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**Delineating an Educational Policy Framework
for the Developing Nations in Meeting the
Emerging Global Challenges by Year 2050**

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An Abstract

School based general education ought to be a future oriented subject. However, over the years, due to parental and grand-parental generations setting policies of education for the younger generation, education is always more past oriented than future oriented. This trend did not cause much of a problem when the change over time was moderate. As Alvin Toffler (1970) says we are in a turning point of human history. In the changing perspective in the world with speed of change, speed of inventions and speed of knowledge and speed of threat on living education got to change to prepare the next generation to face these new challenges. The climatic change, depletion of resources, growing energy crisis, threat of terrorism, rapid of growth of population and the changing structure of population are new challenges the young generation would face. The world in year 2050 would not be a different place to live. Unless and otherwise education policy is framed to address the 'gloom and doom' side of world by 2050, the next generation would face a serious threat of existence. The positive futurists show that technology and science will not allow the world to laps its primitive past once again. It is clear that science and technology is the only answer to human survival. Therefore, it is important that education policy makers taking a fresh look at the policy challenges for the future. This paper makes an analysis based on the published and documented evidence what policy framework would be required in the developing countries in view of the emerging challenges to ensure a survival of the generations to come.

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Delineating an Educational Policy Framework for the Developing Nations in Meeting the Emerging Global Challenges by Year 2050

“Human progress is neither automatic nor inevitable. We are faced now with the fact that tomorrow is today. We are confronted with the fierce urgency of now. In this unfolding conundrum of life and history there is such a thing as being too late...We may cry out desperately for time to pause in her passage, but time is deaf to every plea and rushes on. Over the bleached bones and jumbled residues of numerous civilizations are written the pathetic words: Too late.” ‘Where do we go from here: chaos or community’ Martin Luther King Jr.

Philosophies, theories and practices need to be re-examined from time to time to delineate a policy framework that suits the contemporary world. The usual practice in education is to frame a policy in today’s context and not in a futuristic context. This practice has always caused education to be outdated when it comes to meeting future demands. If educators agree that formal schooling is to prepare the current generation of children to lead their lives as effective, efficient, satisfied and dignified citizens in the emerging world ahead of them, then there is very little argument for any one to oppose the re-examination of the philosophies, theories and the practices of today to make education futuristic. The shaping of the future generation rests in the hands of the present adult population and not in the hands of the children because the young child has no say on what s/he has to study at school. In this context there is a larger responsibility in the hands of the adults to identify what kind of education will be better for their children in order to enable them to meet the future challenges.

If not all adults, at least the educated adults are much more aware of today’s demands, and yet even they are not necessarily aware of the emerging future.

Educational reforms have always been a controversial subject particularly in the developing countries because education has to face ‘the inherent duality’ in education. On the one hand, framing education policy is aimed at preserving a nation’s history, culture, heritage and belief systems. On the other hand it has to accommodate change to bring about the future generation in-line with the emerging world. These two functions respectively are better known as ‘*conservation*’ and ‘*development*’. There is very little opposition to ‘*conservation*’ because the older generations, fathers/mothers and grand-fathers/grand-mothers always – are the policy makers, and they believe that the education that they received was

better. The education that they received was more discipline oriented, more knowledge based, produced dignified gentlemen etc. Particularly in the developing countries where extended family culture predominates, the grand father's generation plays even a bigger role than the parent generation. Therefore, 'conservation' is easy to achieve in framing of education policy than accommodating 'development' or 'change'. Further more, it is less costly to frame a curriculum for the past and the present than for the future. It is easy to find teachers to teach the subjects like history, culture etc. All these factors facilitate conservation. Such facility naturally is not readily available to support 'change'.

In the past the controversy of 'conservation' as opposed to 'change' did not matter much because socioeconomic change was taking place at a very slow pace. *Alvin Toffler (1970)*² in his *'Future Shock'* indicates that "if the last 50,000 years of man's existence were divided into lifetimes There have been about 800 such lifetimes' - (generations). 'Of this 650 generations lived in caves. ...Only during the last seventy five lifetimes (4650 years) has it been possible to communicate effectively from one lifetime to another- as writing made it possible to do. Only in the last six lifetimes masses of men have been able to see a printed word. Only in the last four has it been possible to measure time with any precision. Only in the last two has anyone anywhere used an electric motor. And the overwhelming majority of all the material goods we use in daily life today have been developed within the present, the 800th, lifetime." When anyone of us takes this historical perspective of human development and achievements into consideration, it is not difficult for us to understand two things: One, it is easily understood why 'conservation' could always win in the 'duality-struggle'. The other is to realize that in the 'changing-times' of human kind, time has come to accommodate 'change' over 'conservation' because the 800th lifetime is not only passing by in speed but also as Toffler says *'it marks a sharp break with all past human experience because man's relationship to resources has reversed itself. Within a single life time, agriculture, the original basis of civilization, has lost its dominance in nation after nation.'* - (Toffler 1970, P22).

It is in this context; I selected this topic because 'change' demands firstly an understanding of change in a futuristic manner; secondly to identify how change can be introduced, and thirdly where to find the necessary resources to introduce change. These three questions are very pertinent policy questions. The framing of policy also demands novelty in thinking and there is so much opposition to such changes in the developing countries largely due to the same historical reasons, the values inculcated in adults belongs to the total past, the past 800th lifetimes. Also, due to socialist values those inculcated during the Cold War period of the 800th

² Alvin Toffler (first published 1970), 'The 800th Lifetime', in *Future Shock*, Pan Books,

lifetime are also not facilitating change. If not all, most of the developing nations have been influenced by socialist thinking. There is no doubt that socialist thinking did so much good to the developing nations in terms of respect for humanity, equality and equity and the world benefited much from that ideology. However, in the changing times, at the stage of human history i.e. the 800th lifetime, human kind is faced with a host of new challenges and this demands new directions. Socialism is replaced by democracy. Planned economies are replaced by market mechanisms. Public ownership is shifted to private ownership. Equality is protected by international human rights. Seniority based regimentation is replaced with ability based movements; forced-choice is replaced by freedom to choose. Nationalism is replaced by internationalism. One can keep adding to this list. Change is visible in all domains. Everyone is facing it; and everyone is affected by it.

An innovative policy framework that enables the children of today to live in dignity is much needed. Although there is controversy on the 'changing times', yet there is clear direction to frame policies to ensure the dignity of children of the developing nations in the emerging world.

Re-examination of foundations of education is much needed for us to provide direction for future education. The 14th – 20th century mission and vision of education was religious education, with a little more tilting towards nature in the later part of the 19th century, (Encarta Encyclopedia). Education was for the clergy and the children of the elite. We should not forget that the popular education, education for the common man and particularly for women, is a subject of the 800th lifetime – (last 65yrs), and was not so before. However, the policies and the modality of education, the formal schools and universities those well suited for the elites, were simply adopted as the model for the new consumer, the commoner, without giving much thought to the expectations of the new consumer. More than the modality, the white collar academic curriculum was of little use to the children of the poor.

The misfit of the formal education model for the children of the less affluent perpetuates the social class disparity – (Sedere 2000). This is why today our universities are in chaos because the institutions still offer academic education for the new consumers. It's a misfit. That's why most of the children in the developing countries either drop out or fail in school education. The system is a misfit. The foundations of education need to change. At least, it must change at this breaking point of humanity.

This paper makes an attempt to understand the emerging future to understand policy towards the change in content of curriculum. This attempts to direct policy towards methods of learning and managing

knowledge. This attempts to show policy directions for changing relations of resources for change.

Federico Mayor, DG/UNESCO, (1999) stated that "When we look to the future we confront many uncertainties about the world our children, grandchildren, and great grandchildren will live in. But we can be certain of at least one thing: if we want this earth to provide for the needs of its inhabitants, human society must undergo a transformation. The world of tomorrow must be fundamentally different from the world we know as we step into the 21st century and the new millennium. We must strive to build a "sustainable future." Democracy, equity, social justice, peace and harmony with our natural environment should be the watchwords of this world to come. We must make sure to place the notion of "durability" at the base of our way of living, of governing our nations and communities, of interacting on a global scale. Education, in the broadest sense of the term, plays a preponderant role. In this development aimed at fundamental changes in our ways of living and behaving. Education is the "force for the future" because it is one of the most powerful instruments of change. One of the greatest problems we face is how to adjust our way of thinking to meet the challenge of an increasingly complex, rapidly changing, unpredictable world. We must rethink our way of organizing knowledge. This means breaking down the traditional barriers between disciplines and conceiving new ways to reconnect that which has been torn apart. We have to redesign our educational policies and programs. And as we put these reforms into effect we have to keep our sights on the long term and honor our tremendous responsibility for future generations."-(Federico Mayor, DG/UNESCO, 1999).

The World Development Report of 2006 also addresses the issue of 'Development and Next Generation'- (The World Bank (2007))³. This shows the growing concern of the global community of the future generation of the world and examination of the education policies for the future is a sensible thing to do.

Changing Perspectives

Futuristic Views and Perspectives

We have to attempt to understand what the world would be in 2030 or 2050 to frame futuristic education policies. There is wide a range of views and perspectives from people who have come from a very wide range of different disciplines and backgrounds and interests. These futurists are of two types, and it is important to understand both in framing policies.

³ The World Bank (2007): Development and the Next Generation, The World Development Report 2007

I. "Doom and Gloom" Futurists: They tend to focus on current real world problems, without easy solutions. They discuss issues such as terrorism, nuclear danger, the continuing population explosion, world hunger, depletion of fossil fuels and other nonrenewable resources, global warming and environmental etc. They project these trends into the future, showing that if current trends continue the future will be much worse than the present- (Linda Groff & Paul Smoker, 2006)⁴.

II. "Positive, Visionary, and Evolutionary Futurists": They focus more on positively imaging the more desirable futures that we would like to create; articulating the positive values that we would like a future world to be based on; focusing on technological, societal, and human potentials; tracking groups that are actually trying to create such preferable futures in the world today; and generally empowering people to see that we always have choices - (Linda Groff & Paul Smoker, 2006)⁵.

It is not a matter of knowing who is correct or who is wrong, but understanding what is likely to happen? Policy makers should understand the likelihood of the predictions and projection in a rational manner to identify the best course of action to follow as developing nations in educating our children to ensure their well being in the emerging world.

"Doom and Gloom" Future Perspectives

Let's understand the gloomy side of the future world. This is more important than the understanding the bright side of the world because it is the darker side of the life that we need to address to ensure that these are rightly handled through education to ensure a brighter world for the children.

The gloomiest predict the future world will be more chaotic, scary and problematic. The world resources will be depleted - no water to drink, no gasoline to run motor vehicles, not enough food to eat, etc. The world conflicts will continue and a war torn world will be left behind. Disparities will be widened, and space to live will shrink with global warming. Even if this gloomy perspective is a realistic one, we as adults have to educate and prepare our children to face the emerging gloomy world and manage it in the best possible manner to overcome these constraints. The observations of the gloomiest are true, and it is important to understand them. Yet, these situations could be managed in many other ways if the human resource is prepared to face it. This is where education is the most

⁴ http://www.csudh.edu/global_options/IntroFSTopics.HTML#RangeFSViews

⁵ http://www.csudh.edu/global_options/IntroFSTopics.HTML#RangeFSViews

powerful tool to address it and prepare the 801st generation to manage their lifetime efficiently.

Climate Change:

The Human Development Report (2007/2008 UNDP), just released, is titled '*Fighting Climate Change*' and the report defines the human development challenge of the 21st Century. The report indicates that the failure to respond to these challenges will stall and then reverse international efforts to reduce poverty. The poorest countries and most vulnerable citizens will suffer the earliest and most damaging setbacks, even though they have contributed least to the problem. Looking to the future, no country—however wealthy or powerful—will be immune to the impact of global warming.

The Human Development Report 2007/2008 shows that climate change is not just a future scenario. Increased exposure to droughts, floods and storms is already destroying opportunity and reinforcing inequality. Meanwhile, there is now overwhelming scientific evidence that the world is moving towards the point at which irreversible ecological catastrophe becomes unavoidable. Business-as-usual climate change points in a clear direction: unprecedented reversal in human development in our lifetime, and acute risks for our children and their grandchildren - (UNDP HDR 2007/08).⁶

The report identifies *five key transmission mechanisms* through which climate change could stall and then reverse human development. If climate change continues in the same way, there will be new issues that the world community will have to address. These issues combined with growing population and disparity in distribution of incomes could bring about more stress, particularly on the marginal poor.

- *Agricultural Production and Food Scarcity,*
- *Water stress and water insecurity,*
- *Rising sea levels and exposure to climate disasters,*
- *Ecosystems and biodiversity, and*
- *Human health.*

Agricultural production and food security:

IFPRI (2002), states that the story of food security in the 21st century is likely to be closely linked to the story of water security. In the coming decades the world's farmers will need to produce enough food to feed many millions more people, yet there are virtually no untapped, cost-effective sources of water for them to draw on as they face this challenge. Moreover, farmers will face heavy competition for this water from households, industries, and environmentalists. Irrigated agricultural land increased five

⁶ UNDP (2007), Human Development Report 2007/2008,

times in the last century and covers over 250 million hectares and takes 80% - 86% of the global water resources. Irrigation ensures food security. By 2050 global population will reach 7.9 billion and with 58% of them living in urban areas, the demand for cereals alone will rise globally by over 50% and 65% in the developing countries. It is estimated that on a global scale there are about 20–30 million hectares of irrigated lands severely affected by salinity. An additional 60–80 million hectares are affected to some extent by water logging and salinity (FAO 1996, IFPRI 2002).

Over 60 percent of the world food production is by green water and almost 80 percent of the agricultural land is in use by rain fed production systems. 800 million people do not have access to sufficient food and feeding a world population of 9 billion by the year 2050 is a long-term challenge which implies enormous increased pressure on the world's finite water resources - ZEF- Obuobie, Gachanja & Dörr (2005)⁷.

Climate change will affect rainfall, temperature and water availability for agriculture in vulnerable areas. For example, drought affected areas in sub-Saharan Africa could expand by 60–90 million hectares, with dry land zones suffering losses of US\$26 billion by 2060 (2003 prices), a figure in excess of bilateral aid to the region in 2005. Other developing regions—including Latin America and South Asia—will also experience losses in agricultural production, undermining efforts to cut rural poverty. The additional number affected by malnutrition could rise to 600 million by 2080. This means the world will be short of food and the poor are the ones who will be more affected (UNDP 2007)⁸.

If this gloomy picture of food security is true, how would our children live in 2050? Should education address this issue?

Water stress and water insecurity: Many countries in the African and Asia-Pacific regions are entering the era of severe water shortage and even heading towards water stress. Therefore, water planners, managers, users and policy makers have faced many challenges and the biggest challenge for governments and communities is managing the freshwater resources in an integrated manner addressing the social, economic and environmental dimensions of water issues including assessment of availability, its spatial and temporal variations, quality and quantity assessment of water demand by various user/sectors (agriculture, domestic and industrial sectors) with special attention to the ecosystem and environmental concerns, access to and proper dissemination of data/information on water issues, and

⁷ ZEF (2005) , Emmanuel Obuobie, Paul Mwangi Gachanja & Andréa Cristina Dörr , The Role of Green Water in Food Trade

⁸ UNDP (2007), Human Development Report 2007/2008

participation of local communities in management of freshwater resources etc.(UNEP 2006)⁹

Changed run-off patterns and glacial melt will add to ecological stress, compromising flows of water for irrigation and human settlements in the process. An additional 1.8 billion people could be living in a water scarce environment by 2080. Central Asia, Northern China and the northern part of South Asia face immense vulnerabilities associated with the retreat of glaciers—at a rate of 10–15 meters a year in the Himalayas. Seven of Asia's great river systems will experience an increase in flows over the short term, followed by a decline as glaciers melt. The Andean region also faces imminent water security threats with the collapse of tropical glaciers. Several countries in already highly water-stressed regions such as the Middle East could experience deep losses in water availability - (UNDP 2007).

Rising sea levels and exposure to climate disasters:

Sea levels could rise rapidly with accelerated ice sheet disintegration. Global temperature increases of 3–4°C could result in 330 million people being permanently or temporarily displaced through flooding. Over 70 million people in Bangladesh, 6 million in Lower Egypt and 22 million in Vietnam could be affected. Small island states in the Caribbean and Pacific could suffer catastrophic damage. Warming seas will also fuel more intense tropical storms. With over 344 million people currently exposed to tropical cyclones, more intensive storms could have devastating consequences for a large group of countries. The 1 billion people currently living in urban slums on fragile hillsides or flood-prone river banks face acute vulnerabilities - UNDP 2007.

Ecosystems and biodiversity: Climate change is already transforming ecological systems. Around one-half of the world's coral reef systems have suffered 'bleaching' as a result of warming seas. Increasing acidity in the oceans is another long-term threat to marine ecosystems. Ice-based ecologies have also suffered devastating climate change impacts, especially in the Arctic region. While some animal and plant species will adapt, for many species the pace of climate change is too rapid: climate systems are moving more rapidly than they can follow. With 3°C of warming, 20–30 percent of land species could face extinction - (UNDP 2007).

"Living Planet Report 2006," released in October 2006 by the global conservation group and the Global Footprint Network, says that by 2050 humanity will demand twice as much as the planet can supply. The changing state of global biodiversity and the pressures of human consumption on natural resources is major concern for all. It calculates that in 2003,

⁹ <http://www.rrcap.unep.org/issues/water.cfm>.

humanity's ecological footprint was 25 percent larger than the planet's capacity to produce these resources - meaning that it took about one year and three months for the Earth to regenerate what we used in a single year. That figure is projected to rise to 30 percent this year and to 100 percent in 2050 - (Living Planet Report: October 24, 2006)¹⁰.

Fish populations are dwindling across the world's oceans. "Overall increases in the populations of sea birds and some mammal species in the Atlantic and Pacific Oceans since 1970 mask a decline in many fish species, especially those of economic importance such as cod and tuna, which are decreasing as a result of over-fishing, as well as turtles and other species that are caught as by-catch," said the report. IFPRI (2000)¹¹ study states that most environmental damage stems from wild fisheries, where over-fishing poses by far the greatest environmental threat. Overinvestment in fishing and the resulting overcapacity have led to excessive exploitation of fish stocks, especially by developed-country fleets. During the 1970s and 1980s fleet size increased twice as fast as fish harvests. Most stocks of wild fish today are classified as fully exploited, and an increasing number are overexploited, in decline, or in recovery. Moreover, wild-fishing operations capture, kill, and discard a massive quantity of catch—fish that are the wrong size, the wrong species, or otherwise undesirable. Global discarded catch of fish and other marine organisms is currently estimated at more than 20 million tons a year, nearly one-quarter of the world fish catch. Some fishing practices—like bottom trawling, blast fishing, and poison fishing—destroy marine habitats. The consumption of fish is steadily increasing in the developing countries and over fishing continues the depletion of aquatic resource, coupled with more and more chemical waste dumped in the ocean the future seems very gloomy.

The freshwater species declined to about 30 percent between 1970 and 2003. It's estimated that more than a third of the global area of mangrove forest was lost between 1990 and 2000. More than a quarter of Asia's mangrove cover was lost in the 10 year period preceding 2000. In South America, almost half of all mangroves were lost over the same period.

Dr. Mathis Wackernagel, executive director of Global Footprint Network poses the question, "*How can we live well and live within the means of one's planet? This is the main research question of the 21st century.*"

This is a question that leads to education policies for the future. How do we prepare our children for this gloomy world to survive and live in dignity?

¹⁰ Living Planet Report: Humanity Overdrawn on Nature's Credit, GLAND, Switzerland, October 24, 2006 (ENS), <http://www.ens-newswire.com/ens/oct2006/2006-10-24-01.asp> .

¹¹ IFPRI (2000), Christopher L. Delgado, Nikolas Wada, Mark W. Rosegrant, Siet Meijer, And Mahfuzuddin Ahmed; Future Of Fish Issues And Trends 2020,

The recent movies such as 'Children of Men'(2006) Directed by Alfonso Cuarón, 'The Day After Tomorrow' (2004) Directed by Roland Emmerich', 'An Inconvenient Truth' (2006) Directed by Davis Guggenheim with Al Gore convey these messages very effectively.

New Disease and Human Health:

HIV/AIDS, malaria, tuberculosis, avian flu, and other infectious diseases are threatening humanity. The Ohio environmental study (2007)¹², Heat Advisory: 'How Global Warming Causes More Bad Air Days', confirms that hotter temperatures mean more smog. Smog is formed when pollutants from cars, factories, and other sources mix with sunlight and heat. This means more people would be forced to restrict outdoor activities, while those with asthma and other respiratory illnesses face serious threats. 'The Planet in Peril' (December 2007) the CNN series covering the South Pacific Island is a clear indication of how global warming brings new challenges to future life as the water level rises.

HIV/AIDS is spread to over 5 million people and the largest numbers are in South Asia and Africa and over 90% of those dying are youth. The number of orphan children in schools in most of the high prevalence countries is around 50% in every class. Anti retroviral treatment (ARV) has done immense good to improve this situation and many who were dying have extended their lives. Once again it is the poor who are mostly affected as ARV drugs are too expensive for the poor.

The rich countries are already preparing public health systems to deal with future climate shocks, such as the 2003 European heat wave and more extreme summer and winter conditions. However, the greatest health impacts will be felt in developing countries because of high levels of poverty and the limited capacity of public health systems to respond. Major killer diseases could expand their coverage. For example, an additional 220–400 million people could be exposed to malaria—a disease that already claims around 1 million lives annually. Dengue fever is already in evidence at higher levels of elevation than has previously been the case, especially in Latin America and parts of East Asia. Climate change could further expand the reach of the disease.

Are these, issues for educators? Do we need to delineate new policies for curriculum? Do we have to train our teachers differently? Do our children have to have different knowledge and skills to save humanity?

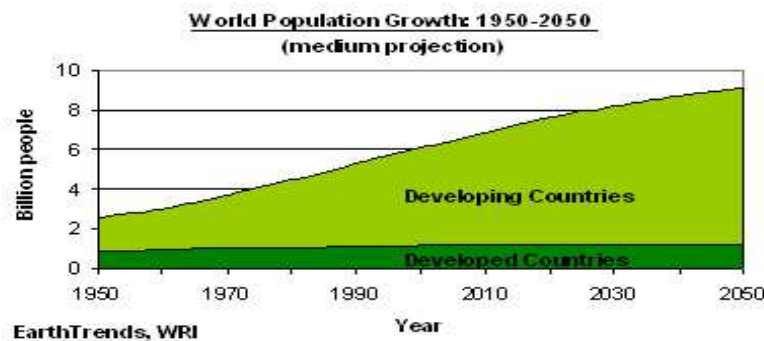
¹² <https://www.environmentohio.org/news-releases/global-warming2/global-warming/new-study-smog-poses-greater-health-risk-due-to-global-warming-more-bad-air-days-for-cleveland-and-columbus>

The World Population:

The earth's population is growing at a much faster rate than anyone ever imagined. According to future estimates it will still reach at least 7.8 billion in about 25 years. In the next 50 years, the world's population will increase by fifty percent, from 6 billion people to 9 billion. The 3-billion-person increase will occur solely in developing countries, while the number of people living in advanced industrial countries will be about the same in 2050 as it is today—roughly 1 billion people.

World population has more than doubled in the last 50 years, and has nearly quadrupled since 1900. Currently, world population is growing at a rate of 1.35 percent per year. The United Nations' most recent forecast, however, predicts a slowing in the growth of world population to about 0.33 percent per year by 2050, at which time forecasters are predicting that world population will total 8.9 billion persons - (William Poole 2004)¹³

"Continuation of these trends will create greater pressures on food, water, sanitation, and infrastructure resources, particularly in places where these are already scarce. According to the Millennium Ecosystem Assessment, 60 percent of earth's ecosystems are currently being used at a rate exceeding their capacity to provide goods and services. The rapid increase in global population will also impose significant strains on earth's natural environment."-(UN-PD 2004).¹⁴ The following diagram illustrates the trends in population growth between the developed and the developing countries by Year 2050.



Issue of Illiteracy: Although, Education for All (EFA) has mobilized all developing nations to achieve EFA targets by 2015, the reality on ground is much worse than many reports indicate. The primary school dropout in the first three years of schooling in many of the African countries is over 50%

¹³ William Pool (2004), http://stlouisfed.org/news/speeches/2004/10_04_04.html

¹⁴ United Nations Population Division Population Prospects: The 2004 Revision. Analytical report and CD-ROM are available online. <http://earthtrends.wri.org/updates/node/61>

(Sedere 2005)¹⁵. Reported enrollments and achievement levels are inaccurate and are often manipulated simply to show better results. In countries like Bangladesh 30% of those children reported are never seen in schools in any given day. Teachers serving in difficult areas in most of the countries do not attend school regularly. Actual learning achievement in children is much lower than reported. The world will continue to suffer from illiteracy. Many of the children of the poorest sectors will continue to be left behind and may not have the requisite skills to live in dignity in the emerging world.

Issue of Aging: On one side the population grows, on the other hand the composition of the world population is changing. The world's fastest growing age group is comprised of those persons 80 years and older. According to the 2006 Revision of World Population Prospects, by 2045 the number of older persons in the world (those aged 60 years or over) will likely surpass, for the first time in history, the number of children (i.e., persons under age 15). This crossover is the consequence of the long term reductions in fertility and mortality that are leading to the steady ageing of the world population (UN DESA 2007)¹⁶. See Table 1.

In 2000, 69 million persons, or 1.1 percent of world population, were aged 80 or older. By 2050, the number aged 80 or older is expected to more than quintuple to 377 million and be 4.2 percent of world population. In that year, 21 countries or areas are projected to have at least 10 percent of their population aged 80 or over. Indeed, Japan is forecast to have almost 1 percent of its population comprised of persons aged 100 or more. The United States is projected to have 7.2 percent of its population made up of those 80 and older. This "graying" of the population poses a serious fiscal problem as the dependency ratio—the ratio of persons out of the labor force to the number of persons in the labor force—rises. Government pension systems—Social Security in the United States—is where a rising dependency ratio has its most obvious impact – (William Poole 2004).

Will this affect our children's way of living? How would they manage the intensity of the grand father generation? Do we need to make them more knowledgeable?

¹⁵ Sedere M. U. (2005), Unpublished Policy Papers, National Conference on Education, Ministry of Education, Malawi

¹⁶ UN DESA (2007), http://www.un.org/esa/population/publications/wpp2006/FS_ageing.pdf
Department of Economic and Social Affairs (DESA) Population Division, Population Estimates and Projections Section, Fact Sheet, Series A, 7 March 2007

Issue of Poverty:

More than a billion of the current world population lives in abject poverty, on less than \$1 a day. Although, there is poverty reduction strategies in all developing countries, and now even linked up with the Millennium Development Goals and Fast Track Initiatives, poverty will continue to be a serious issue in the next five decades as well. Poverty has a direct impact on education and social welfare. It is this marginal population that cannot afford or benefit much from the formal schooling. The human development index ranges from 0.968 (1st Position, Iceland) to 0.33 (177th position, Sierra Leona). There are 78 countries bellow Sri Lanka, highest in South Asia, (77th Position with 0.77).

Increasing Gap between the Rich and the Poor: The gap between the wealthiest countries and the poorest is huge, a situation which threatens future stability, and is morally unsupportable as well. The within country disparity, between the rich and the poor in the same country is rapidly growing. The gap between the rich and the poor in every country is increased in the last few decades. "The average level of real income in the richest countries is 50 times that of the poorest. The richest tenth of the South African population enjoy levels of consumption per person almost 70 times those of the poorest tenth. In Brazil, whereas adults in the richest fifth of the population have 10.4 years of schooling on average, those in the poorest fifth have 3 years. In India, under-five mortality rates are 155 per thousand live births for the poorest twenty percent or the population (in wealth terms), compared with 54 for the richest quintile.Acute inequality in incomes, in health status, in educational outcomes and in other dimensions of welfare is a stark fact of life. Its resilience in individual countries and in the world is often seen as the sign of the failure of past and present economic systems to bring about development for all and the abolition of poverty - (The World Bank 2006)¹⁷.

There are two fundamental reasons. *First*, inequalities in opportunity or capabilities can be a profound source of poverty, both within societies and across nations. Poor people are poor because of inadequate access to schools, health centers, roads, market opportunities, credit, and effective risk-management mechanisms and so on. These are in turn typically associated with inequalities of voice or influence both in the shaping of policy and in its effective implementation. *Second*, reduction in poverty (in incomes, education, health etc.) is a product of both aggregate development and its distribution. The fact is that there are potentially important interactions between the policies and institutions for dealing with equity and such

¹⁷ The World Bank (2006): Equity and Development, The World Development Report 2006

aggregate development processes, including both the level of economic growth and its distribution - (The World Bank 2006)¹⁸.

All population related issues, growing numbers and its distribution, income disparities and illiteracy etc are all education related issues. Education has a direct impact on all these issues. Even in the last five decades these issues were addressed yet no substantial progress is achieved. However, reaching the un-reached, who are the most vulnerable ones, will remain a challenge in the 801st lifetime as well.

Depletion of Resources:

Energy Crisis:

In my view this is perhaps is a more serious issue than climate change. It is possible that the world is heading towards an unprecedented and potentially devastating global energy crisis due to a decline in the availability of cheap oil. Although technology has made oil extraction more efficient, the world has to struggle to provide oil by using increasingly costly and less productive methods such as deep sea drilling.

The world's population continues to grow at a quarter of a million people per day, increasing the consumption of energy. The per capita energy consumption of China, India (2 billion people) and other developing nations continues to increase as the people living in these countries adopt more energy intensive lifestyles - (Wikipedia 2007). Geopolitical situation has further slowed down the supply. Oil prices have reached near \$100 a barrel, 300% increase in a five year period. The cost of living is increased due to high fuel process. Ever since that first oil well punched into the earth in 1859, demand for crude oil has equaled supply. The more oil that was pumped worldwide (an average 2-5% more each year), the more the consumer got used to depend on oil. The oil-using life-style made consumers feel richer and more comfortable—more pharmaceuticals, more plastics, more transportation, more heat, more cooling, more entertainment. Most of the planet's current population, 6billion people prefer the industrialized life-style. Also, most are now dependent on fossil-fueled agriculture to eat.

Most fossil fuel supply experts project a future in which world crude oil supply drops two to five percent per year, starting the year after Hubbert's worldwide peak 2005. Here are some wild guesses as to the timing and amount of future shortages. If it happens in 2005: in 2015, the world's economy must get along on 20% less oil; by 2025, they must use 33% less; by 2035, they make do with 50% less; by 2045, 75% less; by 2060, 99%

¹⁸ The World Bank (2006): Equity and Development, The World Development Report 2006

less. If the peak happens in 2015: by 2030, people must manage on 33% less oil; in 2045, they have 50% less; in 2060, they have 75% less.¹⁹

What could our children of today do if fossil energy is depleted at the current rate?

What alternative energy could be used to live in 2050?

What skills would they require to learn to live with dignity in 2050?

What type of curriculum content and modernization would help the world and the individuals to face this situation in the next generation?

Other Depletions on Planet Earth:

"Living Planet Report 2006," released in October 2006 by the global conservation group and the Global Footprint Network, says that by 2050 humanity will demand twice as much as the planet can supply. The changing state of global biodiversity and the pressures of human consumption on natural resources is a major concern for all. It calculates that in 2003, humanity's ecological footprint was 25 percent larger than the planet's capacity to produce these resources - meaning that it took about one year and three months for the Earth to regenerate what we used in a single year. That figure is projected to rise to 30 percent this year and to 100 percent in 2050 - (Living Planet Report: October 24, 2006)²⁰.

Fish populations are dwindling across the world's oceans. "Overall increases in the populations of sea birds and some mammal species in the Atlantic and Pacific Oceans since 1970 mask a decline in many fish species, especially those of economic importance such as cod and tuna, which are decreasing as a result of over-fishing, as well as turtles and other species that are caught as by-catch," said the report.

The freshwater index examined average trends in 344 species - 287 in temperate zones and 51 in tropical zones. Among freshwater species the report found a population decline of about 30 percent between 1970 and 2003, but there were marked differences within that trend. The report found that mangroves are being degraded or destroyed at about twice the rate of tropical forests. It's estimated that more than a third of the global area of mangrove forest was lost between 1990 and 2000. More than a quarter of Asia's mangrove cover was lost in the 10 year period preceding 2000. In South America, almost half of all mangroves were lost over the same period

¹⁹ <http://www.carlaemery.com/fossil-fuel.htm>

²⁰ Living Planet Report: Humanity Overdrawn on Nature's Credit, GLAND, Switzerland, October 24, 2006 (ENS), <http://www.ens-newswire.com/ens/oct2006/2006-10-24-01.asp>).

Dr. Mathis Wackernagel, executive director of Global Footprint Network pause the question, "How can we live well and live within the means of one planet? This is the main research question of the 21st century."

This is a question that leads to education policies for the future. What education policies would be required to ensure our children learn the right things to survive and live in dignity in 2050?

World Conflicts and Terrorism²¹:

Terrorism is one of the most serious set back for many of the developing countries. The war expenditure in the developing countries is much higher than the expenditure on education and health or development work. This war situation and terrorism has pushed the development agenda to the back seat (Sedere 2005)²². The incidence of suicide bombers blowing up in public places killing the innocent, and creating insecurity and anarchy, causing destruction and suspicion in all quarters, is not only a threat to the local population but also has a serious adverse affect on the direct and indirect foreign economic investment without which the low income economies cannot sustain.

Positive, Visionary, and Evolutionary Futurists Perspective

The positive futurists believe that by 2050 the world will have finally achieved a global economy that will be environmentally sustainable while providing nearly all people with the basic necessities of life and the majority with a comfortable living. The resulting social stability will create a world of relative peace, exploring possible futures for the second half of the 21st century (Jerome C. Glenn & Theodore J. Gordon, 9 May 2002)²³. This is the way the optimistic futurists perceive the future. This is where education policy should have its concentration because this is the only way to address those issues that are contributing to the gloomy world scenario.

Technology

The positive visionaries believe that technology is the key to find solutions. Technology in turn develops technology. This is the single most

²¹ [Significant Terrorist Incidents, 1961-2003: A Brief Chronology](http://www.state.gov/r/pa/ho/pubs/fs/5902) [Significant Terrorist Incidents, 1961-2003: A Brief Chronology](http://www.state.gov/r/pa/ho/pubs/fs/5902), www.state.gov/r/pa/ho/pubs/fs/5902

²² Sedere M. Upali (2005), 'Security Based Approach to Development', Universal Publishers, Florida, USA

²³ **Jerome C. Glenn & Theodore J. Gordon**; The Millennium Project of the American Council for the United Nations University, <http://www.kurzweilai.net/meme/frame.html?main>

dependable modality to fight the gloomy side of the emerging world²⁴. Changing technology not only develops human capacity, it also explores the unexplored potential of the human species. This is the hope that humanity could depend on today to find answers to the challenges. The 'sciences' double its knowledge in amazing speed, and amazing precision of technology works hand in hand with science. Scientific research and the growing precision of technology leave no room for a gloomy future world. These will not allow the world to lapse to its primitive age once again.

However, educators need to realize if technology is the only solution to the very likely gloomy future, then the advancement of technology, capacity building to make the future generation capable, and the dissemination of knowledge and skills largely depends on education systems. Education is the vehicle that transmits these to the generations to come. Therefore, education policy has to facilitate this process.

Civilizations evolved. Evolution is always an improved way of living. However, we have to realize that the world today is faced with challenges that could not be managed thousands of years ago. The unprecedented speed of technology has brought the 800th lifetime to a turning point of human history. There is very little time for the policy makers to mark time as they did in the previous life-times. **Dr. Craig Venter**, the gene pioneer, indicated that *Darwin's theory* will be no longer valid in view of the recent research because evolution is turned over by gene research. This is where education policy makers who always had the luxury to be late, be behind technological advancements in a world that was slowly evolving, would no longer have the luxury to relax. If they failed to bring new technology to our children to prepare them for the future challenge, policy makers will be ridiculed by the future generations for their inability to direct the lives of our children.

Hope of Biotechnology (BT):

"Biotechnology means any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use."²⁵

Biotechnology is a popular term for the generic technology of the 21st century. Biotechnology has applications in four major industrial areas, including health care, crop production and agriculture, non food uses of crops (e.g. biodegradable plastics, vegetable oil, biofuels), and environmental uses. Biotechnology is also used to recycle, treat waste, clean up sites

²⁴ **Gene pioneer Dr. J. Craig Venter** (January 19, 2008)'**A DNA Driven World**' 'Richard Dimbleby Lecture' on BBC TV

²⁵ United Nations Convention on Biological Diversity, Rio de Janeiro in June 1992

contaminated by industrial activities (bioremediation), and also to produce biological weapons. **White biotechnology** also known as **grey biotechnology**, is biotechnology applied to industrial processes. **Green biotechnology** is biotechnology applied to agricultural processes. An example is the designing of transgenic plants to grow under specific environmental conditions or in the presence (or absence) of certain agricultural chemicals. One hope is that green biotechnology might produce more environmentally friendly solutions than traditional industrial agriculture. An example of this is the engineering of a plant to express a pesticide, thereby eliminating the need for external application of pesticides. The term **blue biotechnology** has also been used to describe the marine and aquatic applications of biotechnology. **Bioinformatics** is an interdisciplinary field which addresses biological problems using computational techniques, and makes the rapid organization and analysis of biological data possible. The field may also be referred to as *computational biology*, and can be defined as, "conceptualizing biology in terms of molecules and then applying informatics techniques to understand and organize the information associated with these molecules, on a large scale. Bioinformatics plays a key role in various areas, such as functional genomics, structural genomics, and proteomics, and forms a key component in the biotechnology and pharmaceutical sector²⁶. Biotechnology is also commonly associated with landmark breakthroughs in new medical therapies to treat many of the prevalent life threatening diseases.

Gene therapy may be used for treating, or even curing, genetic and acquired diseases like cancer and AIDS by using normal genes to supplement or replace defective genes or to bolster a normal function such as immunity. The health challenges of the gloomy world, avian flue, HIV, dingy? flu can be treated or prevented with all these inventions.

A chromosome of one species is injected to another replacing the old Darwin's expected natural selection. Gene research will no sooner be able to generate a new human species. Genome research and molecular biology, the biotechnology, has brought new hopes to address not only diseases in humans but also to control pest and genetically manufactured (GM) high yielding crops to addressed the severe food shortage that was discussed in the previous sections. Although there is criticism and many arguments against GM food, through what other ways can the human demand be satisfied? Technology will address its own current shortcomings, limitations and find improved GM food. Whatever the opposition, technology is the only way out to find a solution to the growing severe shortage of food. Will people opt to die without eating GM food or would they rather live with GM food?

²⁶ <http://en.wikipedia.org/wiki/Biotechnology>

Human Genome Technology:

Rapid progress in genome science and a glimpse into its potential applications have spurred observers to predict that biology will be the foremost science of the 21st century. The Human Genome Project²⁷ is an initiative of the U.S. Department of Energy ("DOE") that aims to generate a high-quality reference sequence for the entire human genome and identify all the human genes. Genetic testing involves the direct examination of the DNA molecule itself. The potential applications of genome research²⁸ include

- Molecular medicine
- Energy sources and environmental applications
- Risk assessment
- Bioarchaeology, anthropology, evolution, and human migration
- DNA forensics (identification)
- Agriculture, livestock breeding, and bioprocessing

Molecular Medicine is bringing a revolution in the field of medical sciences. Technology and resources promoted by the Human Genome Project are starting to have profound impact on biomedical research and promise to revolutionize the wider spectrum of biological research and clinical medicine.

Sedere (2005)²⁹ based on the then on-going 'genome research' indicated that the generations to come after 2050 will bring a 'Super Human Race' and they will live disease free to over 150 years of age, highly intelligent, use much more advanced communication and modalities of transport such as teleport. Dr. Venter (2008) the pioneer scientist in genome research confirmed that despite all opposition to genome research, a new human species will emerge. He said one could say it is 'Identity Theft', and it may sound like a fairy tale but he strongly believes that this will happen. The children of affluent adults in the developing countries will join the super world. The super world will curb ill-equipped individual's migrating to developed lands. The developed world will treat the less developed as 'inferior' humans and would corner them. The affluent nations occasionally may dump some humanitarian aid. The next generation of politicians in the developed countries may not be as sympathetic as the present day politicians towards the developing countries. Aid is misused and wasted and the tax payers of the developed countries have too much stress in their lives and now demand more assistance to their children than giving aid abroad or spending for war abroad. This could or would happen beyond

²⁷ http://www.ornl.gov/sci/techresources/Human_Genome/project/benefits.shtml

²⁸ http://www.ornl.gov/sci/techresources/Human_Genome/project/benefits.shtml

²⁹ Sedere M. U. (2005), 'Security Based approach to Development', Universal Publishers, Florida, <http://www.universal-publishers.com/book.php?method=ISBN&book=1581124759>

2050. The movie '*Children of Men*' also shows where illegal migrants are put in isolation separated and caged.

Energy and Biotechnology: Information gleaned from the characterization of complete microbial genomes will lead to insights into the development of such new energy-related biotechnologies as photosynthetic systems, microbial systems that function in extreme environments and organisms that can metabolize readily available renewable resources and waste material with equal facility.

Molecular biotechnology has the potential to invent new bio energy. Molecular biological research may even be able to make the individual to be self sufficient in energy. There are creatures that discharge energy from the body. The lightning-bug (fire fly) and the eel fish are some of them. The energy released by the eel fish is sufficient to light a house with 12 bulbs. There would be a day such genes through the supper-molecular biology provides the self-energized humans.

Genome research and Agricultural Production: 'Understanding plant and animal genomes will allow us to create stronger, more disease-resistant plants and animals --reducing the costs of agriculture and providing consumers with more nutritious, pesticide-free foods. Already growers are using bioengineered seeds to grow insect- and drought-resistant crops that require little or no pesticide. Farmers have been able to increase outputs and reduce waste because their crops and herds are healthier'³⁰.

How much of genome research and bio-technology is taught in our universities? What is the place of genome research and bio-technology in our school curriculum?

Bioinformatics and Computational Biology is another domain that grows hand in hand with all these research investments. Today, the computers are used to see through processes. Visualize hypothetical assumptions. Illustrate outcomes and make comparative analysis of many options. It is not just 'Information Technology' (IT) of the last decades.

We do realize that computer education is needed for our children. Information Technology (IT) is a popular demand today. At least the middle class parents make an effort to give some IT education to their children. Governments also are trying to give a few computers to some selected schools. While appreciating these efforts, I also wish to underline that old style IT will soon be a story of the past. IT world is now merged with BT. IT jobs are no more for the office management. IT literacy needs

³⁰ http://www.ornl.gov/sci/techresources/Human_Genome/project/benefits.shtml

new definitions. Most of the IT policies of the developing countries for school children are outdated because those were developed a decade back. A decade is a long time now.

Nanotechnology

“Nanotechnology is the engineering of functional systems at the molecular scale”³¹. “The principles of physics, as far as I can see, do not speak against the possibility of maneuvering things atom by atom. It is not an attempt to violate any laws; it is something, in principle, that can be done; but in practice, it has not been done because we are too big.” — (Richard Feynman, Nobel Prize winner in physics)³² K. Eric Drexler is the leader in this field for a long time. He continuously defined and advocated possibilities of nanotechnology to answer many future issues.

Nanotechnology is another technological advancement that would help the human race to survive addressing many of the issues that we discussed under the future gloomy world. This is the most refined level of technology that is now coupling with the advance computer technologies, robotic and molecular biology that make another revolution in humanity.

A *nanometer* is one billionth of a meter, roughly the width of three or four atoms. The average human hair is about 25,000 nanometers wide. Nanotechnology is the engineering of tiny machines — the projected ability to build things *from the bottom up* inside personal nanofactories (PNs), using techniques and tools being developed today to make complete, highly advanced products. Ultimately, nanotechnology will enable control of matter at the nanometer scale, using mechanochemistry. Shortly after this envisioned molecular machinery is created, it will result in a manufacturing revolution, probably causing severe disruption. It also has serious economic, social, environmental, and military implications.³³

Manufactured products are made from atoms. The properties of those products depend on how those atoms are arranged. If we rearrange the atoms in coal we can make diamond. If we rearrange the atoms in sand (and add a few other trace elements) we can make computer chips. If we rearrange the atoms in dirt, water and air we can make potatoes.³⁴

Nanotechnologies new capabilities are very promising for addressing the issues of the gloomy world that we discussed in the earlier sections. It's a

³¹ Center for Responsible Nanotechnology: <http://www.crnano.org/whatis.htm>

³² Richard Feynman, Classic Talk 1959

³³ <http://www.crnano.org/basics.htm>

³⁴ <http://www.zyvex.com/nano/>

proposed new appliance, something that might sit on a countertop in your home. To build a personal nanofactory (PN), you need to start with a working fabricator, a nanoscale device that can combine individual molecules into useful shapes. A fabricator could build a very small nanofactory, which then could build another one twice as big, and so on. Within a period of weeks, you have a tabletop model.

Modern synthetic chemistry has reached the point where it is possible to prepare small molecules to almost any structure. These methods are used today to produce a wide variety of useful chemicals such as pharmaceuticals or commercial polymers. This ability raises the question of extending this kind of control to the next-larger level, seeking methods to assemble these single molecules into supramolecular assemblies consisting of many molecules arranged in a well defined manner.³⁵

What could nano-factories produce? Nanotechnology can produce "Lifesaving medical robots *or* untraceable weapons of mass destruction; Networked computers for everyone in the world *or* networked cameras so governments can watch our every move; Trillions of dollars of abundance *or* a vicious scramble to own everything; Rapid invention of wondrous products *or* weapons development fast enough to destabilize any arms race."³⁶ US National Science foundation says "*Imagine a medical device that travels through the human body to seek out and destroy small clusters of cancerous cells before they can spread or a box no larger than a sugar cube that contains the entire contents of the Library of Congress; or materials much lighter than steel that possess ten times as much strength*".

These technological advancements are not only available but are also becoming increasingly accessible to many. As a Sri Lankan I am happy to read the news that Sri Lanka recently declared open two nanotechnology projects. This is a very welcoming incident. However, that is not enough. How are we going to bring our younger generation to experience these and see themselves how this happens and make them curious and interested in playing around, understanding and utilizing these for the good of the self and the fellow citizens.

Global Warming, Energy Crisis & Technology

The issue of global warming demands immediate cutting down of use of fossil fuels. Greenhouse gas emission has to be reduced. On the other hand gasoline prices keep climbing. Affordability of using gasoline is increasingly difficult. Due to escalation of gasoline prices many of the developing

³⁵ Simple to complex: a molecular perspective, <http://en.wikipedia.org/wiki/Nanotechnology>

³⁶ <http://www.crnano.org/basics.htm>

countries are faced with inflation and economic inefficiencies. The real answer to global warming is not cutting down of the use of vehicles or stopping manufacturing. The real solution is to find clean energy and efficient engines and motors. This will not only save the globe from greenhouse gases but also enable many more people who have no access to material goods to have access to a better life. The solutions to end the energy crisis will bring more environmentally friendly technology to people. The solutions will not only mitigate the further deterioration of the ozone layer but will also make the consumption of energy much cheaper.

Changing Global Economic Order

Global Economic Governance at a Crossroads (The Brookings Institution 2004)³⁷, replacing the G-7 with the G-20. This illustrates both the glaring gap in global governance and the increasing economic and policy interdependence between industrial countries and major emerging market economies (EMEs). The G7 was founded in 1978. G20 was founded in 1999. The G-20, in contrast, is composed of ten industrial countries (the G-7) plus Australia, Russia, and the EU president and ten emerging market economies - Argentina, Brazil, China, India, Indonesia, South Korea, Mexico, Saudi Arabia, South Africa, and Turkey. The implications of these demographic and economic facts are that the structures, mechanisms, and processes of global economic governance must be realigned to better correspond to the current realities of the global economy and global society, not to mention the patterns that will change over the next half-century. Globalization is not merely the internationalization of trade and financial flows between national economies interacting at arm's length. Globalization, in fact, has fundamentally transformed the nature of international economic interaction - The Brookings Institution (2004).

The world's economies now penetrate each other's internal domains because large, modern firms are no longer merely factories but global networks that function seamlessly across borders. Intra-industry and intra-firm trade have increased as a proportion of total trade. The integration of world financial markets has created what is essentially a single global capital market. Migration and the outsourcing of activities have transformed and linked labor markets globally. And modern transportation and communication linkages in effect have shrunk geographic distance. As a result of these factors, porous borders have changed the meaning of the boundaries that define nations.

The shifting global economic scenarios naturally have an impact on education policy for our future children. To benefit from it, the developing countries need to align their education systems to enable our children to develop the

³⁷ The Brookings Institution, (April 2004), Policy Brief # 131, 'Global Economic Governance at Crossroads'. <http://www.brookings.edu/comm/policybriefs/pb131.pdf>

right kinds of skills to become effective and efficient investors and consumers of the global economy. Creating a class of students with anti social skills, and with outdated socio-political ideologies, particularly in the universities, makes our nations more vulnerable. Such political movements have to realize these are only remnants of the out-going generation and these only kill the potential of our nations to align our children with the emerging future. Even if such forces manage to disturb a small country like Sri Lanka, the rest of the world will move faster towards the emerging world leaving us behind.

Renewable Energy:

Alun Anderson, the Chief Editor of New Scientist (2007) says that "I'm optimistic about...a pair of very big numbers. The first is 4.5×10^{20} . That is the current world annual energy use, measured in joules. It is a truly huge number and not usually a cause for optimism as 70 per cent of that energy comes from burning fossil fuels. Thankfully, the second number is even bigger: $3,000,000 \times 10^{20}$ joules. That is the amount of clean, green energy that pours down on the Earth totally free of charge every year. The Sun is providing 7,000 times as much energy as we are using, which leaves plenty for developing China, India and everyone else. How can we not be optimistic? We don't have a long-term energy problem. Alun Anderson (2007)³⁸

About forty nations have oil resources (most rather negligible), but all nations have access to wind, sunlight, and most to water for hydrogen generation. We could see energy independence on a global scale and no more geo-political battles over oil, both extremely positive outcomes. "A combination of wind turbines, solar cells, hydrogen generators, and fuel cell engines offer not only energy independence, but an alternative to climate-disrupting fossil fuels,"-(Brown 2007)³⁹

Lester Brown (2006)⁴⁰ imagines a variety of expanding industries in an eco-economy. The needed restructuring of the global economy has already begun, Brown reports. The shift from the fossil fuel era to the solar/hydrogen era can be seen in the contrasting growth rates of these energy sources in recent years. During the past decade, the use of wind power grew by 25 percent a year, solar cells at 20 percent a year, and geothermal energy at 4

³⁸ Alun Anderson (2007) the Chief Editor of New Scientist: World Question Center, http://www.edge.org/q2007/q07_1.html

³⁹ Lester Brown (2007), Eco-economy offers alternative to Middle East oil, Earth Policy Institute, Washington D.C.

⁴⁰ Lester Brown (2006), Plan B 2.0: Rescuing a Planet Under Stress and a Civilization in Trouble, <http://www.earth-policy.org/Books/PB2/index.htm>

percent annually. In stark contrast, oil expanded by only 1 percent a year and coal use declined by 1 percent annually. Natural gas, which is destined to be the transition fuel from the fossil fuel era to the hydrogen era, grew by 2 percent per year.

The technology is so capable of finding solutions. Already cars run with water with HHO gas splitting hydrogen and oxygen. Over 2 million people use solar homes. The hybrid cars do over 35kms per liter. It is all technology.

- Hydrogen Energy
- Ocean waves and other sources may be tapped to provide some local electricity and to split hydrogen from water.
- Fuel-cells
- Solar-cells
- Wind-farms & Wind-Turbines
- Energy efficient vehicles

These are the future of the world. These energy sources are not only cheap. They are also environment friendly and stop greenhouse gas emission and save the atmosphere.

Lester Brown (2007) further states that the restructuring is gaining momentum. For example, from 1995 to 2000, world wind electric generation expanded nearly fourfold, a growth rate previously found only in the computer industry. Denmark gets 15 percent of its electricity from wind. In the northern German state of Schleswig-Holstein, it is 19 percent. For Spain's state of Navarra, it is 22 percent.

"Wind power has an enormous potential," said Brown. "According to a US Department of Energy wind resources inventory, three of the most wind-rich states - North Dakota, Kansas, and Texas - have enough harnessable wind energy to satisfy national electricity needs. China can double its current electricity generation from wind alone. Europe's offshore wind potential is sufficient to meet the continent's electricity needs."

Advances in wind turbine design have reduced electricity costs from 38¢ per kilowatt hour in the early 1980s to less than 4¢ at prime wind sites in 2001. Further cuts are a prospect. In response to falling costs, wind farms have come on-line recently in Minnesota, Iowa, Kansas, Texas, Colorado, Wyoming, Oregon, Washington, and Pennsylvania.

"At the end of 2000, nearly one million homes worldwide were getting their electricity from solar cells. With the new solar cell roofing material developed in Japan, the stage is set for dramatic gains in this new energy source as rooftops become the power plants of buildings. For many of the nearly 2

billion people without electricity, solar cells are their best hope.” - (Brown 2007).

In describing the transition to the eco-economy, Brown identifies both sunset and sunrise industries. Among the sunset industries are coal mining, oil pumping, clear-cut logging, and the manufacture of internal combustion engines and throwaway products. Among the sunrise industries are wind turbine manufacturing, hydrogen generation, fuel cell manufacturing, solar cell manufacturing, light rail construction, reforestation, and fish farming. Rapidly growing professions include ecological economists, wind meteorologists, recycling engineers, geothermal geologists, and environmental architects – (Brown 2007).

What has education policy got to do with these developments? Should education address these developments to ensure that we educate our children to save the world? Is it necessary that our children are enabled to be contributors and efficient investors, and producers and consumers of this emerging renewable energy?

Education for the Future

We live in an age where changes happen so fast that unless policies foresee the changes and align the education system with the emerging world, even the children of literate parents would not be able to meet the challenges efficiently. These emerging issues are being addressed in some of the developed countries to a certain extent. Even in the developing countries the private sector facilitates change and children of the educated and affluent parents benefit in one way or another. In particular the youth from affluent families do not seek higher education in their own countries. Today, the national universities in most of the developing countries only cater to the children of the less affluent parents and are in disarray. Social violence, strikes, and indiscipline predominates rather than demanding an orientation to future. Governments have been too slow to act or are afraid to act to bring higher education into perspective.

Public policy on middle, secondary and higher education needs a radical change.

The philosophical, theoretical and developmental trends need to be examined, understood and translated into policy. These trends need to be disseminated to the public to bring awareness in teachers and parents before accommodating them in educational reforms. There is no such mechanism in place to study change. Although the formal schools in most of the developed countries have liberalized, in most of the developing

countries the bureaucratic boundaries of schooling continue without much change.

The main concern in this paper is to provide a futuristic view of the global changes and set the stage for countries, like Sri Lanka, in envisioning of education for the future, beyond 2020. The global effort in envisioning the world in 2020 and/or 2050, likely implications and how best educators of today may design a policy framework for the emerging future, is a huge challenge. Can the children of the developing countries qualify for global citizenship by 2020 or 2050? The trends of today strongly indicate that it will be impossible unless affirmative actions are taken to change the existing state of affairs on a priority basis.

Policy of Curriculum and Subject Matter

Glenn and Gordon (2005) further state by 2050 the "Internet has become a right of citizenship. Businesses give free accounts to all customers; employers give them as an employee benefit. The connection of virtually all people to the global information and communications systems accelerated the pace of scientific research and the introduction and diffusion of new technology. Biotechnology, nanotechnology, and closed-environment agriculture could feed the world. New and improved sources of energy made cleaner economic growth. Brain-like intelligent systems used neural networks to augment human intelligence and improve decision making. Molecular manufacturing (nanotechnology) lowered manufacturing unit cost, requiring less volume of materials and energy usage, and hence, lowered the environmental impact of a population that had almost reached 10 billion. Vaccinology and genetic engineering eliminated most acquired and inherited diseases further reducing the need for more frequent pregnancies to have a similar sized family. This was a factor in further lowering fertility rates, even though generational mini-booms have continued from the great population explosion in the mid-20th century. Cyberspace had become a major medium of civilization creating a constantly growing, non zero-sum economy and had changed day-to-day life as significantly as the industrial revolution had changed life 200 years earlier. The success of the International Space Station had led to other orbital habitats, the lunar base, and the pioneer communities on Mars. Nearly 250,000 people now work in space communities in orbit, on the moon, and on Mars, giving a new frontier for human imagination and advances in civilization."- (Glenn and Gordon 2005).

It is important for us to understand Glenn and Gordon's statement. This is not something fancy. It is an achievable future. It is achievable by our developing nations as well, if we concentrate on the right policies for the future and wisely invest resources in the prioritized targeted activities for the future.

The interest here is to focus on the changing the nature of subject matter of education. Education policy should be to review and align curriculum material on regular basis to accommodate systematic scientific advancements. The futuristic studies indicate that 'change is happening at an ever faster rate today, driven partly by technological changes leading to changes in all other areas of our lives, and by the increasing interdependence between countries and peoples today, as well as the decentralization of societies and institutions within countries (also furthered by information technologies today). The end of the Cold War is also changing political and economic borders, systems, and alignments, as everyone seeks to become part of a global economy and society, while still maintaining national, ethnic, and cultural identities and meaning'⁴¹.

What should be the curriculum content in our schools?

Is teaching of integrated science 'four classroom-periods' a week, in our middle school sufficient? What type of science subject matter do we have to teach in view of the world developments? How much technology do we teach our children in school? Technology is not a part of general education. This is the way our policy makers perceive education. We continue to believe in general education and teaching rather than hands on learning and training. We need to change the subject matter in our curriculum and bring challenging topics of the future to the school curriculum. Subjects like alternative energy, molecular biological studies, new scientific methods and techniques in science have to be included and children should be fully exposed to these domains. *Today's schools need a technology oriented curriculum. Technology excites children. Technology opens up the child for self learning. A policy is needed to combine the so-called technical education with general education. Without which our children will be lost.*

A policy is needed to introduce new subject matter over the traditional curriculum. Our leaders are so fond of history. I have no objection for teaching history but not to everyone. Let those who wish to study history study it. Let everyone also have one or two modules of such subjects. We need to concentrate on modern subjects. The modern subjects such as alternative energy are easy things to introduce and allow children to experiment with. Children to do self learning, self experimentations is one way of learning and promoting creativity. In some countries even primary school children make solar cookers and solar heaters. Most of the developing countries are in eternal power cuts. Yet, our school curriculum has not considered a way of addressing these. A small water creek in the

⁴¹ http://www.csudh.edu/global_options/IntroFSTopics.HTML#RangeFSViews

school or in a neighborhood could produce energy. Bio fuel can run generators. Have we given this knowledge to our growing youth? We still wait to teach these at technical colleges.

Texas⁴² updates secondary schools curriculum to reflect the newest technology relating to alternative energy and alternative fuels. The updates will encompass emissions, forecasts, recent research on global climate change and the benefits alternative energy provides in reducing emissions of greenhouse gases and demand on energy resources. Expansion of the material includes streamlining existing secondary education materials on renewable energy and energy efficiency and conservation into one electronic product for web delivery and CD production. Tests are being updated to reflect changes in educational standards and teacher requests. Texas State Technical Colleges introduced Fuel Cell curriculum.

The Sioux Valley⁴³, California has introduced an Alternative Energy Curriculum from primary schools to High school. This is one of the most interesting curricula that are also using technology demonstrates in full how an energy curriculum can be introduced in schools. Even the on-line the material illustrates all concepts so systematically.

The state of Pennsylvania has also introduced energy curriculum, here you'll find lesson plans, curriculum, and educational materials for teaching students and children about energy, particularly energy efficiency and renewable energy for both K-12 and higher education⁴⁴.

Basic Skills:

The basic skills in the world are no more the basic skills (3Rs) that we used to have. Reading, writing and numeracy skills are finding new directions. *It is necessary to redefine basic skills accommodating technical and adaptation skills to changing environment. Education policy should facilitate and universalize the newly defined basic skills* I have seen the pre-K children learning technology. The child from Pre-K through 12 learns modern technology. Today's children read through new media. Intelligent parents provide their children such education either after school hours or by sending them to schools where modern disciplines are taught. Even without the knowledge of parents a child acquires many new concepts through media. Today's middleclass children are so keen to find technology.

⁴² Energy Education Curriculum Projects <http://www.propane.tx.gov/education/objectives.html>

⁴³ http://siouxvalleyenergy.apogee.net/kids/las_ifrm.aspx

⁴⁴ <http://www.marketplaceforthemind.state.pa.us/m4m/cwp/view.asp?a=3&q=151273>

The stories they learn through the digital media. Anything and everything is becoming a downloading culture, a digital culture, and a virtual culture. And these devices are becoming cheaper and cheaper. Meanwhile our policy makers keep printing the same textbook for five years, 50 copies to 50 children. If we continue to teach the same curriculum matter in the same way that we do business, use to teach in the same way that our grandfather's generation learnt, how could our children advance? Today all basic skills can be learnt much faster through the exciting media. One can print a CD 05% of the cost of a book. One can download high quality free learning material from the web. Simply by contributing a few hundred dollars a library could have access to thousand of books.

Teacher as Facilitator of Learning:

The children of today are more capable than the teachers in learning technology. They have the right mind-set to learn which is not there in our policy makers to make the shift. The traditional teachers have not brought about the change that we expect. Quality of learning in a traditional sense is yet to be achieved. We keep recruiting and training teachers and go in the same cycle of problems relating to deployment of teachers. Often we recruit teachers who are not competent to even teach the traditional subjects. Could we move a nation forward by blindly surrendering ourselves to an ineffective dissatisfied system of teacher recruitment, training and deployment?

It is the policies governing teacher education that have to change. It is not a matter of resources; it is a matter of rearranging resources to give the best to our children. Still our politicians need more buildings and more recruitment of teachers to get political mileage at the cost of our children's future.

Today we don't need to bring all children to one place to teach. It is those who learnt through self-learning who invented science. Thomas Edison's mother took him out from school because he was failing in school. He made over one hundred inventions. Henry Ford dropped out of school at 16 and invented the car. Charlie Chaplin dropped out of school when he was 10. The hydrogen car was invented in 2005 by a mechanic who has not diploma.

Self-learning makes people inventors. Teaching through the teachers kills natural creativity. Teachers impose their thinking on children and bring stereotype personalities by cutting out the sharper edges of human intelligence. Let's give a child guided freedom to learn. Let's develop thousands and thousands of 3-4 hrs course units, on all aspects of fast

growing knowledge to make those available for the children to select and to learn what they like to learn.

Policies relating to the textbooks have to change. Children do not have to have the prescribed eight or nine subjects in the curriculum. They need some modules as essentials. Let's get away from the textbook written for a year for all, and have these replaced with modules of short durations. Let's get away from teaching a subject all year for six years in the middle and secondary levels.

Teachers should be trained to become facilitators of learning rather than to teach. One real teacher, who knows the real subject matter, today can teach the entire world through technology. We need to find ways of bringing the best to our students. Any university student can learn from the best sources today. Why do we have to have the traditional models to teach? We need learning-facilitators to facilitate learning at schools, homes, and at public and private institutions. Does it matter whether the child goes to learning? Whether it is a private tutor or a school, commercial firm or an industrial plant? Governments can pay the unit costs of learning to all children no matter where they receive learning. What is required is to coordinate and facilitate freedom to learn.

Computer Education:

Many developing countries are installing computer labs, 10 – 20 computers per school, to provide computer education. This is a positive step. Yet, computer is equipment and it cannot do any thing by it-self. What do we do with the computers in our schools? In many places I have seen having a computer lab and no one using them or most of the time those computers are lying idle. In schools and in some government institutes in the region the computer lab is under all controls and some places do not even a staff member who has free access to them. Often there is no teacher. If there is a teacher s/he is not competent to do an exciting lesson with new technology. After a few months, in many places computers are out of order, either hit by a virus or frozen due to failure of up-dating software. In many places electricity fluctuations and power failures are hindering even the very little that children get. There are computers but no learning package in place.

- What do we do with those computers? What software do we have?
- How much surfing is a child provided with?
- How much interactive teaching learning materials are there?
- Are our textbooks prepared with CDs and DVDs to have interactive learning? Can we prepare our textbook with interactive CDs and DVDs?

- Do we have the learning material linking to websites for the child to visit, surf and learn much more than a teacher does?

The policy should provide internet and media equipment with computer and introduce learning through computer packaged sciences, math, languages etc. This is needed. Today computer has very little use if it has no free internet access. It has very little use if it has no media equipment. Computer and internet, combined with media equipment could do wonders to educate children. Everything is becoming so simple to access, illustrate, demonstrate and take the child in to a new fascinating world of learning. When a child is into it, the child has over 100% commitment to learning. They get addicted to learning. Media, if rightly used will allow the child to find his or her own way of learning. They will pursue this to a very advanced level of self-learning. The policy needs to accommodate computer based interactive learning for all grade levels.

The ideological basis of future education becomes more important because the *learning theories and technology* has to become one for children to learn. The media is the most powerful tool of learning today and most of the burning topics are much better presented through media. It is more about what they should learn and how they should learn. The emerging global trends all around us are becoming more challenging and many of the adults are unable to even understand the real gravity of the geopolitical, biological, ecological and cosmological challenges the humans are faced with and are to deal with today and in the next three to five decades.

Policy towards New Methods of Learning:

Educators need to understand that the theories that govern methodology, psychology and sociology are constantly at the threshold of recent brain and neurological research. Technology has advanced even faster than the advancement in theories of learning – (see brain connection website). Technology comes with a new gateway to learning. Offers much more hope in learning. It could allow children to experience and manage knowledge. With minimum guidance a student can be a self-learner. One need not wait for a year to pass a grade level. One need not fail and repeat because technology guides the child to alternative ways of learning the same subject matter. Technology has the capacity to disseminate lessons from the best teachers. It has the capacity to illustrate, visualize and interact. Very soon 'Interactive Television' will be a reality (Interactive TV, Panasonic, Youtube 2008). Though a lot is said about the utilization of technology in education, not much is achieved in the schools in the developing countries and even in the public schools in the developed countries.

Learning theories have changed. *The theories of self-learning predominate the learning particularly for children in Middle and Secondary Schools.*

Children in the middle and high schools are capable of learning by themselves. Policy should recognize these potentials and realities. Computers are becoming cheaper and cheaper every day. We continue to build schools and provide big buildings. Today is the time to operate without such buildings. Technology has brought virtual classrooms, virtual universities to action and those provide more effective learning. No student strikes. No violence. No wastage of precious youth time and scarce resources.

University Education:

*Universities need to bring the latest technology to the youth. Our universities build more classrooms and big buildings. This is not what we want. This has never materialized due to the increasing cost of university education. The total formula of higher education has to be undone. Do we need to have more traditional universities? How do they learn? What is the quality of our graduates? How much actual time is spent for learning by a university student? Could we count learning by hours and units of learning rather than in academic years? Does it matter whether a student had a 3 year degree or a one year degree? Or what matters is how much the student acquires in a year or in three years? These are all challenging questions that our policy makers need to address. *My appeal to the policy makers is to open up the systems, not to believe in the traditional model which does not work. Don't put our youth into old formula of learning. The traditional universities need a shake up. To find a new path and open its doors to learning, not to some selected few students who have passed an examination. Let the children conquer the world of learning. Invest in virtual universities and develop more and more technology based websites and units of excellence to expose our youth to the best technology in the world.* Recently I was assessing vocational education system in Tanzania. The Tanzanian situation is the same in almost all developing countries. All Vocational Training Colleges (VTC) have 30 year old motor cars to teach motor mechanism. You bring an 18 year old youth who is going to work the next 50 years of his or her life and impart training on a 30 year old obsolete vehicle, and expect economic growth, efficiency, and survival in the future? Why are we so blind? Simply no country can provide you with all new models of motor cars to teach up-to-date technology. Could we have a more low cost new approach to train our youth with excitement to learn. There are new and cheaper ways of doing technological training than building such VTC those only could accommodate a batch of 30 or 40 students.*

We should not restrict learning by bringing more and more controlled models that govern our traditional higher education systems. We have to have the courage to bring a revolution in our universities and higher education institutions to operate day and night not surrendering our selves

to the destructive few who keep our universities closed rather than open. They are anti-social elements, keeping a nation behind. We need to transform the systems through new technology to ensure that no one is controlled by another. *Every one, not only the so-called university student, but any one who has the interest to learn, the motivation to learn, should be given an opportunity to learn at their own pace through technology* based better material and methods to bring change and ensure that they are made capable of surviving in the future generation that is emerging at unbelievable speed.

Answers to the problems of the future are not found in reversing of development. Stopping fuel powered vehicles and going back to horse carts; stopping cell phones and having landlines; stopping manufacturing plants and making things manually are not answers to the problem. Technology is the promise to sustain what is achieved and protecting the dreams of humanity.

Educators and policy makers, particularly in the universities and higher education institutions must realize that the amount of scientific research done in the last decade is much more in quantity and quality than all research done in the world in the last 400 hundred years. The information technology and transfer of data now doubles every six months. The research done by young scientists brings more impact on human life than generations of senior scientists have done. The present world crisis in many domains, energy, climate change, disease, scarcity of water and food etc, could be addressed and resolved through technical and human advancement.

However, the on-going clash of civilizations, civil wars, the war on terrorism, poor governance, and by and large the on-going and never ending destruction will delay many of the developing nations from reaching a better life for their children by 2050. If such conflict and destruction continues, such nations would run the risk of making their children live in misery. Children of these nations will succumb to the forces that bring gloom.

If the developing countries wait for everything to fall on their laps, as usual, unless we are futuristic thinkers, we will be too late. Our universities, higher education institutes and schools cannot go on doing business as usual. This will only lead the developing nations to a more chaotic future leaving our children incapable of facing the challenges that they would face in a few decades.

We need to concentrate and consolidate all our efforts in all possible ways to ensure the rapidly advancing technology of the emerging world is brought to our children. We need to identify the minimum required level of

technology to barely survive and keep the 'identity' and 'dignity' of the children of the less affluent in the emerging world. This I believe is the challenge for the policy makers to make them dignified citizens in year 2050 where technical skills will be the most wanted basic skills to survive.

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