



## **Meeting the environmental challenges of China and India: Towards innovative policy formulation**

**D. J. Thampapillai<sup>1</sup>**

### **Abstract**

The rate of environmental degradation in China and India has perhaps surpassed the rapid rate of economic growth in these countries. The scale of damages is so large that they cannot be relegated to the category of localised problems. They are global problems. The already fragile global ecological systems are being strained even further. Demanding compliance with strict environmental standards would significantly retard the pace of growth in these economies and exacerbate their problems of poverty and unemployment. Innovative thinking to facilitate growth whilst protecting and restoring natural endowments is warranted. The paper draws on business management literature that argues for transforming environmental challenges into business opportunities. The paper also illustrates that the mindsets of many policy makers – especially those trained as professional economists - can be a major impediment to the pursuit of innovative thought to achieve economic growth alongside environmental sustainability.

**Key words:** governance; environmental policy; China; India

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<sup>1</sup> Lee Kuan Yew School of Public Policy at the National University of Singapore

## Introduction

The object of this paper is to address the environmental challenges facing China and India and thence outline some policies to meet these challenges within the overall ambit of sustainable development. The challenges posed by the scientific realities of the natural environment are real and formidable; for example irreversible changes in ecology and bio-diversity; and the loss of assimilative capacity of air-sheds. Yet, there also exists an equally formidable set of challenges of an ideological nature. These stem from the mindsets of many policy makers – especially those trained as professional economists.

The paper is structured in three parts as follows. The first part deals with ideological challenges. The discussion here centres on a brief review of the history of economic thought. This review illustrates that the mindset of the contemporary dominant decision makers remains firmly rooted on mistaken premises which appeared in the literature during the middle of the last century. As a result many important environmental issues have failed to receive the priority that they deserve. The second section displays an assembly of some of the important environmental issues faced by China and India. These issues can no longer be regarded as localised challenges of China and India. They are challenges that confront the entire world. The final section deals with corrective measures that recognise environmental challenges as business opportunities.

## Ideological challenges

The main source for the ideological challenges stem from the fact that the discipline of economics (which often occupies centre stage in policy formulation) veered off into a trajectory in the late 1940s. One might say that this coincided with Paul Samuelson's (1947) publication of the *Foundations of Economic Analysis*. Between the late 1800s and the 1940s, the natural environment and nature as such occupied a very important place in economics including neoclassical economics. The first ever concise text book in neoclassical economics was perhaps Alfred Marshall's (1891) *Principles of Economics* which was published in five volumes. In this text, Marshall presents a set of arguments that support the notion that *nature is ultimate capital*. That is, if we examine any item that is exchanged in markets, and disaggregate it into components until we can disaggregate no more, then we will find that the ultimate components come from nature. Apart from the several references to the role of nature as capital, Marshall even asserts that man does not create things but only rearranges matter<sup>2</sup>. This assertion, which is the First Law of Thermodynamics, was indeed influential in Marshallian ideology.

Marshall's writings also coincided with those of Professor Irving Fisher at Yale. In a seminal paper on Capital Theory, Fisher (1904) outlines three properties of capital, namely "*a stock that is durable*", "*a stock that provides a flow of services*" and "*a stock that depreciates with usage*". The unique feature of this paper is that Fisher's starting premise was "nature is capital". That is, nature is (infinitely) durable; provides (an infinite) flow of services and it degrades when altered or used. It was the recognition of these properties of nature that enabled Fisher to formalise a theory of capital. Some analysts have attempted to conceptualise nature as capital in terms of the three properties of capital without realizing that the three properties originated from nature itself. The period spanning late 1800s to late 1940s / early 1950s witnessed economic theory exposit the formation of output in terms of three ingredients, namely labour, (manufactured) capital and environmental capital; for example see Jevons (1865) Gray (1914), Schikele (1935), Hotelling (1936), Ciriacy-Wantrup (1938), Bunce (1942), and Scott (1955). The significant departure from

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<sup>2</sup> For example see Marshall (1891) Book II. Chapter III, Paragraph II.III.2

this premise marked the formalization of a theory of economic growth by economists such as Harrod (1939) Domar (1946), Swan (1956) and Solow (1956) where the explanation of output was confined to labour and manufactured capital. Thence followed a procession of theories, models and policies over nearly three to four decades focusing primarily on labour and manufactured capital; for example see Todaro and Smith (2004). Such conceptual ideology was perhaps a major driver even within organisations such as the World Bank, which in the 1970-80s funded several forest clearing programs<sup>3</sup>. But the point is that the dominant ideology of the 1950 to 1980 period, namely that growth needs only labour and manufactured capital continues to be firmly rooted in the mindsets of many senior decision makers across the world including in China and India.

Some contemporary decision makers also appear to seek solace in the conceptual premises underlying the more recent publication of Environmental Kuznets Curve (EKC). The existence of an EKC, namely an inverted U type relationship between income levels and the emission of specific pollutants, has been suggested by several authors; for example see Grossman and Krueger (1991, 1995) and Shaffik (1994). That is, environmental damages which tend to increase with the onset of economic growth begin to diminish after some threshold level of income is reached. This threshold is supposedly a per-capita income of US\$5-6 thousand; (Thampapillai 2007). It is not surprising that the EKC evidence lends support to the ideology growth first and environment later. But the EKC evidence misses the fact environmental sinks are choked and that reduction in the emissions is not going to restore the sinks. We do not need scientific evidence to support this claim. Some common sense reasoning would do. For example, ask yourselves the question: “On how many days in the year, (barring cloudy and rainy days), do the people of Beijing and Delhi witness a haze free clear blue sky?” In 1998, Beijing had only 100 days of clear blue sky and 11 blue sky days per month over the past 5 years, whilst the target has been 22 days per month; (China Daily August 15, 2006)<sup>4</sup>.

Consider now some empirical evidence which suggests that if we internalise the cost of pollution abatement, the rate of economic performance may not be as striking as it seems.

### **Environmental challenges**

Environmentalists often describe the challenges in terms of threats to natural cycles such as the carbon cycle, the nitrogen cycle and the hydrologic cycle; (Chapin, Matson and Mooney, 2002). The carbon cycle is the one that has been mostly addressed in terms of green house gases and climate change. This cycle explains the exchange of carbon between the various spheres involving the earth; (Houghton 2005). The emission of carbon gases especially carbon dioxide and monoxide, have changed the levels carbon concentrations in our air-sheds far beyond acceptable levels. At the same time the amount of carbon that needs to be retained in the subterranean surfaces of the earth has diminished significantly. The evidence of the carbon imbalance is manifested in global warming and related events such as the accelerated rates of the melting of glaciers, and the latitudinal shifts of flora and fauna. But, scientists are also becoming increasingly concerned with changes in the nitrogen cycle. Nature has in place some natural processes (for example the physiology of leguminous plants) that fix nitrogen in the soil; (Vitousek et al. 1997). But the fixation of nitrogen has far exceeded the naturally acceptable

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<sup>3</sup> <http://www.whisperedmedia.org/wbforests.html>

<sup>4</sup> [http://www.chinadaily.com.cn/china/2006-05/30/content\\_604206.htm](http://www.chinadaily.com.cn/china/2006-05/30/content_604206.htm)

levels due to the application of artificial fertilisers. The concentration of nitrogen in the atmosphere has also changed owing to the emission of nitrous oxides from the burning of fossil fuels. The hydrologic cycle explains the balancing mechanisms between various bodies and forms of water; (Speth 2004). The building of dams, the abstraction of water from rivers and lakes, desalination plants in oceans and deep ocean outfalls of sewerage are some of the many activities that change the hydrologic cycle. China and India are both active contributors to the changes of these natural cycles. This does not by any means lead to the conclusion that China and India are the only agents of change. There are of course other players who have done significant damage in the past and continue to do so at present. But the point here is that there is a sense of misplaced euphoria about the economic performance of China and India. Figures 1-6 illustrate the role of China and India towards the damage of the various cycles<sup>5</sup>.

**Figure-1: CO2 Emissions in China and India (1989-2003)**

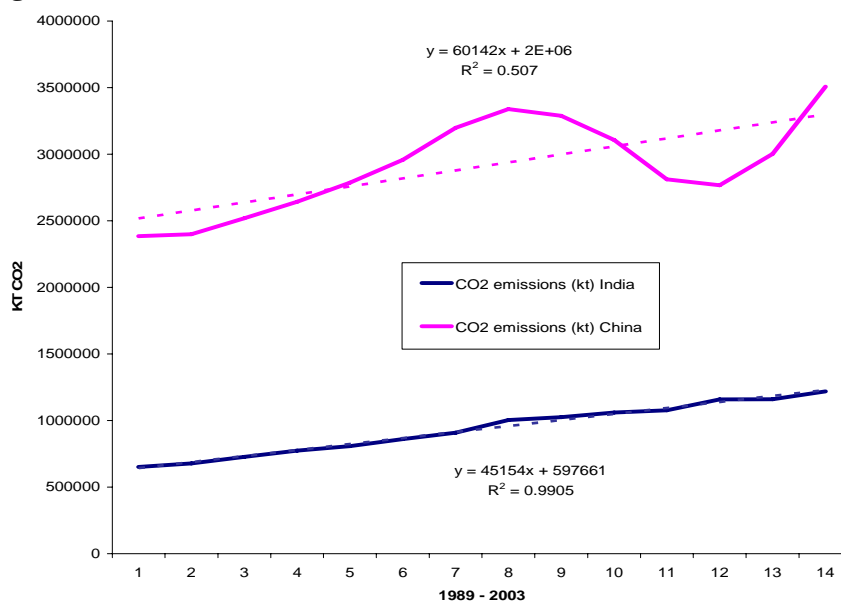


Figure-1 shows that both China and India have been adding on average 60 and 45 million tons respectively of CO2 per year. Another indicator of damages to the carbon cycle is the reliance on coal for electricity generation. As illustrated in Figure-2, China appears to be adding some 9 billion KWH of electricity per year from coal, whilst the rate of addition for India 2 billion KWH per year. A reasonable proxy for damages to the nitrogen cycle is the usage of fertiliser. China appears to be on average adding some 1.1 Million tons of fertiliser per year and India's addition is nearly half of this (Figure-3) and likewise for the emissions of nitrous oxides (Figure-4).

**Figure-2: Electricity generation from coal: China and India (1987-2003)**

<sup>5</sup> The source of data for Figures 1-6 is World Bank (2005)

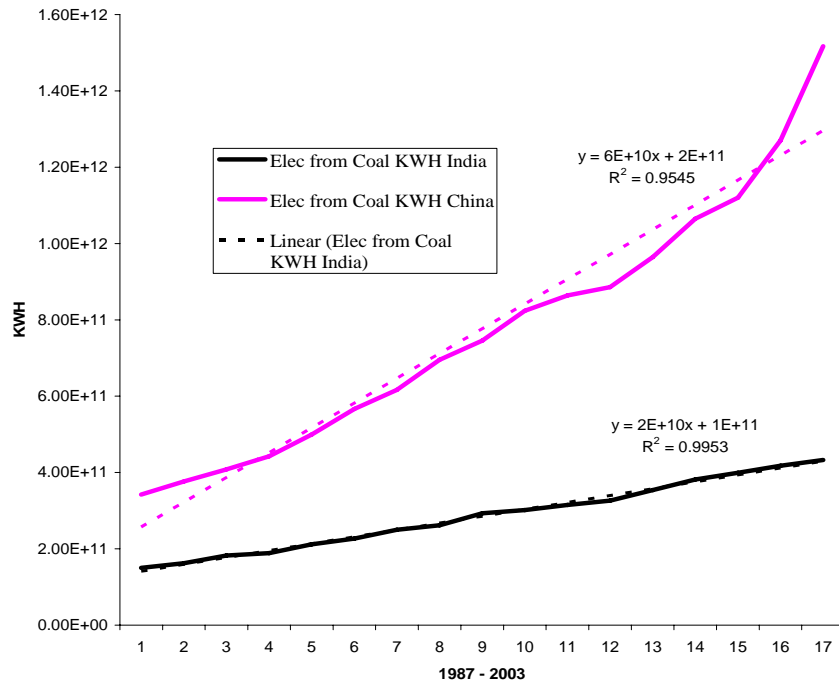


Figure-3: Fertiliser consumption in India and China

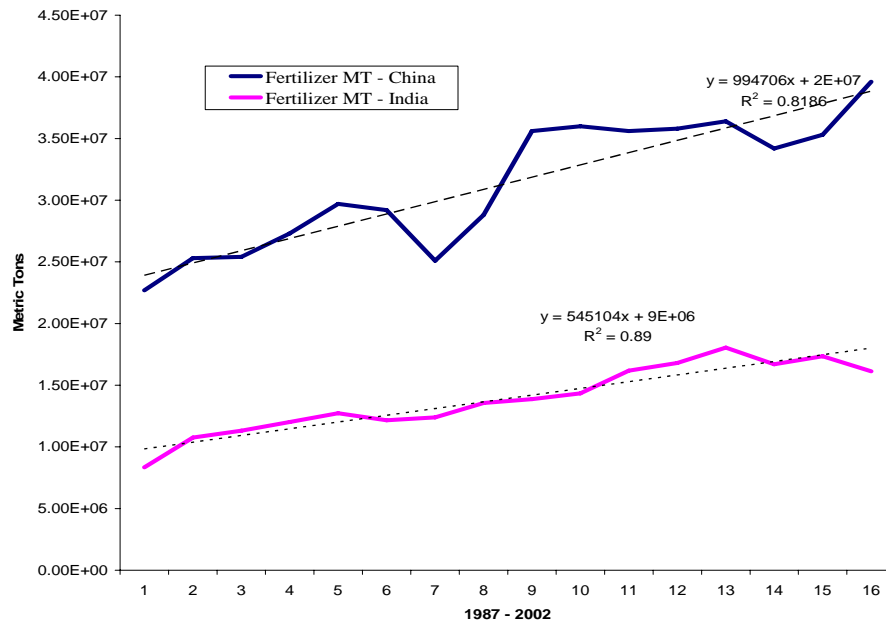
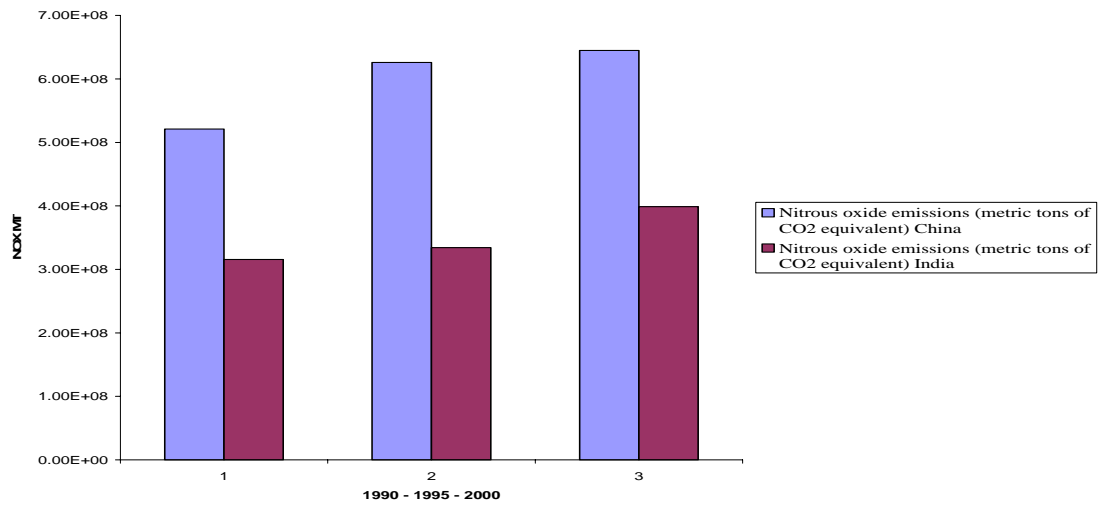


Figure-4: Nitrous oxide emissions in China and India



The dependence on hydroelectricity is a reasonable proxy in part for the damages inflicted on the hydrological system. The reason is that dams and turbines alter the patterns of surface flows and add to sedimentation. As illustrated in Figure-5, China appears to be increasing its reliance on hydro electricity at the rate of 10 billion Kilo Watt Hours per years and India by 1 billion Kilo Watt Hours per year. Damage to the hydrologic cycle is also caused by water pollution (Figure-6), which appears to be diminishing recently.

Figure-5: Hydro electricity in India and China (1989 – 2003)

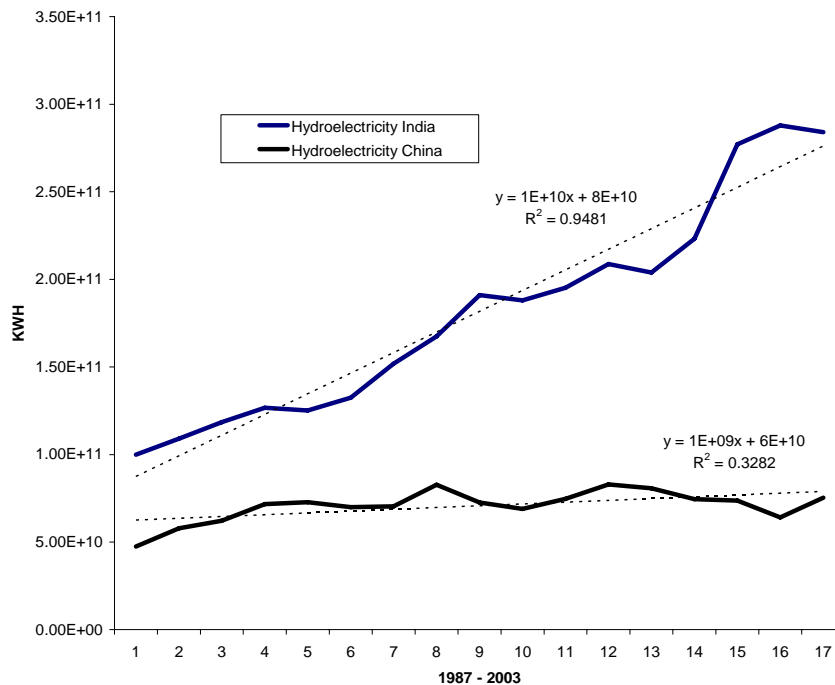
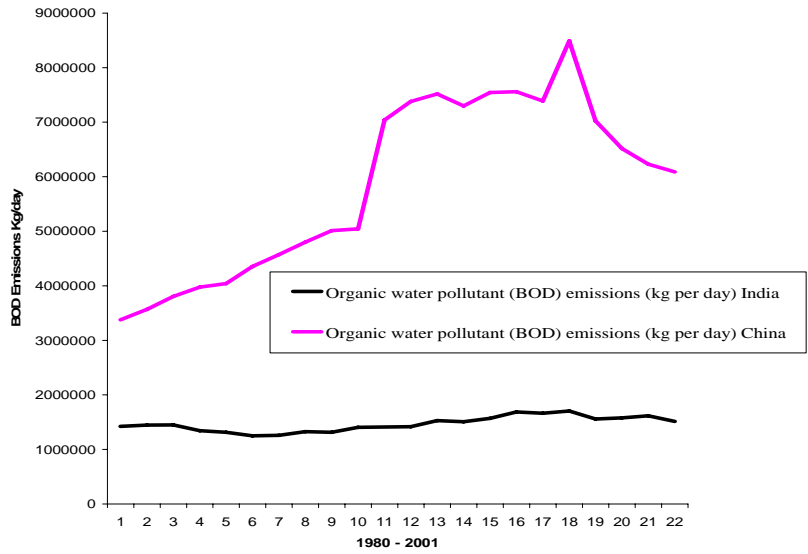
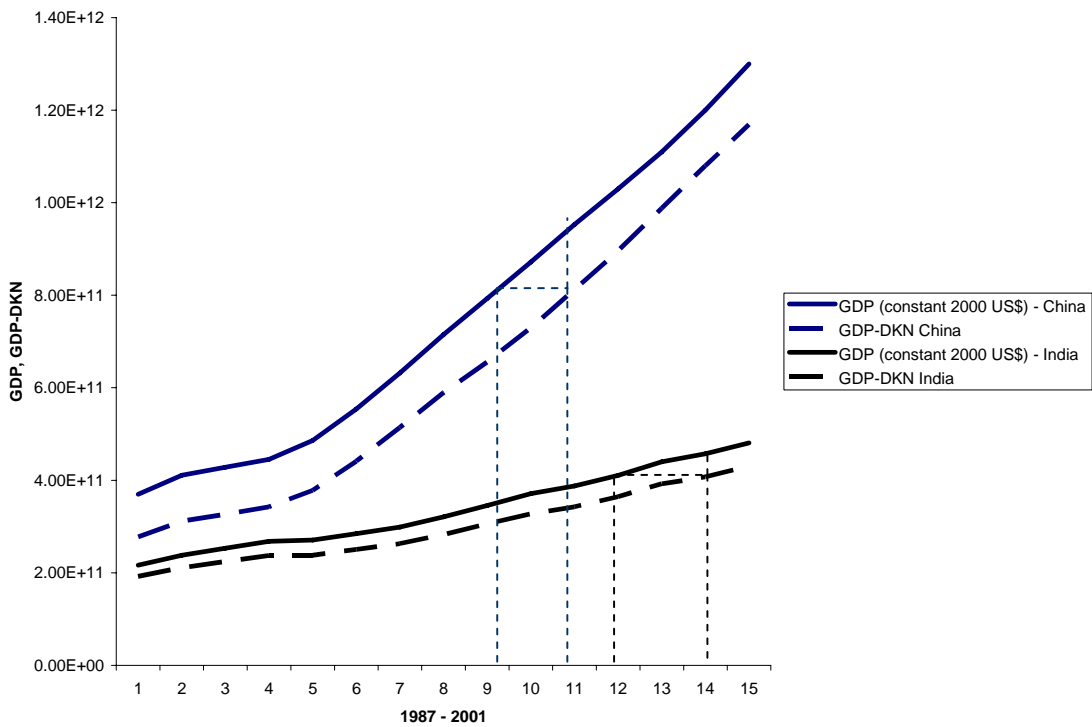


Figure-6: BOD Emissions in China and India (1980 – 2002)



**Figure-7: Time Trends of GDP VS GDP-DKN FOR China and India (1987-2001)**



Consider now how some of the above information can be used to evaluate economic performance. For example consider the time trend of GDP and that of GDP less ( $D_{KN}$ ), namely the depreciation of environmental capital; (Figures-7). Here  $D_{KN}$  was estimated for each year as the sum of the costs of the following items:

- CO<sub>2</sub> abatement at US\$ 38.6 per ton (based on Frankhauser's (1994) estimate adjusted to 2000 US\$ values;
- Fertiliser application at US\$166 per ton (based on statistics from the FAO (2005)
- Water pollution at US\$ 59.4 per ton (based on Dasgupta et al. 2001)
- Hydropower at US\$ 0.02 per KWH<sup>6</sup>

An examination of the trends shows that in any given year the GDP estimate of China is overstated by an amount that is equivalent to the difference between the observed value in the given year and that which existed two years ago. That is, for reasons of sustainability, the value of GDP in any given year should be that which existed two years ago. The time period for India on similar grounds is three years. Note that these values are entirely dependent on the proxies chosen and on how these proxies have been valued. It is likely that a more robust estimation would lead to a much larger deviation between GDP and (GDP-D<sub>KN</sub>) and the corresponding time period for adjustment. For the period 1997-2001, the size of D<sub>KN</sub> has been on average, approximately 10-12 percent of GDP for both China and India. The chief implication of such an observation is that at least 10-12 percent of GDP has to be allocated towards environmental remediation measures and compliance with stringent environmental standards. The crux of the problem lies with this implication. Controlling emissions and complying with stringent standards means curbing economic growth. But, higher levels of economic growth are seriously sought mainly because of the need to reduce the excessive levels of unemployment and poverty. For instance, in the year 2000, the number of unemployed persons in China and India were respectively 23 million and 17 million. Such observations lend credence to the ideology of "growth now and environment later."

The calls for compliance and environmental stewardship are often refuted by many developing countries on the grounds that the contemporary developed countries did violate all standards during the early stages of their economic development. Further, the extent of irreversible environmental damages that were inflicted on countries such as China and India by their colonisers (namely some of the contemporary developed countries) some 100 – 150 years ago were not exactly insignificant.

### Potential Remedies

Nevertheless, there are at least two important points to note. First, some 100 – 150 years ago, when the contemporary developed countries were accelerating their pace of economic growth, scientific knowledge concerning the global environmental linkages was far less limited relative to the present period. This limitation was an important driver in the perpetuation of self-interest and the categorization of environmental problems into bundles such as "theirs" Vs "ours". However, scientific knowledge on global environmental systems has advanced to such an extent that all environmental problems now belong to just one category, namely "ours". Therefore, the second point is that, the challenges presented within China and India can no longer be regarded as localised challenges. They are global challenges and resolving them is as much a global responsibility as it is the responsibility of China or India. Consider this reality, namely that the environmental problems of China and India are global challenges, in the context of China's and India's legitimate right to growth and development and draw a significant size of its populace away from absolute poverty. In such context, one needs to seek for policy alternatives that go far beyond the traditional mould of environmental taxes, subsidies and pollution trading schemes. For example, see Hart (1997, 2005), where the key message is that many of the environmental challenges can be transformed into business opportunities. The following excerpts from Hart (1997) make this point.

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<sup>6</sup> This is an arbitrary estimate

- “It is easy to state the case in the negative.....faced with ...degraded environments, ... it will be increasingly difficult for corporations to do business.
- But the positive case is even more powerful.
- The more we learn about the challenges of sustainability, ... realise that environmental opportunities might actually become a major source of revenue growth.”

Current endeavours for boosting the performance of economies appear to be confined to traditional measures, such as agricultural processing, garments and timber products. However, given the context of fragile eco-systems, it might be prudent to explore income generating investment options that would strengthen and sustain the eco-systems. Such opportunities provide a new basis for global partnership and for helping developing countries achieve their aspirations of growth and development without compromising the state of the environment. Recent literature on business and the environment [Porter (1991), Caincross (1992), Schmideheiny (1992), Makower (1993), Porter and van der Linde (1995)], Hart (1997), Lovins et al (1999), and Reinhardt (1999)]<sup>7</sup>; suggests that the business sector has the potential to transform environmental challenges into valuable business opportunities. By combining the work of Lovins et al (1999) and Reinhardt (1999) it is possible to classify potential environmental business strategies for China and India (for that matter for all developing countries) into six types, all of which are closely inter connected. These are as follows:

- Improve the productivity of environmental capital and achieve cost savings
- Innovate and adopt closed loop systems that yield no wastes or toxicity and develop biologically inspired production models
- Differentiate products that offers greater environmental benefits
- Regulate privately to avoid the punitive measures of government regulation and managing environmental risks
- Change the fundamental nature of the business model to a solutions based model
- Reinvest in natural capital to maintain competitive advantage

In the context of the China and India it is pertinent to consider options such as solar power, bio-energy and wind mills to alleviate the demand for hydro power generation. Proposed industrial parks could follow the example of the Kalundborg endeavour in Denmark to protect Lake Tisso. Here, the industrial park was carefully designed to display the features of closed loop production systems. That is the residual of one firm enters as a resource into another firm and the process continues such that the discharge into the environmental sink is either harmless or non existent. Further examples include self composting systems to replace large sewerage treatment plants and innovative attempts replicate nature's methods of dealing with waste. Benyus (1997) provides several examples under the heading Biomimcry which is defined as:

*"A new science that studies nature's models and then imitates or takes inspiration from these designs and processes to solve human problems".*

The protection and sustainability of nature in the form of business opportunities has the capacity to forge the co-operation between rich and poor countries.

## **Conclusion**

Economic growth, development and poverty alleviation represent a basic right for countries such as China and India. It is quite easy to also demand that China and India achieve this right by complying with stringent environmental standards that would help ensure the attainment of global sustainability. But, it is much easier to help them achieve the growth and poverty alleviation goal

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<sup>7</sup> Also see {<http://www.wbcds.ch/aboutus.htm>}, website of the World Business Council for Sustainable Development

by becoming partners in environmental resource management and remediation. The literature on business management appears to be cognizant of this whilst the literature on economics appears not to have matured sufficiently enough.

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