000 cars, which translates into 113 vehicles per thousand people (Factbook C. W., 2016).

According (Kogan, 2014), expert in vehicles, the sum total of vehicles in the world was of 1.1 thousand million vehicles when driving, a figure that represented more than double (57%) of those registered in 2004. The fuel burned by the 1.1 million vehicles in circulation would be tantamount to 1.730.000.000 metric tons of CO2 sent to the atmosphere each year.

The total number of vehicles registered in India, the macro data of Expansion (Expansion, 2016), indicate that in 2014 remained in circulation on average 28,001,864 vehicles (Figure 3), only that year were generated 44,039,295.2 metric tons of CO2, a figure even less than that recorded in the same year in the United States and China, according to the calculations personal (Figure 4).



Source: own based on macro data of expansion (2016)



Source: own elaboration based on data from (IEA, 2016) Paris, 2016

Table 1. Number of vehicles in use in India 2005-2014

Year	Commercial vehicles in use	Passenger vehicles in use	Total number of vehicles in use	Vehicles per 1000 inhabitants
2005	2706000	7626000	10332000	0927
2006	2948000	8572000	11520000	10.19
2007	3642000	9444000	13086000	1142
2008	3954000	10006000	13960000	1253
2009	4433000	11744000	16177000	13.73
2010	4682000	13268000	17950000	15.02
2011	5086000	15027000	20113000	16.52
2012	5726000	16896000	22622000	18.2
2013	5916000	19095000	25011000	19.86
2014	6030000	21971864	28001864	21.62

Source: Macro Data of expansion (2016)

Figure 3 and Table 1 show that the growth of the use of vehicles in circulation average per year is sharply on the rise and it is therefore expected that the pollution also is on the increase. Without doubt the number of vehicles for use by passengers exceeds at 3.6 times the number of vehicles for commercial use, therefore, the proportion in the field of pollution must have a figure more or less relative, since it cannot be said completely by the type of vehicle and the engine capacity respectively between personal type vehicles and commercial type.

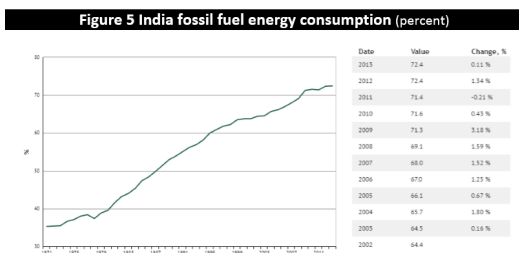
The manufacturing sector and the construction industry related to the production of cement, are considered at the global level as the main generators of CO2 emissions from the economic point of view. China is the main generator of CO2 in the world by this concept with nearly six times more emissions than India that occupies the second place. It remains in the order United States with data very close to those of India, Russia, with almost half the emissions of the United States and eventually, Brazil and Mexico with figures very close to each other (Figure 9). In this sector of the manufacturing industry was compounded by the CO2 from the sector of cars already that together represent slightly more than 50% of the CO2 is emitted to the atmosphere in the world in relation to the use of fossil fuels.

Emissions of CO2 by type of fossil fuel generated in India are associated mainly to the use of coal and oil, although projections toward the 2018 (Figure 10) denote that despite the fact that both fossil fuels will have a marked tendency toward increasing substantially their CO2 emissions to the atmosphere, will be the use of the mineral coal who will have a greater impact in this country. The gas is not very significant since India has no reserves of this fuel as well as a commercial partner that could cater to difference of mineral coal which is a resource to a certain extent with high availability in many mines of the Kashi mountains in the state of Meghalaya in northeast India, reason by which the prime minister of energy Piyush Goyal, you bet on this resource but also to renewable energies to resolve the problem of the generation of energy why it has requested considerable investments both for the generation of energy as well as for resolving the problem of the distribution and maintenance of Lines. India consumes little more than 800 mlls tons of coal a year and intends to increase its consumption to more than double by 2035 so to ensure energy self-sufficiency increased for the 2020 to 1500 million tonnes the domestic production of coal (Martin, 2015).

The composition of the total emissions of CO2 by the use of fossil fuels in India in 2015 (Figure 8), shows that the industry that generates electrical energy represent 43 per cent of the emissions, of which 13 per cent can be awarded to the generation of energy supplied to the residential sector while the remaining 30% is intended for other sectors than the family use. The other 57% of CO2 emissions by the use of fossil fuels is divided between five sectors in which stands out the manufacturing industry and construction with the 37 per cent, 18 per cent related to the transport of which 10% corresponds to cities and 8 per cent to transport alien. Finally, a 2 per cent corresponds to various sectors not specified.

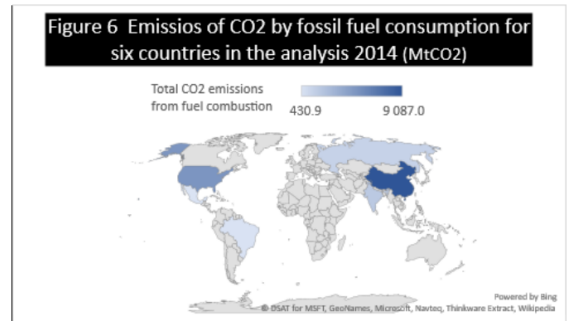
Fossil fuel energy consumption

With a remarkable upward trend in the last ten years, India depends in a 72.4 per cent of the consumption of fossil fuel that includes coal, oil, and natural gas products for the generation of energy that demand for its development (Figure 5).

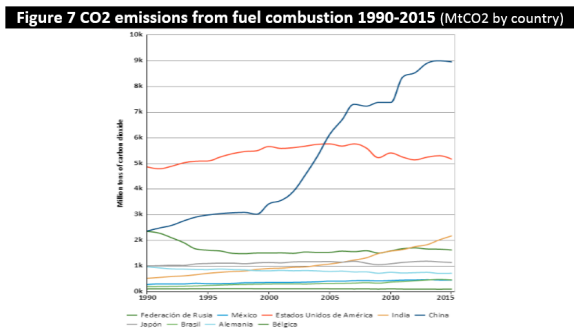


Source: (IEA, 2016)

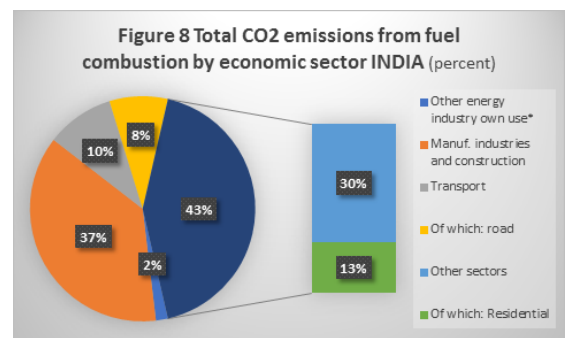
Emissions of CO2 arising from the consumption of fossil fuels located to India in the fourth position with the 6.96 per cent of the world total, exceeded without doubt by China 3.7 times with the 25.35 per cent of the world total and United States 2 times with the 14.4%, who occupy the first and second place, respectively. In less advantageous position is India in relation to other emerging countries such as Mexico 1.67% and Brazil 2.4%, or in your case by Russia that occupies the fourth place in the world with 5.3%. Emissions of CO2 by consumption of fossil fuel for energy generation denote marked upward trend for China and India (Figure 7).



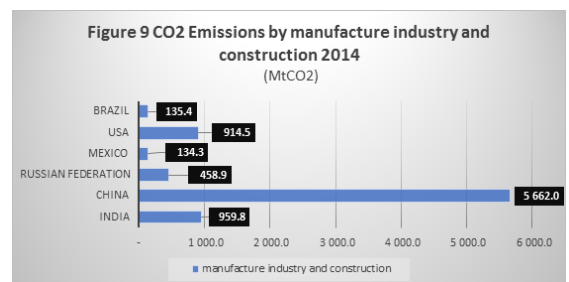
Source: own elaboration based on data from IEA CO2 emissions from fuel combustion, OECD/IEA, Paris, 2016



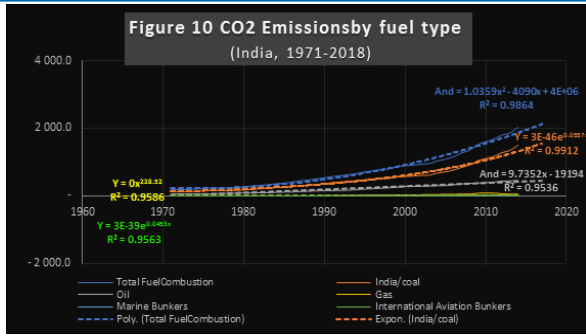
Source: own elaboration based on data from (IEA, 2016)



Source: own elaboration based on data from (IEA, 2016), Paris, 2016



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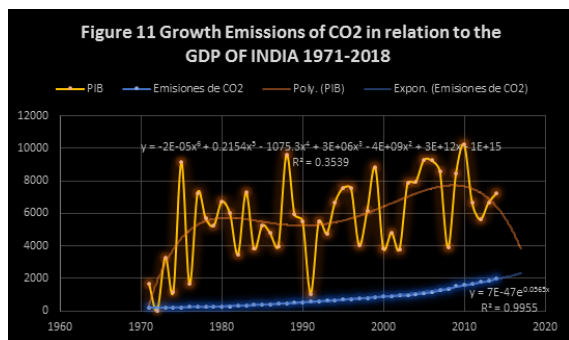


Source: own elaboration based on data from IEA CO2 emissions from fuel combustion, OECD/IEA, Paris, 2016

Emissions of CO2 in relation to GDP growth of India

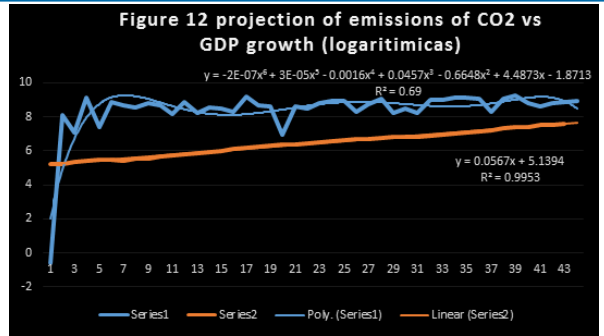
The political momentum in India to improve their economic growth and achieve the goal of being a country with one of the highest growth rates in the world has also meant an increase in the emissions of CO2 into the atmosphere. India, an eminently agricultural country now you bet to industrial growth in a culture little believer of the economy and conditions of the markets coupled with the problem of the generation of electrical energy. Without doubt, India has significantly improved GDP growth while maintaining a high growth rate higher than the 7.0 per cent annum, though still only represents 2.5% of the global GDP unlike China that shows a similar rate of growth but that represents 13.5% of world GDP (Head, 2016). To do this has tended to generate enough energy and emissions of CO2 from the economic activity mainly in the form of industrial and construction as has already been mentioned.

Figure 11, shows that it is from 2008 that the growth of both GDP and pollution have become increasingly significant in India. The erratic growth and with marked cyclical variations every seven years show in the projection of the graph that is unlikely to make actual estimates with direct assessment of GDP growth unlike the projections of CO2 emissions that have shown significant growth, constant and exponential type. Without attempting to give explanations for these series with cyclical variations of GDP and making a mere descriptive analysis through the use of statistical techniques are applied and observed in Figure 12 a logarithmic type model which compares in the period of time in analysis such minimal differences of exchange between both variables perceived GDP vs CO2 emissions that are derived exclusively from the economic activity leaving aside other sectors that emit CO2 in India and which have been mentioned in the paragraphs above.



Source: own elaboration based on data from World Bank (Global, 2016)

Figure 12 makes it clear that economic growth has a high cost in environmental matters and that has been paying this country and that the increase in the GDP at a high rate will have a high cost in the economic future that is intended through industrialization. It was also suggested that the rate of growth in emissions of CO2 will be greater than the rate of economic growth and that the cyclical instability of this growth will continue to be observed in the economy of India.

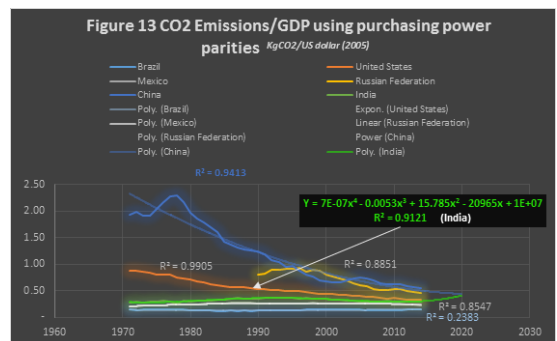


Source: own elaboration based on data from World Bank (Global, 2016) And the IEA (IEA, 2016)

Efficiency between the intensity of CO2 emissions and GDP Growth

The indicator of total CO2 emissions in relation to the growth of GDP, is a measure of the efficiency, in terms of emissions with the one that grows the economy of a country. CO2 intensity is the ratio of CO2 emissions from fuel combustion over Gross Domestic Product (GDP) measured in constant US \$ at purchasing power parities (kilograms of carbon dioxide/GDP at constant 2005\$ PPP on Figure 13). It measures the CO2 emitted to generate one unit of GDP. GDP is expressed at constant exchange rate and purchasing power parity to remove the impact of inflation and reflect differences in general price levels and describe energy consumption to the real level of economic activity. Using purchased power parity rates increases the value of GDP instead of exchange rate increases the value of GDP in regions with a low cost of living, and therefore decreases their energy intensities.

The projections made in Figure 13, showing the majority of countries are seeking to raise the level of efficiency of around to the emissions of CO2 to decrease the environmental fee of economic growth and achieving a better distribution of profit, while India is going in the opposite direction in the future projection of their goals of economic growth. In other words, India is likely to maintain the same levels of technology needed to ensure that economic growth is more redistributive among the population and even environmental cost increasingly low so that the scenario to a near future to 2020 is little promise for this country in relation to the efficiency in relation to the emissions of CO2 to achieve more sustainable economic growth.



Source: own elaboration based on data from World Bank (Global, 2016) And the IEA (IEA, 2016)

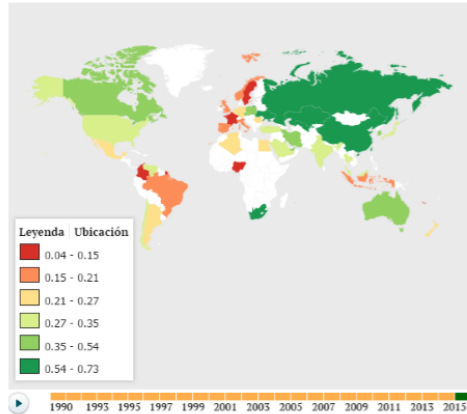
In terms of this efficiency indicator of intensity of CO2 in relation to GDP at constant purchasing parities the Worldwide indicator it was 0.15 (koe/\$2005p) in 2015, in response to the search for the majority of countries to reduce the effect of climate change. This indicator of environmental efficiency has decreased substantially from 0.225 in 1990 to 2015. Although with a marked tendency to diminish worldwide shows some increases in times of economic crisis and the 2005 and 2009 (Factbook C. W., 2015).

With 0.35 in 2016, India is comparatively between countries with a

rate in the middle range of the intensity of emissions of CO2 to generate its GDP (Figure 14), when compared to China, the latter is located between the range of 0.54 and 0.73 in the intensity range, although for the 2014 you are ranked in the 1.10 according to data from (IEA, 2016). Russia is also among the countries with a high level of intensity of inefficiency in the cost of CO2 emissions.

In Latin America, some countries in the analysis as Mexico, Chile and Argentina observed indicators with greater efficiency than India in a range between 0.21 and 0.27. Brazil for its part highlighted in Latin America with the lowest rate in the range between 0.15 and 0.21 with this is about the world rank of efficiency. For its part the United States is further behind to be located in the range between 0.27 and 0.31 sharing so relatively close with India for its level of efficiency (Figure 14).

Figure 14 CO2 intensity at constant purchasing power parities 2015 (kCO2/\$2005p)



Source: own elaboration based on data of Expansion (Expansion, 2016) And (Factbook C. W., 2016)

Conclusions

India has opted to use of fossil fuels to achieve its current rate of economic growth, the same as for the generation of electric power, this represents 72.4% of what has been achieved. A high cost in Environmental Matters has had to pay India whose effects have been felt already in some cities such as the capital of the country New Delhi when only in 2016 reported levels of contamination above what would be considered detrimental to the human being.

The use of mineral coal and oil are the main types of fossil fuels in India. The first by the high amount of reserves represents a low-cost element in the production of energy unlike oil which is imported which is to India as the third largest importer of this product at a global level.

The capitalist logic of economic growth of India is therefore subject to the studied by (Selden, 1994) And (Restrepo, 2005) On the model of the Kutznets curve (OKpedia, 2016), who define the economic growth of a simple way to cite that this generates greater prosperity for the population, commonly measured as the largest GDP per capita. This logic of capitalist economic growth in India is also echoed in the study of the economist Simon Kuznets (1955) who formulates the hypothesis of Kuznets curve. This concept that must be studied more extensively in another time, relates to the environment with the productive growth with emphasis in which the economies find themselves called poor or low industrial development as India and the inverse relationship in an initial stage of this development to achieve a form of inverted U with the time when the income reaches a maximum level and is achieved the redistribution (Santos, 2006).

The previous theory suggests that a poorly developed society such as India under the conditions referred to above shall pay a high social cost that is converted late that early on a topic of vital interest to the public policy, pollution, meanwhile will be forgotten if the

population is too poor to be able to survive in both not be achieved to improve the income in the first stage of growth as is currently the case in India. When the income achieved substantially improved and adopt the technologies and generate the necessary public policy pollution shopkeeping to decrease in India as indicated (Dasgupta, 2002). The foregoing should not be taken as a justification but as a simple explanation of what has been observed in the majority of the foregoing.

The future scenario of economic growth to improve the welfare of the population is still insufficient given the size of the population and its growth rate, as well as the conditions of lag in which they are located. Follow the direction in the current conditions of technology and energy efficiency in relation to the generation of CO2 emissions the cost to be paid will be very high. The concept of "grow now and pay later" is unlikely to be a functional since the same population pay the price in their health. The Government of India has shown its concern to reduce emissions of CO2 mainly in the power generation sector to gamble on the sustainable technology, but this would only have a likely effect of 20% reduction in emissions of CO2 and so relative to the total, according to the estimates of the experts. In other words, the pollution will continue to increase.

For its part, CO2 emissions related to the vehicle sector show a marked increasing trend especially in cities where it generates 1 of each 10 tonnes of CO2 as own estimates. The increasing use of fossil fuels coupled with the growth of this sector is a reality.

The satisfaction of needs in India can not stop, much less if you want to remove from the extreme poverty to more than 300 million Hindus in a wide territory and with a population distributed regionally and with cultures and features a little different. For this, the main instrument that India requires at this time, and it is to that greater investment should give you the technology itself. Import or seek external investments would have immediate response, but with a high cost of self-sufficiency and surely of indebtedness end.

The great current projects of the government of "Made in India" sound more like the idea of doing so with technology of India and in India if we are to succeed in this issue of environmental pollution and development. Perhaps and only perhaps, projections and projects for economic development should be viewed as a more microrregión approach and not as big projects, based on a development of the Local. L agriculture is not so bad and less when you must feed more than 1,200 mlls of Hindus.

The citizen participation should be considered an important instrument of public policy to reduce the effects of CO2 emissions to the atmosphere, however, is the industry and the government in the field of energy who have the most important role. So that, the compromise now from investing in "clean" technologies must be an immediate policy associated with the modernism shallow if it is to be followed by the same Western model of economic neoliberalism. The other is to gamble to growth through the promotion of the industry without fireplace as the tourism.

Finally, the comparative indicators between countries here exposed, as well as the socioeconomic data that are presented, shows that India has a complicated scenario only by 2020. In all projected trends are shown substantial increases and in particular to the theme of this work, the cost of the pollution in the economic growth of India. India must make drastic changes and the must do now!.

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