

# **Current Relevance of Some Future Studies**

By

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## **Introduction**

The concept of looking at future in a relatively systematic manner began to emerge towards the close of the 19th century<sup>1</sup>. Scientific progress gained momentum with the industrial revolution and still further in the closing centuries of the second millennium<sup>2</sup>. The first half of the 20<sup>th</sup> century saw epoch making events like the two World Wars, the Communist revolutions, the lethal usage of the atomic bomb and the socio-political transformations at a global level. The risks of conflicts, the emergence of UN, the changing geo-political order, the power of science and technology and the intensifying cold war compelled man to think on the precarious existence of the world, the man-made systems and man himself. Study of future started receiving more attention from experts and institutions. This paper is an attempt to capture the essence of two major studies and their current relevance. These are [1] Limits to Growth initiated by the Club of Rome and [2] The Goldman Sachs study called BRICs Report.

## **The Limits to Growth<sup>3</sup> and its current relevance**

### **Genesis**

The *Limits to Growth* is a pioneering futurological study initiated by the Club of Rome in the late sixties. It was also the first major initiative of the Club of Rome which was established in 1968 by Aurelio Peccei, an Italian scholar-industrialist and Alexander King, a Scottish scientist. The Club of Rome composed of “scientists, economists, businessmen, international high civil servants, heads of state and former heads of state from all five continents who are convinced that the future of humankind is not determined for once and for all and that each human being can contribute to the improvement of our societies.<sup>4</sup>” The initial charter of the Club of Rome was to become a learning organisation with focus on four central themes: Long range thinking, Global thinking, Holistic thinking and whatever it takes to start understanding of the know of interrelated global problems such as food, energy, and basic needs<sup>5</sup>.

### **Methodology**

The Club of Rome tried to build a model of the world, based on the principles of Systems Dynamics<sup>6</sup>, to investigate five major trends of global concern: accelerating industrialisation, rapid population growth, widespread malnutrition, depletion of the renewable resources and a deteriorating environment. This was one of the earliest efforts in making a computerised model of the world; this was developed at MIT, over a period of time, to understand the dynamic behaviour of the complex systems. Since this was the initial model, the researchers decided to keep it simple. They chose to study one general

population, a population that statistically reflected the characteristics of the average population; they chose one class of pollutants, whose dynamic behaviour in the ecosystem, the scientists were comfortable in understanding; they chose one generalised resource that represented in aggregation the combined reserves of all non-renewable resources.

### Observations

This was the first collective initiative to study the complex problem of the sustainability of the globe as a whole. It gave the researchers tremendous insight into the systems and the forces that gave shape to things happening on the earth. One observation the researchers made was that technological changes happened fairly quickly where as social and political institutions changed only gradually; even when the changes are triggered by the technological changes. For instance improvements in healthcare infrastructure would take considerable time to reflect in improvements in the health of the people.

The researchers observed that the variables, they were investigating, were characterised by an input rate and an output rate. For instance the population in a social system at any point of time is characterised by a birth-rate and a death-rate; the pollution level of a system at any point of time is characterised by the rate of pollutants being generated in the system and the ability of the system to absorb or annihilate the pollution. They also observed that the *inter se* relationships between the input rate and the output rate decided the growth or decline of the variable. When the input rate was more than the output rate the variable grew; when the input rate was less than the output rate, the variable declined; when they were equal the system remained in equilibrium. Any initiative taken to control the birth-rate of population would have its impact gradually because [a] the initiative itself would show results only gradually and [b] the parallel initiatives in health improvements would ensure a decline in the death-rate thus going against the desired effect of population decline. The researchers realised the need to study the impacts of the positive and negative feedback loops. The result is the publication of the report of the Club of Rome titled *The Limits to Growth* in 1972.

### Conclusions

The major conclusions of the study have been:

- a. If the present trends of growth of the basic variables continued, the world would soon reach a stage characterised by inadequate resources, unmanageable populations, uncontrollable pollutions etc leading to situations of catastrophe. The researchers also made sensitivity analysis by assuming possibilities of technological breakthroughs; these altered the scenarios but still they came to the conclusions that the catastrophic situations would emerge sooner or later, but in any case not later than AD2100.
- b. It is possible to change these growth patterns and achieve ecological equilibrium far into the future where the input-rates and out-rates of the critical variables are designed to be in harmony and where each individual is assured of the basic resource requirements and minimum opportunities

to realise his full potential. Such a possibility is feasible only through a very high order of discipline in utilising the resources of the nature; it calls for a paradigm shift in the nature of man's relationship with nature.

### Criticism

The publication of *The Limits to Growth* generated a whole range of criticisms. Some critics felt that the *Limits* was no different from the predictions of Malthuse<sup>7</sup>. They painted the Club of Rome and its members as prophets of doom. Many critics felt that Club of Rome has not considered adequately the ingenuity and technological innovations that man was capable of. Some critics described the *Limits* as a disguised attempt by the protagonists of the planned economy, to sabotage the spirit of free enterprise enshrined in the western capitalist economies.

The *Limits* did not predict what would happen; it only said that if the current life-styles and consumption patterns continued, then the earth would soon reach its limits in less than a century. The decades of 50s and 60s formed an era of growth and rapid expansion in capitalist and the communist segments of the world. The western world thought they had all the solutions to the problems of the world through a market based society; so they could not accept the prognosis of the *Limits*. The Communist block believed that solutions to the problems lay in technology; they too rejected the prognosis of the *Limits*. Both capitalists and the communists described the *Limits* as alarmist. In the early 70s one-fifth of the global population of 3.2 billion formed the rich nations; they consumed four-fifths of the global resources. The focus was on conquering the nature and exploiting its resources to the maximum; environmental degradation was not an issue at that point of time.

### Current Relevance of the study; Hope

By 2000 the global population has doubled to 6 billion; the rich countries' share of the population has marginally decreased but their share of the resources has not changed any significantly. Environmental degradation has become a major concern of mankind. Do we see symptoms that the earth is moving towards its limits? One of the major sources of energy, petroleum, has become much dearer. In fact the first symptoms of petro-politics happened in the form of OPEC-orchestrated oil-crisis in 1973 just about the time *Limits* got published. Depletion of the oil resources, search for renewable energy resources, depletion of the ozone layer, the increasing threat of global warming etc are symptoms that tell us of the earth's fateful journey towards its limits. It is not just an irony nor mere coincidence that this journey is in sync with the third law of thermodynamics which states that the entropy<sup>8</sup> of the universe is destined only to increase.

The second conclusion of the *Limits* that it is possible to alter the current pattern of life to achieve ecological equilibrium, gives us a glimmer of hope. It leads us to explore equilibrium by living in harmony with nature by creating an alternative social system.<sup>9,10</sup> This concept is in contrast to the principle of conquering and exploiting nature. It is akin to the Oriental philosophies where every species and every element of nature are inseparable parts of the vast canvas of the ecosystem. Whether we will be able to imbibe

this spirit and move towards sustainability is a matter of conjecture which only time can tell. This is testimony to the continued relevance of the prognosis of the *Limits*. It must be looked up as a reminder to man about his eventual destiny if he does not mend his ways.

### **The BRICs study of Goldman Sachs<sup>13, 14</sup>**

#### Genesis

A team of economists from Goldman Sachs explored the growth patterns of various countries for the next 50 years from 2000 and came up with the observation that four countries, namely Brazil, Russia, India and China, which collectively they called BRICs, are destined achieve far more significant economic growths than most other countries, including the developed countries, resulting into very interesting and startling paradigm shifts on the global arena. They concluded that China would, in terms of GDP, overtake UK by 2005, Germany by 2008, Japan by 2015 and US by 2040. Similarly India would overtake Germany by 2025 and Japan by 2030. Russia, they said, would overtake Germany by 2028; Brazil would overtake Germany by 2035 and BRICs as a group would overtake the G6 countries by 2040. If these happen, the global power balance would have shifted significantly towards Asia with significant consequences on all possible fronts.

#### Methodology

The object of the study was to project the growth patterns of different countries and assess significance of such differential growth patterns to various aspects like international trade, poverty reduction, income levels, international business and perhaps international relations.

A basic premise the team based its work on is that the growth rates are bound to be different for different countries at a given time; and they would be different for the same country at different times. The developed countries being mature economies would experience slower growth rates than countries in the growth phase. The developing countries, on the contrary, have the prospect of achieving higher growth rates for two reasons: [a] They need less capital per worker resulting in better capital productivity, higher growth in capital stock etc. [b] They can access, at some cost, proven technologies from the developed countries. This advantage of better growth rates would continue to accrue till the developing countries 'catch up' with the developed countries; the difference in the growth rates would decline, with time, towards convergence. This phenomenon has been observed in the case of Japan and Germany in the second half of the 20th century.

Another premise is the fact that countries get richer along with appreciating currencies. Countries with higher per capita income invariably have their currency exchange rates very close to Purchasing Power Parity [PPP]. In contrast developing countries are characterised by low productivity levels, low per capita incomes and their exchange rates would be far away from PPP. The process of growth for the developing countries envisages improvement in productivity and per capita income accompanied by rise in the exchange rates towards convergence on the PPP.

These premises have been built into a growth model which is based on the Cobb-Douglas function of three variables:

$$Y = AK^aL^{1-a}$$

Where Y = overall level of GDP

A = the level of technical progress or Total Factor Productivity growth

K = the capital stock

L = Labour measured by the working age population [ 15 to 60]

a = share of income that accrues to capital

Total Factor Productivity growth [A] is a measure of technical progress which is assumed to change with the economy. The speed of convergence depends on the income per capita and is expected to slow down as the economy 'catches up' with developed economies.

The capital stock [K] at any point of time will depend on the capital stock of the previous period, less depreciation, plus the investment of the period. The rate of investment is derived from historical data. The income share of capital [a] is derived from historical data

The results of these projections are used to track the real exchange rate. With productivity improvements and growth in per capita income, the exchange rate would move closer to PPP. It is possible to vary the assumptions on investment, demographics and speed of convergence; thus map different paths of growth rates and exchange rates.

### Projections

An extract of the projections made by the study is given in the table below

Projected GDP [in US\$ Billion]												
	BRICs				G6						Total BRICs	Total G6
Yr	Braz	Rus	Ind	Chi	Fra	Ger	Ita	Jap	UK	US		
00	762	391	469	1078	1311	1875	1078	4176	1437	9825	2700	19702
10	668	847	929	2998	1622	2212	1337	4601	1876	13271	5441	24919
20	1333	1741	2104	7070	1930	2524	1553	5221	2285	16415	12248	29928
30	2189	2980	4935	14312	2267	2697	1671	5810	2649	20833	24415	35927
40	3740	4467	12367	26439	2668	3147	1788	6039	3201	27229	47013	44072
50	6074	5870	27803	44453	3148	3603	2061	6673	3782	35165	84201	54433
Projected GDP per capita [ in US\$]												
	BRICs				G6							
Yr	Braz	Rus	Ind	Chi	Fra	Ger	Ita	Jap	UK	US		
00	4338	2675	468	854	22078	22814	18677	32960	24142	34797		
10	3417	5948	804	2233	26314	26877	23018	36178	30611	42926		
20	6302	12527	1622	4965	30723	31000	27239	42359	36234	48849		
30	9823	22427	3473	9809	35876	33898	30177	49944	41194	57263		
40	16370	35314	8124	18209	42601	40966	33583	55721	49658	69431		
50	26592	49646	17366	31357	51594	48952	40901	66805	59122	83710		

Projected GDP per capita Growth: 5 year averages											
BRICs				G6							
Braz	Rus	Ind	Chi	Fra	Ger	Ita	Jap	UK	US	Yr	
-9.8	7.0	3.7	9.2	2.2	1.4	2.7	1.1	3.0	2.6	00-05	
6.3	10.3	7.5	11.2	1.5	2.0	1.6	0.9	1.9	1.7	05-10	
6.4	8.1	7.4	9.2	1.5	1.6	1.7	1.2	1.9	1.3	10-15	
6.2	7.5	7.2	7.8	1.6	1.3	1.7	1.8	1.6	1.3	15-20	
4.6	6.1	7.4	7.3	1.6	0.9	1.2	1.8	1.2	1.4	20-25	
4.7	6.2	8.2	6.9	1.6	0.9	0.9	1.5	1.3	1.7	25-30	
5.2	5.2	8.9	6.5	1.9	2.0	1.3	1.2	2.0	2.0	30-35	
5.3	4.3	8.9	6.3	1.9	2.0	1.3	1.2	2.0	2.0	35-40	
5.0	3.6	8.3	5.9	1.9	1.9	1.8	1.6	1.8	1.9	40-45	
4.9	3.4	7.6	5.4	2.0	1.8	2.1	2.0	1.7	1.9	45-50	

*[This table is an extract of the table given in the paper of Dominic Wilson & Roopa Purushottaman]*

### Validation

In validation of their study the Goldman Sachs team has cited the following

- a. The team looked at the IMF projections for 10 years up to 2010. The results of the two studies are not very different.
- b. During 1955 to 1985 the real GDP of Japan grew 8 times and the real industrial output grew 10 times. During 1970 to 1995, Japanese yen appreciated by 300 % in nominal terms against the US dollar. Similarly S Korea's GDP grew 10 times during 1970 and 2000. The growth patterns projected for the BRICs are modest compared to the experiences of Japan and S Korea.
- c. The team made projections using Levine-Renelt<sup>15</sup> econometric model to project GDP growths. This model explains GDP growth as a function of initial income per capita, investment rates, population growth and secondary school enrolments. The results were found to be close to those obtained earlier.
- d. The team went back in time to 1960 and made projections on 11 countries [US,UK, Germany, France, Italy Japan, Brazil, Argentina, India, S Korea and Hong Kong] using data available in 1960. They employed identical methodology as in the present BRICs study. The results they got fairly matched with the actual growths these countries experienced. They also observed that in countries [like India and Brazil] where policies were not adequately growth-oriented the gaps were wider.

### Learning from the study

The main learning from this study is the knowledge of the preconditions for growth. The study has listed four major conditions for growth: Macro-stability, Institutional capability, Openness and Education. The team's conclusion is significantly influenced by Robert Barro's<sup>16</sup> pioneering work on the determinants of growth. The first condition reflects fiscal and financial discipline required on the part of the economy. The second condition is a reflection of the capability of the system to facilitate and implement policies and programs. The third condition is a reflection of the economy's ability and maturity to do business with rest of the world; it calls for intrinsic strengths, long-term vision, external image and leadership qualities. The fourth condition is a reflection of the

continued human development efforts required to sustain the growth process. Essentially the growth process depends on enterprise, resourcefulness, innovation and leadership; to sustain the growth process it is necessary to nurture people with the right skills and right attitude.

The second learning is for the developing economies. A clear understanding of the conditions of growth enables them to plan their policies and programs to ensure the growth process. The BRICs study gives us significant insights into the growth process; so the developing economies has the opportunity to plan and achieve better results than projected in the study.

The third learning is for India. Despite the long periods of high growth projected on a 50 year horizon, India's per capita GDP, even in 2050, would be the lowest among all of BRICs and the G6 countries. The country ahead of India will be Brazil at US\$ 26,592 vis-à-vis India at US\$ 17,366. It is worthwhile for India at this stage to think of ways and means to accelerate the growth rates to achieve some semblance of parity with the developed economies.

#### The BRICs study and after

The study marks the unchaining of the BRICs towards growth and prosperity. China initiated structural changes and embarked on a path of growth from the 80s and the impact is being felt in the new millennium. Russia and India started in the early 90s; Brazil still later; the results are beginning to show. Each of these economies is characterised by size and legacy; challenges of sustaining the growth process are many. There can be many a slip till each one of them achieves the critical mass and momentum.

If and when the BRICs story unfolds, the focus of economic activities would be more towards Asia. With China, India and Japan located in Asia, there would be a definite shift in the global power balance towards Asia.

With the increasing purchasing power of the BRICs economies, their share of the demand growth will be significantly higher; patterns of business and trade would undergo major shifts. This would mean increased business opportunities in these markets; MNCs would need to reposition themselves to adjust to this situation. It is reasonable to presume that there will be ripple effects on the smaller economies around the BRICs.

Today major segment of the extremely poor, defined as those with per capita income of less than US\$1 per day, estimated at about 2.5 billion globally, are found in the continents of Asia, Africa [ mainly sub-Saharan Africa] and Latin America<sup>17</sup>. The rise of BRICs will hopefully push up the economic status of the have-nots in Asia and Latin America. There is a fair chance that the percentage of the extremely poor would diminish significantly.

#### Epilogue

This is a brief examination of the two future studies initiatives; in terms of their context, objectives, methodologies, conclusions and current relevance. Both offer tangible points of learning for the policy makers and the managers. They offer plausible scenarios to enable them to take positions and to base strategy formulations on a very long term horizon.

### **End Notes:**

1. Futures Study had its origin in science fiction. H G Wells [1866 to 1946] is considered the father of Futures Study. It took some decades before the new branch of study emerged as an independent area.
2. Industrial Revolution ushered in a host of changes from the 17<sup>th</sup> century onwards. But the major scientific and technological inventions were rolled out only in the 18th and 19th centuries. The progress definitely followed an exponential progress. Very often it is a practice to cite the speed of travel achieved by man as an illustration of the speed of scientific progress. Most of the powered vehicles emerged in the last 150 years with phenomenal increase in their speeds.
3. Meadows, Donella H; Meadows, Denis I; Randers, Jorgen and Behrens III, William W: The Limits to Growth: A Report to the Club of Rome; Earth Island Limited, London 1972.
4. <http://www.clubofrome.org>
5. Botkin, Dr. Jim; The Club of Rome: A Learning Organisation? New Horizons for Learning, 2001. <http://www.newhorizons.org>
6. The field of System dynamics developed from the paper of Jay W Forrester namely Industrial Dynamics [Forrester 1961]. This book is still a statement of philosophy and methodology in the field. The span of applications of Systems Dynamics has been expanding continuously. Some illustrative areas are Corporate Planning and Public Policy, Biological and Medical Modelling, Energy and Environment, Theory development in the natural and social sciences, Dynamic decision making, complex non-linear dynamics etc.
7. Thomas Robert Malthus [ 1766-1834], a contemporary of David Ricardo and James Mill is well-known for his work ‘an essay on the Principle of Population’ published in 1798. He argued that the increases in population would diminish the world’s ability to feed itself and anticipated catastrophes. Charles Darwin [1809-1898] gives credit to Malthus’ work on Population for triggering his thoughts on his theory of Natural Selection. Malthus has been misinterpreted very often; he has been painted a prophet of doom by many. In the 20<sup>th</sup> century with the advent of Keynesian Economics, Malthus regained currency.
8. Entropy is a measure of randomness, of disorder, of messiness. The more organised a system is, the less entropy it has. Left to themselves, natural systems tend towards more stable situations of less energy. Like water from higher to lower levels; like electricity from higher to lower potential. Second law of Thermodynamics tells us that natural changes lead to decrease in energy and



increase in entropy. Since the days of Big Bang, Universe has been on a singular direction: of increasing entropy.

9. The Economist: Development and the Environment, a special Supplement on March 21, 1998.
10. Trainer, F E: The Conserver Society; Alternatives for Sustainability. London Zed Books, 1995.
11. Trainer, F E: The Limits to Growth case now, The Environmentalist, 4<sup>th</sup> Dec 1999. 325-336.
12. Suter, Keith: Fair Warning? The Club of Rome Revisited. Original Source: Australian Broadcasting corporation  
<http://www.abcnet.au/science/slab/rome/default.htm>
13. Dominic Wilson and Roopa Purushottaman: Dreaming with BRICs: The Path to 2050; Global Economics Paper No.99; 1<sup>st</sup> Oct 2003. GS Global Economics Website; <https://www.gs.com>
14. Jim O'Neil, Dominic Wilson, Roopa Purushottaman and Anna Stupnytska: How Solid are the BRICs? Global Economics Paper No.134; 1<sup>st</sup> Dec 2005. GS Global Economics Website; <https://www.gs.com>
15. Levine, Ross & Renelt, David: A sensitivity Analysis of Cross country Growth Regressions, American Economic Review, 1992. Vol. 82(4) p942-63.
16. Robert J. Barro, Determinants of Economic Growth: A Cross-Country Empirical Study. Cambridge, MA: The MIT Press 1997. The author, besides giving a summary of his pioneering work on the factors underlying growth, gives a characterisation of the growth theories, a critical evaluation of the econometric methodologies in the growth literature and an analysis of the relationship between democracy and economic progress.
17. Sachs, Jeffrey D: The End of Poverty – How We Can Make It Happen in Our Lifetime. Penguin Books, 2005.