naturenomics™

Nature and Economics - Nurturing Interdependence

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Contributing Organizations & Publications

California Environmental Associates
Eco-Economy - Building an Economy for the Earth, Lester R. Brown
Harvard Business Review
McKinsey & Co.
Ecology vs Economy, Tilburg University

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Our Natural Inheritance

RANJIT BARTHAKUR, gms

Through the ages we have used nature's capital to surge economic growth. This use, overuse, and misuse of nature have eventually put both of "us"; the "consumers" and the "resources" on the verge of destruction. We have paid a very high price for the phenomenal economic growth and now are in danger of derailing the same growth if we do not manage our natural assets in a more effective and sustainable manner.

Under these circumstances, there is little or no scope for rejoicing over such short term wealth creation which is actually responsible for the ecological deprivation and the rapid decline of our natural inheritance.

The fundamental issue is one of measurement and frame-working of ecological value. Economics has its own theoretical construct based on economic value creation which is measured by market forces in terms of optimal utilization of all available and accessible assets - land, labour, capital and natural resources. A market price is attached to this efficiency in the utilization of assets - the better the utilization of the assets, the higher the market price. This is in conflict with the ecological value framework - ecological value is, in principle, based on factors such as the complexity of the ecosystem, its connections with other ecosystems, the scarcity of the ecosystem, its vulnerability, and its contribution to biodiversity. This implies that ecological value is not based on any market mechanisms; it is based on the ability to sustain ecology through the complex inter-relationships in the eco-system. Hence, a 'friction factor' is bound to occur at the overlap of these two components - nature and economics, impacting security across all four areas of our living and inheritance - food, water, energy and environment.

However, instead of focusing on the conflict we envision an emerging interdependence between nature and economics which we call **Naturenomics™**. Naturenomics™ relates to capital formation for a region or organization through the creation of ecologically 'compliant' assets in a sustainable manner.

There are two imperatives which will underlie the principles of Naturenomics™:

- **a major paradigm shift** - adjusting the balance of power by displacing economics at the heart of all activity, and replacing it with nature assets as the soul of all activity

- **agree to a common system and methodology of valuing nature assets** - just as there are generally accepted accounting principles (GAAP) in economic accounting, and accepted methods like net asset value and discounted cash flows of valuing economic assets, we need to develop a 'green accounting methodology' (GAM) and a Nature Quotient (NQ) - a list of nature parameters to measure ecological value and performance.

"Naturenomics™ - Nature and Economics - Nurturing Interdependence" is a compilation of thought pieces dedicated to the themes of Naturenomics™. We are indeed grateful to all those who have contributed to this collection including eminent persons and organizations such as Lester Brown, Pavan Sukhdev, Bittu Sahgal, Harvard Business Review, McKinsey & Co., etc, and last but not the least, my colleagues at GMS.

This compilation is not meant to provoke discussion and debate; we have indeed seen and heard enough of that already. It is intended to stimulate immediate action, without which we will continue our rapid downward spiral into the black hole of imbalance between nature and economics.

Our organization, Globally Managed Services (GMS), is at the forefront of nurturing Naturenomics™. Our high NQ initiatives in this space include:

- **Balipara Foundation -** community level involvement and employment/income generation through social entrepreneurship in initiatives that are economically self sustaining - focus on bio-diversity and natural agriculture.
- **GMS - Morarka Organic Development Initiative (GMODI)** - Under Balipara Foundation, GMODI is a joint venture between GMS and the Morarka Foundation focusing on developing community based organic cultivation programmes, including developing market linkages
- **AgriQuest** - focused on back end agricultural products preferably insecticide and pesticide free and organic produce, supply chain aggregation and marketing, working closely with the farming communities and entrepreneurs to ensure market access for their products
- **FarmQuest** - aggregates larger agricultural land banks to bring them under organized cultivation of bio-diverse farming practices preferably organic.
- **NatureFirst -** helping governments, corporations and individuals develop strategies in clean environment, water and carbon management, and take actions to help restore the balance between nature and economics
- **River Journeys and Bungalows of India** - a nature tourism initiative currently with two properties - Wild Mahseer (a cluster of high end tea garden bungalows) and Wild Grass (a nature lodge)

GMS will strive to continue to build, manage, operate and nurture initiatives in the domain of Naturenomics™, and work closely with different constituents (governments, NGOs, multilateral agencies, thought leaders, local communities, private sector enterprises, public sector enterprises, etc) to enable this paradigm shift. Towards this we work closely with the governments of the states of North East India to facilitate the process of Naturenomics™ by facilitating investment flow in areas sectors as agriculture, clean energy, eco-tourism, eco-townships, waterways, etc. We envisage that many of these projects will be implemented in Public-Private Partnership formats between these governments and private parties.

Together lets nurture nature - OUR NATURAL INHERITANCE!

I

The Deteriorating Balance between Nature and Economics

ALEM AO, gms

Planet Earth is dying. With changes in the atmosphere, waste of resources and the consequent pollution, ongoing deforestation and the destruction of fisheries, the rapidly spreading deserts and the mass extinction of species, biological life arrayed in complex ecological splendor that set the conditions for life is threatened as never before.

Globally air, water, land and ocean ecosystems are collapsing. Global inequities in human wealth, health and justice continue to soar. A recently released World Wild life Fund (WWF) report indicates that "a third of the natural world has been destroyed by humans over the past three decades."

Several recent scientific studies indicate that rates of human consumption have surpassed the rates whereby the Earth can replenish itself - a condition termed "ecological overshoot".

The world population has trebled in the last hundred years. With increase in global population there is a corresponding increase in demand for natural resources. Environmental degradation resulting from increase in population has had an impact on many of the resources that we take for granted. If the resources available today are far greater than those in the past, the threats we face are also far greater.

With the dynamic interplay of socio – economic, institutional and technological activities, the cause for environmental degradation is the magical 'human touch', which invariably leads to the deterioration of the environment across all verticals of water, land and energy.

Humans have altered the planet more violently and rapidly in the past 50 years than in any comparable time in human history. With accelerated technology and the given continuation of current trends the impending global ecological collapse is inevitable.

Stress on Food

The United Nations World Food Programme (WFP) and the Food and Agriculture Organization (FAO) insist that there are a significant number of people at risk of food insecurity. Global food security will remain a worldwide concern for the next 50 years and beyond. Recently, crop yield has fallen in many areas because of declining investments in research and infrastructure, as well as increasing water scarcity. In 1990 a total of 780 million people out of 4 billion in the developing world are living on diets that are not sufficient to maintain a healthy life (FAO).

Demand for food is influenced by a number of forces, including population growth, income levels, urbanization, lifestyles, and preferences among others. Almost 80 million people are likely to be added to the world's population each year during the next quarter

century, increasing world population by 35 percent from 5.7 billion in 1995 to 7.7 billion by 2020 (UN 1996) which suffice to say would only increase the demand for food. In the 1990s global poverty fell by 20%, but the number of hungry people rose by 18 million.

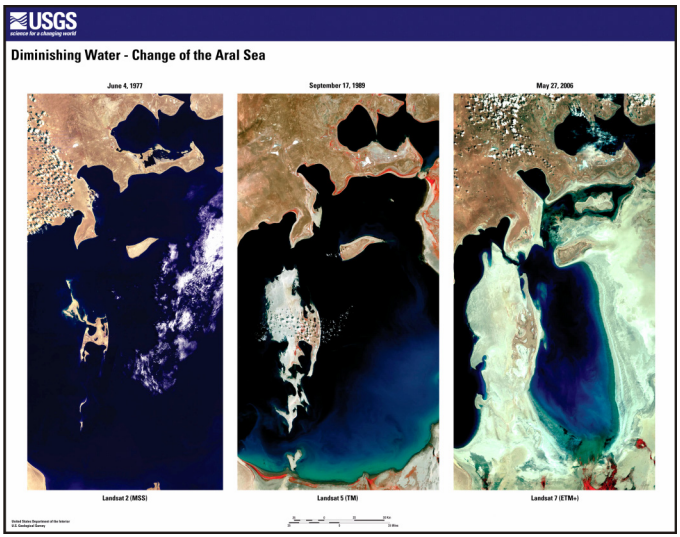
Much of the world's best cropland is already in use, and farmers have to turn to increasingly marginal land. And the good land is often taking a battering - soil degradation has already reduced global agricultural productivity by 13% in the last half-century. This gives rise to an externalization of scarcity: the quantity of available fertile land cannot be augmented by human actions; it is determined externally.

With excess fertilizers running off farmland, from livestock manure, and from other human activities, it is changing the composition of species in ecosystems, reducing soil fertility, depleting the ozone layer, intensifying climate change, and creating dead zones in the Gulf of Mexico and other near-coastal seas. The sheer amount of the Earth we need to produce our food has an enormous impact.

Stress on Water

A study of the global water inventory shows that a very minute portion of the global water is actually needed for humans. But with over six billion people living on the planet this makes the per capita availability of water very low indeed. Adding to the stress on water is the fact that most of the water resources have been used wastefully.

The world is running up a water deficit. Some of the most wide spread indicators of the water scarcity are rivers running dry, wells going dry and lakes disappearing. Water tables are falling on every continent as the demand for water outruns the sustainable yield of aquifers. The development of diesel and electric pumps has led to a phenomenal increase in the amounts of water being extracted from ground water sources. As water tables are falling through out the globe the springs that feed rivers go dry, reducing river flows.



The changing faces of the once mighty Aral Sea

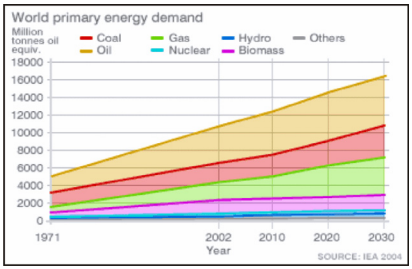
A third of the world's population lives in water-stressed countries now .By 2025, 1.8 billion people will live in countries or regions with absolute water scarcity.

Stress on Energy

In an energy starved, searing and polluted Planet, with inadequate water, unproductive lands and military resource grabs; we are running out of cheap energy despite our best intentions. Peak oil is expected in no more than thirty years, or likely much sooner.

The industrialized world's prosperity is based upon unsustainable rates of energy consumption. Americans are 4% of the world population, yet consume about 25% of the world's petroleum - much going towards feeding their automobiles. If every last bit of oil is to be ripped from the Earth and burned before alternatives are seriously pursued, large natural ecosystems and the global atmosphere will cease to function in the manner they have throughout history. A post-petroleum World will face widespread poverty, persistent environmental problems and a dearth of energy adequate to meet basic needs.

Fossil fuels – coal, oil and natural gas -- currently provide more than 85% of all the energy consumed in the world. Moreover, it is likely that world's reliance on fossil fuels to power an expanding economy will actually increase over at least the next two decades even with aggressive development and deployment of new renewable and nuclear technologies.



Global energy demand is projected to increase by 60% in the next 25-30 years as developing countries industrialize and rich countries continue to guzzle power, according to the International Energy Agency. Fossil fuels will continue to dominate, estimated to account for 85% of new demand.

The global rise on temperatures is a well documented fact and point towards an enhanced greenhouse effect. The all-time high in 1998 was 14.69 degrees Celsius. Over the last century, the average global temperature climbed from 13.88 degrees Celsius in 1899-1901 to 14.44 degrees in 1999-2001, an increase of 0.56 degrees. But four fifths of this gain came in the century's last two decades.

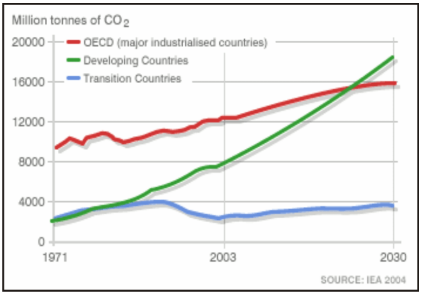
By 2100 global temperatures are expected to increase in the range of 1.4 to 5.8 degree Celsius and the sea level is expected to rise about 9-88 cm.

The world community faces many risks from climate change. Emissions of long-lived greenhouse gases into the atmosphere are predicted to lead to a significant anthropogenic influence on the climate; repercussions of the climate effect with the oceanic circulation and the dynamic of the polar ice-masses are to be expected.

Carbon-emissions

Carbon emissions - a major cause of global climate change - are set to increase by 60%. As developing countries' share of world energy demand surges from 38% to a predicted

48%, poor countries are expected to contribute two-thirds of the projected increase in carbon emissions.



Over the 20th century sea levels rose between 10 and 20 centimetres (4-8 inches). There are many variables – including how much the expected increase in precipitation will add to snow packs and most importantly, our greenhouse gas emissions over the next decades. Even a small amount of sea level rise will have profound negative effects.

Potential global change from increasing Ultra Violet rays and glacial retreat may have heterogeneous effects on subarctic marine systems. Projected climate change over the next century will further affect the rate at which glaciers melt. Simulations project that a 4°C rise in temperature would eliminate nearly all of the world's glaciers (the melt-down of the Greenland ice sheets could be triggered at a temperature increase of 2 to 3°C).The report published by IPCC (TAR 2001) projected that the small glaciers will disappear entirely while the larger ones will shrink to about 30% of their current size.


Gaumukh Glacier, Photograph by Ashish Andheria - Sanctury

Melting glaciers and permafrost may be at a stage where there is no turning back. As they contribute their fresh water to the oceans and as methane gas is released these events will further accelerate global warming.

Stress on Environment

For a few tenths of a point of economic growth forests are being traded daily, and there is a bounty on free green or any other kind of thinkers.

Globally, we have taken over about 26% of the planet's land area (roughly 3.3 billion hectares) for cropland and pasture, replacing a third of temperate and tropical forests and a quarter of natural grasslands. Another 0.5 billion ha has gone for urban and built-up areas. Habitat loss from the conversion of natural ecosystems is the main reason why other species are being pushed closer to the brink of extinction. Forest and natural vegetation covers all over the world are shrinking at an alarming rate. While they still cover 1/4th of the planets area, they are being lost at the rate of 11.30 million ha every year.

Extraction of wood for fuel and commercial logging has also led to the shrinking of forest areas. The World Resource institute estimates that 40 % of the world's intact forests will be gone in less than 20years. This will generically lead to reduced precipitation, rise in temperatures, changes in climatic conditions, increase in GHG etc. By 2020, plantation production is projected to meet 44 percent of global wood demand

According to a recent report in Science, the Amazon rain forest has lost nearly two million acres to logging each year since 1996. This alarming loss of trees in the world's largest rain forest could increase the amount of atmospheric carbon dioxide by roughly 200 tons each year.


Deforestation, Photograph by Bittu Sahgal - Sanctuary

The destruction of forests means destruction of habitat for wildlife. Species of all kinds are threatened by habitat destruction, principally through the loss of tropical rainforests and this rate will only accelerate species and habitat loss.


Bengal Tiger, Photograph by Bernard Castelien - Sanctuary

The unique Royal Bengal tigers are also on the list seriously endangered species. Most species in the region of the Sundarbans face threat of extinction form global increase in sea levels.

According to the World Conservation Union – IUCN Red List of Threatened Species (2000) 12 percent of the world's nearly 10,000 bird species; 24 percent of the world's 4,763 mammal species; and an estimated 30 percent of all 25,000 fish species are vulnerable or in immediate danger of extinction. Diseases and death due to toxins has also increasingly become a common cause of loss of biodiversity. The most publicized example is DDT, an insecticide that was used all over the world. These toxic substances (along with others like Polychlorinated Biphenyls) have caused eagles and peregrine falcons to produce eggs that had shells so thin that they broke just from the mother sitting on them.

The primates are one of the most critically endangered species. Habitat destruction is the main cause for its decline. The Bush meat trade is another major factor for the extinction of primate species, especially for the east and West African countries.


Golden Langur, Photograph by Bernard Castelien - Sanctuary

Water pollution and increased water temperatures have wiped out endemic species of fish in many habitats. Oil spills destroy birds, fish, and mammals, and may contaminate the ocean floor for many years after the

event. Acid rain, the toxic result of extreme air pollution, has been known to kill organisms in freshwater lakes and destroy large tracts of forested land.


Fishing in Sundarbans, Photograph by Gertrud & Helmut Denzau - Sanctuary

Among the three ecosystems that supply our food – croplands, rangelands, and fisheries – the excessive demand on fisheries is perhaps most visible. In the last fifty years, accelerating population growth and steadily rising incomes drove the demand for seafood upward at a record pace. At the same time, advances in fishing technologies, including refrigerated processing ships that enabled trawlers to exploit distant oceans, dramatically boosted fishing capacity. If the present pace of the fishing continues around the world there is more chance that more and more species will vanish and there will be a global collapse in already declining fisheries.

Stress on Population

Current trends of population growth which stands at about 80 million people per year is projected to reach an astounding rate of about 50 million by 2050. Today it stands some 6.6 billion people and with such a projection population will hit an estimated 9.2 billion by 2050. With this surmounting increase, population would only be tantamount to the ever increasing stress on all verticals including food, water, energy and the environment. The core of the tremendous stress as aforementioned can only be traced back to the human factor. More people would lead to more consumption of food, water and energy which would further lead to depleting the environment of its resources which then leads to drastic climatic changes.

Within the biosphere there exists a sort of steady state, maintained by the various cycles and feed back mechanisms that are operating within it. Behind every cause, there is an effect and behind every effect, there is a cause. As it is, the system tries to remain causeless and “effect-less”. But when we human beings, out of ignorance produce causes, it manifest as effect that further fuel new causes till it reaches certain maximum where it collapses and reverses. This cause and effect flows from the minutest organism to infinity and a decline on any one vertical is not isolated but affects the equilibrium of every existential value chain. The cycle does not restrict itself to parameters.

NaturalGist

- ***The Dying Earth:*** *Biological Life arrayed in complex ecological splendor that set the conditions for life is threatened as never before with dramatic changes over air, water, land, and environmental verticals. The cause for such environmental degradation is the magical 'human touch' with surpassing the rate at which the Earth can replenish itself to ecological overshoot.*
- ***Stress on food:*** *Demand for food influenced by a number of forces, including population growth, income levels, urbanization, lifestyles, and preferences among others*
- ***Stress on Water:*** *With over six billion people living on the planet the per capita available of water is very low. Adding to the stress on water is the fact that most of the water resources have been used wastefully.*
- ***Stress on Energy:*** *We are running out of cheap despite our best intentions. The industrialized world's prosperity is based upon unsustainable rates of energy consumption.*
- ***Stress on Environment:*** *Habitat loss from the conversion of natural ecosystems is the main reason why other species are being pushed closer to the brink of extinction.*
- ***Stress on Population:*** *Today population stands 6.6 billion people, which is projected hit an estimated 9.2 billion by 2050. With this surmounting increase population would only be tantamount to the ever increasing stress on all verticals including food, water energy and the environment.*
- ***To sum up:*** *All the natural resources are under severe strain with the increasing parasitical footprint that the human race is leaving on Planet Earth.*

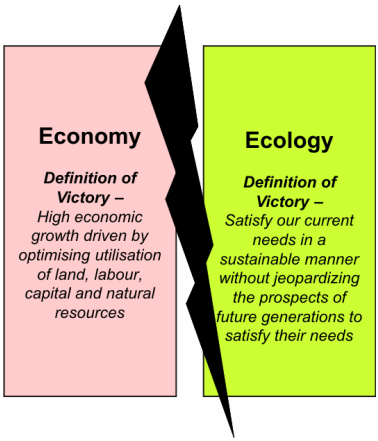
II

Naturenomics™ - A Differentiated Approach to Nature Driven Economic Development

DIPAK KRIPALANI, gms

Over the past 50 years, we have witnessed unprecedented growth of the global economy, international trade and investment. The global economy has expanded seven-fold since 1950, from US$ 7 trillion of products and services, to and estimated US$ 69 trillion in 2007 (based on purchasing power parity). This has truly been definition of victory for economists by any measure.

However, this economic gain has often come at the cost of ecological losses by pushing the demand on local eco-systems beyond sustainable yield. The outcomes have been devastating:



- Shrinking Forests
- Collapsing Fisheries
- Soil Degeneration
- Falling Ground Water Levels
- Rising Sea Levels
- Climatic Changes
- Disappearing Species
- Dry Rivers and Rivers Changing their Courses
- Water Scarcity, etc

Naturenomics™ - A Differentiated Approach

The current model of economic development forces us to make a choice between development and sustaining natural resources. However, we believe that this needn't be a choice, and infact we can have economic development through sustaining our natural resources. This is the spirit within which we conceptualized Naturenomics™.

Naturenomics™ relates to **capital formation** for a region or organisation through the **creation of ecologically 'compliant' assets** in a **sustainable manner**.

Naturenomics™ aims at adjusting the balance of power by displacing economics at the heart of all activity, and replacing it with nature assets as the soul of all activity.

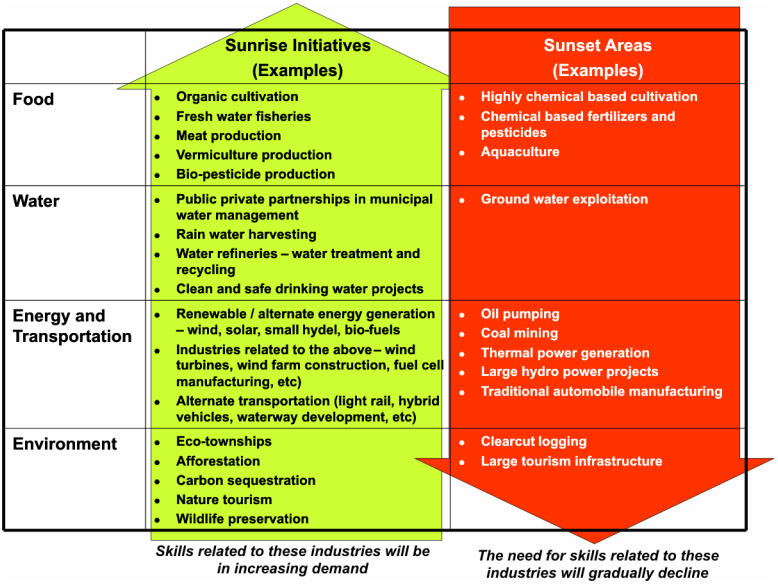
A Naturenomics™ based economy attempts to secure 4 key natural assets - food, water, energy and environment. Hence practically, this means deriving our food and water needs through effective land and water resource management and not by exploiting

these resources, by satisfying our energy needs through hydrogen and solar based fuels rather than carbon based fuels, and satisfying our ever increasing appetite for materials by increasing reuse and recycling and not by increasing extraction.

Migrating to a Naturenomics™ Based Economy

A Naturenomics™ based economy will drive the growth of certain industries, and skills related to these industries will be in increasing demand. Industries like fish farming, biopesticides and bio-fertilizers, organic cultivation, etc will ensure our food security, and industries like hydrogen generation, fuel cells, wind turbines, etc will ensure our energy security. Industries not consistent with the principles of Naturenomics™ will face declining importance.

For it to be successful, a Naturenomics™ based economy needs to be designed and implemented keeping in mind consumer tastes, preferences, economics and requirements.



The performance of an economy or organisation is currently judged by its ability to achieve growth through optimal and profitable utilisation of its assets - land, labour, capital and natural resources - this value is then reflected in its GDP or market capitalisation. We believe that the true performance of an economy or organisation should be based on its economic value and the value of the ecological decline it has impacted. Unfortunately, in many cases, if we do such a valuation, many countries and organisations will show significant value depletion rather than value creation. Naturenomics™ also aims at developing a framework for valuing nature assets of an economy or organisation, and to develop a scorecard of performance based on nature based indicators. This can then be mapped with the economic indicators to get a true picture of value creation or depletion.

Unlocking Naturenomics™

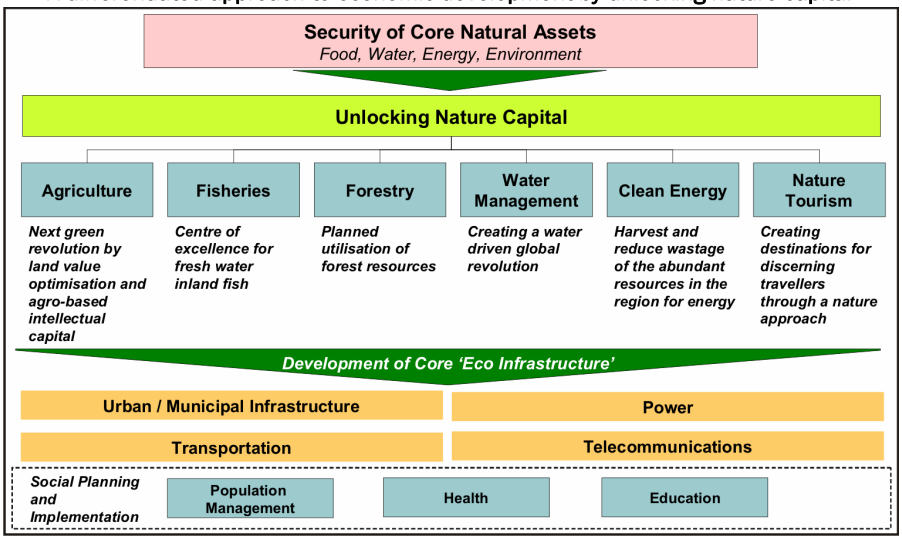
Successful securitization of core natural assets (food, water, energy and environment) would result in the creation of nature capital, which will fuel the growth of the economy. Nature capital can be created through:

- Agriculture - creating the next green revolution by optimising the economic value add of land, and developing agro-based intellectual capital
- Fishery - centre of excellence for fresh water inland fish
- Forestry - planned utilisation of resources
- Water management - creating a water driven revolution
- Clean energy - harvest and reduce wastage of the abundant resources in the region for energy
- Tourism - creating destination for discerning travellers through a 3-pronged nature driven approach

Each of these industries will support symbiotic industries which will create the multiplier effect in the regional economy. Investment in nature capital is critical to restore, sustain and expand the ecosystem.

In addition, to support these verticals, investments would need to be made in infrastructure, both hard infrastructure (urban / municipal infrastructure, power, transportation, telecommunications), and social infrastructure (population planning, health, education).

A differentiated approach to economic development by unlocking nature capital



A Monumental Task - but not Impossible

Having defined what would comprise a Naturenomics™ based economy, and how nature capital can be unlocked, we need to be cognizant that there is no precedent for transforming an economy shaped largely by market forces into one shaped by the principles of ecology. What we know is that there are some imperatives that are required to migrate towards this approach:

- Requires rapid systemic change - isolated projects will have limited impact
- Stabilising population is a key imperative to migrate to an ecology based economy - global population has increased from 1.6 billion in 1900 to about 6.67 billion (estimated) in 2007. Increasing population results in increasing demand for, pressure on, and imbalance in our scarce natural assets
- Multiple constituencies need to get involved - there is no single government or organization that can carry this through on its own
- Tools need to be developed and used for restructuring the economy - fiscal policies will play a key role in this

However, glimpses of Naturenomics™ based approaches are now emerging in some regions and countries:

- Over 30 countries in Europe have stabilised their population size - population stabilised within their food producing capacity
- China, the world's most populous nation, has dramatically lowered its fertility rate - lower fertility rate than the US
- Denmark is the emerging leader - population stabilised, banned construction of coalfired power plants, banned use of non-refillable beverage containers, over 15% of its energy comes from wind power, restructured its urban transport network, etc

The time to act is now, before we run short of food, water, energy and the environment for our planet's estimated 9-10 billion citizens in 2050.

The first step of awareness and realisation is well underway. Countries and organisations that move rapidly from realisation to action will emerge as the winners in this new ecologically driven world order.

NaturalGist

- ***Ecological Losses:*** *The economic gain come at the cost of ecological losses by pushing the demand on local eco-systems beyond sustainable yield resulting into Shrinking forests, Soil degradation, Falling ground water levels, Rising sea levels, Climatic changes, Disappearing species, Water scarcity, Food Scarcity.*
- ***Growing Population:*** *Stabilizing population is a key imperative to migrate to an ecology based economy.*
- ***Capital Formation:*** *Naturenomics™ aims at adjusting the balance of power by displaying economics at the heart of all activity, and replacing it with nature assets as the soul of all activity.*
- ***Unlocking Naturenomics™:*** *By transforming an economy shaped largely by market forces into one shaped by the principles of ecology*
- ***Future:*** *Industries not consistent with the principles of Naturenomics™ will face declining importance. Framework for valuing nature assets and a scoreboard of performance based on nature indicators.*
- ***Securing Nature Assets:*** *Successfully security of core natural assts (food, water, energy and environment) would result in the creation of nature capital, which will fuel the growth of economy.*

III

Restoring Balance between Nature and Economics – Developing "Eco-Balance" strategies

SAMIR MENON, gms

Natural Balance has been upset

The Earth's natural ecological balance has been disturbed by human activity. Its sophisticated recycling mechanism for core assets (e.g. the Carbon Cycle and Water Cycle) is unable to cope with the disruption. They are no match for the rapid rate at which humans are moving carbon into the atmosphere by burning fossil fuels and industrialization and economic development are causing deforestation.

Figure 1: Maintaining Earth's Natural Balance - Carbon Cycle and Water Cycle

Nature had created a balancing mechanism for the carbon exchanges between the atmosphere and oceans (ocean uptake and release systems) and between the biosphere, landmass and the atmosphere (sedimentation, respiration and photosynthesis). However it has no mechanism to balance the carbon exchange due to fossil fuel burning – in fact there is no exchange, currently it is a one-way street. Furthermore the clearing and burning of forests upsets the current mechanism by converting organic carbon to carbon dioxide gas. This also impacts the water cycle by affecting a key means of water management and creating economic or physical water scarcity in certain regions.

The loss of balance has taken a heavy toll on Earth. It is creating a vicious cycle that threatens food and water resources, fragile ecosystems and bio-diversity and interestingly the socio-economic development plans that created the initial imbalance.

Restoring balance by addressing the conflict areas between economy and ecology

The path to economic development has typically been incongruent to the path of ecological preservation because of what Lester Brown calls the 'stressed relationship' between economy and ecology[1]. It has been difficult to create a common path that embraced economic development and nature conservancy.

However a combination of technological advances and an increase in public awareness and responsibility of the ecological challenges have helped us develop an alternate approach to capital formation. The approach helps us address these conflict areas effectively and provides a means of economic development while sustaining natural assets and is called *Naturenomics™.*

The current model of development forces us to make a choice between development and sustaining natural resources as the 'true value' of nature's capital is often not captured. Naturenomics™ allows us to create economic development and sustainable competitive strategies while retaining nature's resources.

Succeeding in the 'balanced' Brave New World

Using the principles of Naturenomics™ we believe we can help companies adapt and thrive in the new economic model by developing *"Eco Balance"* strategies. As the name suggests the focus is on restoring the natural balance. The industries that will thrive in this new model will be the ones that emphasize:

- Recycling and reuse rather than extraction
- Land and water management rather than exploitation
- Renewable energy source rather than fossil-based fuels

We also believe that current corporations will have to reposition themselves to be ready for this new economic model. And as companies like GE, BP and ITC are already showing, the earlier companies make this transition the more they (and nature) are likely to benefit.

The goal of *"Eco Balance"* strategies is to be able to engage in economic activities that create value and capital while sustaining natural resources. One approach to do this successfully is to focus on economic activities that help restore the natural carbon cycle and water cycle. As a result the components of developing an *"Eco Balance"* strategy typically involve the development of plans to restore the *'carbon-balance'* and *'water balance'*.

There are three key stages to the process of developing the strategy:

❖ **Audit impact of corporate activities on natural assets**

- During most of the past century economic gains have been achieved at the expense of ecological losses. To help reverse this trend it is important to take an audit to estimate the impact current activities are having on natural assets
- The output of this exercise is an emissions footprint for the organization as well as a water utilization profile. This allows us to identify areas where the corporation has a positive impact as well as where they may disrupt the natural cycles.

❖ **Formulate approach to create optimal "Eco Balance" strategy**

- Develop mitigation actions to address disruptions to the cycle – e.g. reduction plan for emissions or identification of carbon offset opportunities to address potential emission imbalance.
- Focus on high-impact areas for intervention to reduce emissions[1]:
  - *Energy utilization* – Minimize usage of coal by promoting alternatives or utilizing Carbon Capture and Storage (CCS)
  - *Industrial operations* – Improving efficiency on equipment and reducing emissions from largest emitters
  - *Buildings* – Avoid "lock-in" of energy-intensive new building and appliances – focus on utilizing Design for Environment approaches
  - *Transportation* – Improve vehicle efficiency, decarbonizes fuels and encourage mass transit systems
  - *Forestry* – Promote incentives and mechanisms to compensate for avoided deforestation
- Improve utilization of water and other natural resources and implement Design for Environment approach to minimize waste.
- Invest in upgrading technology to make it more environmentally sustainable.
- Take advantage of the positive impacts to natural cycle with clear monetization plan either under the Kyoto Protocol or EU ETS scheme.
- Evaluate new ventures / offerings that leverage existing strengths to take advantage of the new economic model.

❖ **Create and execute roadmap to implement strategy in a sustainable manner**

- Begin with pilot projects that are representative of the overall strategy – senior-level corporate support and strong change management skills are key requirements.
- Develop systems and processes that provide regular reports highlighting deviations and suggesting corrective actions.
- Communications strategy will be critical – both internally and externally – to highlight successes and capture feedback from the key constituents.
- Do a capability assessment program and ensure that the team is adequately staffed and trained to deliver the strategy.

The figure below outlines activities of developing a “carbon balance” strategy.

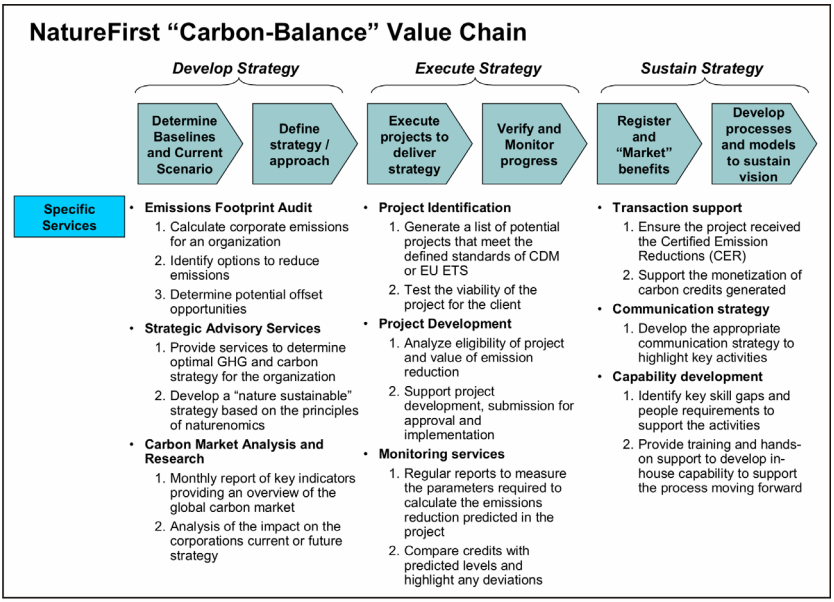


Figure 2: NatureFirst™ “Carbon Balance” Approach

Figure 3: Potential options for reduction of carbon emissions

The time to act is now

While the debate still rages about the precise cause and impact of these changes, the cost of inaction seems to get higher every year. As the recent *Design to Win Report* by California Environmental Associates shows a delay in action creates a "carbon lock-in" which may make future action ineffective or even futile. The task become tougher as the amount of emission reduction required increases and the share of mitigation that can be identified also falls[3].

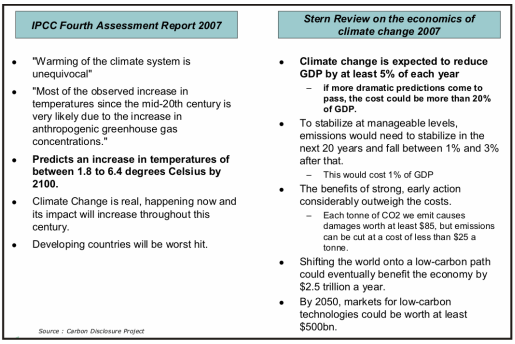


Figure 4: Key reports support need for immediate action

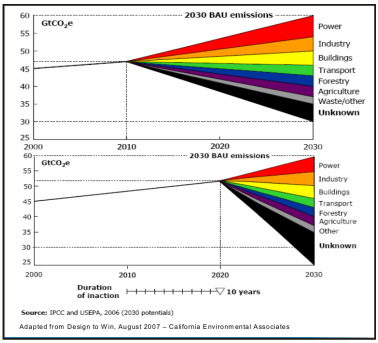


Figure 5: 2030 Emission reduction potential by sector

And in all fairness, as we have helped create the problem, we owe it to our children to help develop the solution. It is true that ***"Economic deficits are what we borrow from each other; ecological deficits are what we take from future generations"***

With a view towards discovering solutions to address the imbalance between Nature and Economics, we have given birth to **NatureFirst™**

NatureFirst™ is an organization created to take a leading position in developing ventures that engage in economic activities and capital formation by utilizing natural assets in a sustainable manner. We follow the concepts of Naturenomics™ to help achieve these objectives. Our delivery mechanism is based on an eco-system of partnerships that help provide the specialists required to deliver these integrated ventures. We are well advanced in the process of developing this ecosystem.

There are two business models that we follow to deliver our products and services.

The first is our consulting services and expertise that is linked with our intention to be at the forefront of thought, action and implementation in the following areas:

- *The Clean Revolution or "carbon balance" strategies* – Focus on Clean and alternate energy options, reducing carbon emissions, Carbon capture and sequestration, forestry management, solid waste management and building environmental awareness and education
- *The Blue Revolution or "water balance" strategies* – Focus on Water positive strategies, Rain Water Harvesting, affluent recycling

We offer customized services that help corporations test their current strategies and develop new ventures that are consistent with the new evolving economy. These include:

- NatureFirst℠ Natural Assets Impact (NAI) Audit – this allows us to create an emission footprint and a water utilization profile for the corporation to estimate their impact.
- NatureFirst℠ Natural Assets Management (NAM) Plan – we develop a customized plan for the corporation to manage natural assets in a sustainable and beneficial manner and also create a Natural Assets Management System (NAMS) that allows the corporation to continue to monitor and intervene when required.
- We also help develop business cases and participate in new ventures with corporations by identifying opportunities in the Naturenomics™ space that leverage assets of the corporation.

Our second area of focus is our portfolio on Clean Energy and Clean Water technologies that we help commercialize in Asia with a current emphasis on India particularly in the North East. Some of the technologies in our portfolio include:

- Industrial and agricultural waste to bio-fuel
- Energy generation from "flowing water systems"
- Water purification technology using automated and industrial Copper Silver Ion Generators

NaturalGist

- ***Natural Balance have been upset:*** *The earth's natural balance has been disturbed by the frenetic pace economic development. Unfortunately, unlike nature we have not developed effective recycling mechanism that will balance our emissions and water utilization profiles.*
- ***The loss of balance has been taken a heavy toll on Earth:*** *It is creating a vicious cycle that threatens food and water resources, fragile ecosystems and bio-diversity and interestingly the socio- economic development plans that created the initial balance.*
- ***Under the Naturenomics™ framework,*** *the goal of "Eco Balance" strategies is to be able to engage in economic activities that create value and capital while sustaining natural resources. One Approach to do this successfully is to focus on economic activities that help restore the natural carbon cycle and water cycle.*
- ***There are three key stages to the process of developing the strategy:*** *First- audit impact of corporate activities on natural assets, second- formulate approach to create optimal "Eco Balance" strategy and third- create and execute road map to implement strategies in a sustainable manner.*
- ***"Eco Balance" strategies*** *allow us to develop actionable roadmaps to achieve these objectives. And as certain companies have shown already, the quicker you make the transition to this new model the more they (and nature) will benefit. Furthermore it is critical that we take action now before we are 'locked in' to technologies and designs that will become too expensive to change and retrofit.*

IV

The Expanding Human Footprint

SACHIN SALIAN, gms

Population explosion & its impact on Natural Resources

As the world population continues to grow geometrically, great pressure is being placed on arable land, water, energy, and biological resources to provide an adequate supply of food while maintaining the integrity of our ecosystem.

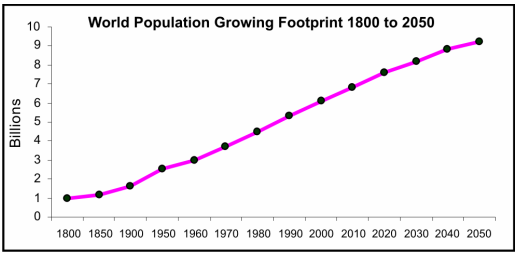
In developing countries, there are a number of socio-economic realities that leads to population growth. Standard of living, limited access to adequate health care facilities, lack of readily available, safe contraceptives, and knowledge of how to use them, religious beliefs etc,. According to the Worldwatch Institute, less than 30 per cent of people in developing countries use family planning.

Currently world population is growing by about 80 million people per year as opposed to 85 million in the early 90's. According to a recent UN medium variant projection, only after 2015 will we observe a gradual decline of the annual population increase - reaching about 50 million by 2050. However, this is only possible, if fertility - in all developing countries - falls to the "reproductive level" of 2.1 children per woman by 2050. For countries like India, Pakistan or Nigeria this is a long way to go.

Between now and the middle of the next century world population will most likely increase by some 3.68 billion people - all of these increase will be contributed by the developing countries. Most of this population growth in the developing world will occur during the next 30 years where it is projected to increase by 2.3 billion and between 2025 and 2050 it will "only" grow by 1.39 billion.

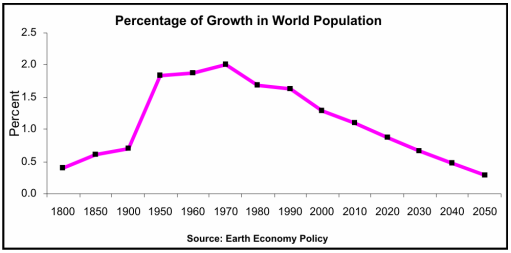
Area

Through the ages the world population has grown to a total of one billion people. During the 1800s, human numbers increased at increasingly higher rates, reaching a total of about 1.7 billion people by 1900, and today it stands at over three times its size- some 6.6 billion people.

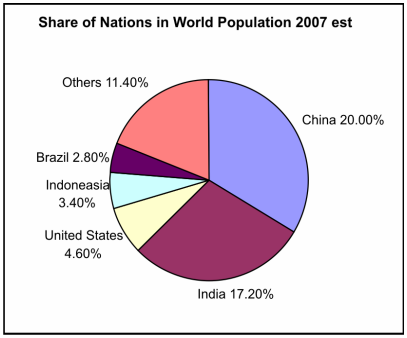


From the mid-1980s through the mid 1990s, world population rose by 85 to 100 million people per year. The population grew more than 80 million people in 1997. Almost 98 % of the increase in population occurs in less developed countries and these countries are on a course to double their populations over the next 30 years. Environmental degradation, stagnant economies, hunger, malnutrition and child-deaths plague poorer

countries experiencing runaway growth. China, India, the United States, Indonesia, Brazil and Russia are the six most populous countries in the world.



However, most of the world population increase is concentrated in Asia. From the 3.68 billion people that will be added to the world population between 1995 and 2050, Asia will contribute some 2 billion. This enormous increase is due to the already massive size of the population.This is further projected to increase between 2025 and 2050 to 658 million.



Latin America and the Caribbean, on the other hand, will have only a very moderate population increase of some 334 million between 1995 and 2050 during the next three decades. This is due to both the smaller initial size of the population and the already relatively low level of fertility.

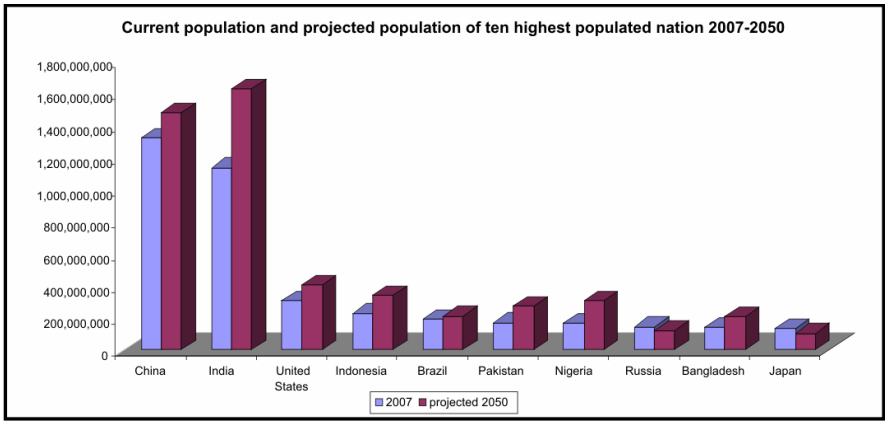
The ten countries which will contribute most to world population growth over the next 30 years are India, China, Pakistan, Nigeria, Ethiopia, Indonesia, United States of America, Bangladesh, Zaire, and Iran

According to the most recent (medium variant) UN population projection India's population will increase by an additional 401 million between 1995 and 2025 - China will grow by "only" 260 million. The next largest contributor to world population growth - surprisingly - is not Indonesia which has the third largest population among developing countries, but Pakistan. This country's population will grow by about 133 million between 1995 and 2025. An almost equal contribution to world population growth will probably come from Nigeria - 127 million. Perhaps unexpected, the next largest contributor to world population growth will be Ethiopia, which will have an additional 80 million people over the next three decades. Indonesia, on the other hand, will grow by "only" 78 million people - which is just sixth place in the "hit list" of contributors to world population growth. The United States of America will probably grow by 65 and Bangladesh by 62 million. Few development experts would have put Zaire on a watch list for population growth. But this Central African country is projected to have an increase in population of almost 61 million between 1995 and 2025. The tenth largest contributor to world population growth will be Iran - with a population increase of almost 60 million during the next three decades.

India will out-grow China.

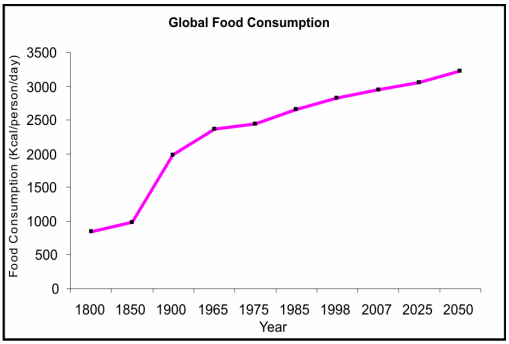
In the early 1950s both China and India had a Total Fertility Rate (TFR) of about 6 children per woman. But while China's TFR sharply fell to about 2.4 in 1990, it declined only slowly in India and was still above 4 children per woman in 1990. This relatively slow decline of fertility has built up a huge population momentum in India. The country's

population structure is much "younger" than that of China. These "broad base" of children and young adults - born during the high growth period in the 1960s, 1970s and early 1980s - will enter reproductive age in the near future. Even if fertility continues to decline to reproductive level by 2020 (as being assumed by the UN projections) the Indian population will probably increase to almost 1.6 billion by 2050 - slightly more than that of China (UN medium variant). However, India's population might become even much larger. If the average Total Fertility Rate would only decline to 2.6 (instead of 2.1) children per woman in 2020, the population would increase to about 1.9 billion by 2050.



The Human Footprint

Food

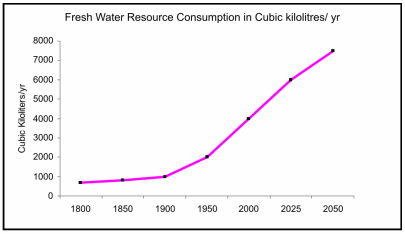


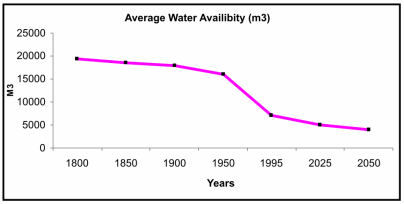
Reports from the Food and Agricultural Organization of the United Nations, numerous other international organizations, and scientific research also confirm the existence of this serious food problem. For example, the per capita availability of world grains, which make up 80 per cent of the world's food, has been declining for the past 15 years. Certainly with a quarter million people being added to the world population each day, the need for grains and all other food will reach unprecedented levels.

More than 99 per cent of the world's food supply comes from the land, while less than 1 per cent is from oceans and other aquatic habitats. The continued production of an adequate food supply is directly dependent on ample fertile land, fresh water, energy, plus the maintenance of biodiversity. As the human population grows, the requirements for these resources also grow. On a per capita basis they will decline significantly because they must be divided among more people.

Water

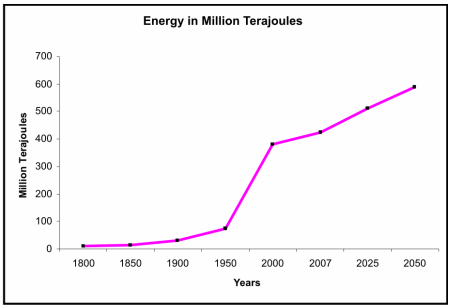
An international study group has warned that the water shortages in India and other parts of the world will be a serious problem in days to come. “Scores of countries are overpumping aquifers as they struggle to satisfy their growing water needs, including each of the big three grain producers —China, India, and the US. “More than half the world’s people live in countries where water tables are falling,” Lester Brown of the Earth Policy Institute has said. In India, water shortages are particularly serious simply because the margin between actual food consumption and survival is so precarious.





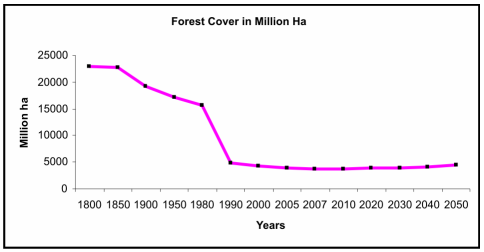
Energy

Fossil energy is another prime resource used for food production. Nearly 80 per cent of the world's fossil energy used each year is used by the developed countries, and part of it is expended in producing high animal protein diets. The intensive farming technologies of developed countries use massive amounts of fossil energy for fertilizers, pesticides, irrigation, and for machines as a substitute for human labor. As supplies of fossil energy dwindle, the cost of fuel increases everywhere. The impact of this is already a serious problem for developing countries where the high price of imported fossil fuel makes it difficult, if not impossible, for poor farmers to power irrigation and provide for their other agricultural needs. Worldwide, per capita supplies of fossil energy show a significant decline.



Environment

Global forest cover is a key indicator of the health of the planet. An intact forest cycles nutrients, regulates climate, stabilizes soil, treats waste, provides habitat, and offers opportunities for recreation. By a conservative tally, these services are worth more than $4.7 trillion, a total equal to one tenth of the gross world product which is 67 billion dollars as of year 2006. Forests also supply goods, including food, medicines, and a large array of wood-based products.



Forests worldwide cover some 3.9 billion hectares—almost a third of the earth's land surface excluding Antarctica and Greenland. Though vast, this wooded area is only half

the size of forested land at the dawn of agriculture some 11,000 years ago. Most forests are no longer in their original condition, having changed in composition and quality.

People now use or appropriate an estimated 39-50 per cent or more of the earth's biological production, through agriculture, forestry and other activities. Half of the world's forests have disappeared since the end of the last Ice Age, and only 22 per cent of the original forest cover remains in large, unbroken areas without substantial human influence. Deforestation rates in the last few decades have reached the highest levels in history, as global population growth has also peaked.

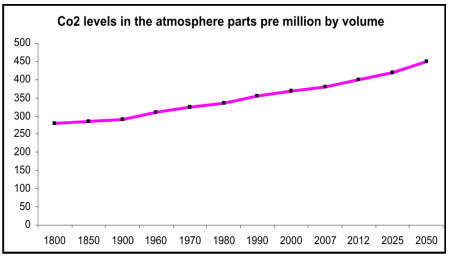
In the last 40 years, per capita forest area worldwide has fallen by more than 50 per cent, from a global average of 1.2 hectares to less than 0.6 hectares per person. This is due to both decreasing forest area and increasing population, and it threatens the well-being of both people and the forests they depend on. The proportional loss of forests (the amount lost relative to the amount remaining) has been greatest in Asia, followed by Africa and Latin America. These ongoing losses have been partially offset (by about 10 per cent) by a relatively small increase in forest plantations and re-growth in some developed countries.

Tropical forests contain an estimated 50 per cent of the world's remaining biodiversity (plant and animal species). At current rapid deforestation rates, and in the absence of any intervention, the last significant primary tropical forest could be harvested within 50 years. 89 Because habitat destruction is the leading cause of species extinction, the loss of tropical forests is likely to lead to a substantial and irreversible decline in global biodiversity.

Human population growth, density and other demographic variables, and their effect on deforestation, are critically important but under-studied factors in this context. Many of the countries that contain the largest blocks of remaining tropical forest are also those with the highest population growth rates (2-4 per cent per year).96 Ongoing human migration, both national and international, is another critical factor that affects forests, habitat and biodiversity.

Biodiversity depletion: Indonesia, India, and China are among the countries with the most threatened species of mammals and birds, according to the World Conservation Union (IUCN). Indonesia has the highest number of threatened mammals (135 species), followed by India (80) and China (72). The Philippines has more critically endangered birds than any other country in the world.

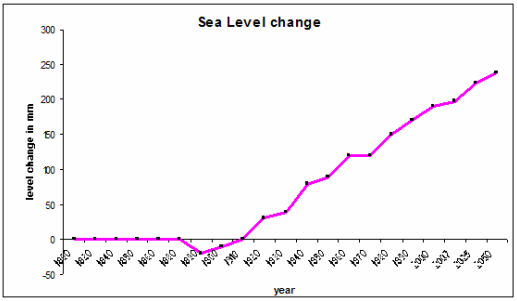
Green House Gases and Climate Change
Carbon dioxide and other "greenhouse gases" trap heat in the atmosphere and raise average global surface temperatures. Emissions of carbon dioxide grew 12-fold between 1900 and 2000, from 534 million metric tons per year in 1900 to 6.59 billion metric tons in 1997.



In the same period, human population nearly quadrupled, from 1.6 billion to 6.1 billion, progressively consuming greater quantities of fossil fuels—oil, gas and coal. Expanded agriculture, destruction of forests and increased production of certain chemicals also increase greenhouse gases in the atmosphere.

Climate change will have a serious impact. The Intergovernmental Panel on Climate Change (IPCC) estimates that the earth's atmosphere will warm by as much as 5.8 degrees Celsius over the coming century, a rate unmatched over the past 10,000 years.60 The IPCC's "best estimate" scenario projects a sea-level rise of about half a metre by 2100 (with a range of 15 to 95 centimetres), substantially greater than the increase over the last century.

The human and ecological impacts of rising oceans include increased flooding, coastal erosion, salinization of aquifers, and loss of coastal cropland, wetlands and living space. The intensity and frequency of hurricanes and other hazardous weather may also increase, endangering the growing human population in coastal areas.



A warming climate also poses a significant public health threat. The redistribution of precipitation would markedly increase the number of people living in regions under extreme water stress — a problem compounded by increasing population. The geographical range of temperature-sensitive tropical diseases, such as malaria and dengue fever, would also expand. Higher average temperatures mean longer and more-intense heat waves, with a corresponding rise in heat-related health problems.

The combined effects of population growth and climate change could produce regional resource shortages, which in turn could result in the exploitation of environmentally sensitive areas such as hillsides, flood plains, coastal areas and wetlands. These conditions may also increase environmental refugees, international economic migration and associated socio-political challenges. Climate and environmental policy should address the geographical distribution and movement of people in the 21st century, as well as their absolute numbers.

Conclusion

With water and land in limited supply, whether we move toward the higher or lower number may have more influence on future environmental and social stability than anything else we do. The most humane way to achieve the low-level projections is to improve health and social conditions to promote population stabilization through reduced birth rates, not to allow death rates to climb as a result of negligence.

- ***Exponential growth in Population:*** *The world population continues to grow geometrically and great pressure is being placed on arable land, water, energy, and biological resources. The ten countries which will contribute most to world population growth over the next 30 years are India, China, Pakistan, Nigeria, Ethiopia, Indonesia, United States of America, Bangladesh, Zairre and Iran.*
- ***The Human Footprint:*** *The burgeoning population only leads to dire causative effects along the verticals of food, water, energy and environment.*

The Changing World	2007	2050
Population (Billion)	6.6	9.2
Food Consumption (Kcal/Person/Day)	2940	3220
Water Consumption (m3)	4800	7500
Co2 Emission (Parts/Mn by Volume)	380	450
Energy Consumption (Million Terajoules)	425	590
World Forest Cover (Million ha)	3800	4500
Increase in Sea Level (mm)	198	238

- ***Impact on resources:*** *food production has gone up, water consumption has almost increased by six times since year 1800 while energy use and production has shot up by 400 times in just 100 years.*
- ***Distressing signs:*** *the forest cover is rapidly decreasing, fresh water will become more precious than petroleum in coming years and the air, land and water that supplicate us with their bounty suffer from degradation.*
- ***To sum up:*** *Charles Darwin has once famously quoted that no species can become extinct due to over population but we might prove him wrong.*

V

IS THERE ENOUGH TIME?

LESTER R. BROWN

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Can we do what needs to be done fast enough? We know that social change often takes time. In Eastern Europe, it was fully four decades from the imposition of socialism until its demise. Thirty-four years passed between the first U.S. Surgeon General's report on smoking and health and the landmark agreement between the tobacco industry and state governments. Thirty-eight years have passed since biologist Rachel Carson published Silent Spring, the wakeup call that gave rise to the modern environmental movement.

Sometimes things move much faster, especially when the magnitude of the threat is understood and the nature of the response is obvious, such as the U.S. response to the attack on Pearl Harbor. Within one year, the U.S. economy had largely been restructured. In less than four years, the war was over.

Accelerating the transition to a sustainable future means overcoming the inertia of both individuals and institutions. In some ways, inertia is our worst enemy. As individuals we often resist change. When we are grouped into large organizations, we resist it even more.

At the institutional level, we are looking for massive changes in industry, especially in energy. We are looking for changes in the material economy, shifting from a throwaway mentality to a closed loop/recycle mindset. If future food needs are to be satisfied adequately, we need a worldwide effort to reforest the land, conserve soil, and raise water productivity. Stabilizing population means quite literally a revolution in human reproductive behaviour, one that recognizes that a sustainable future is possible only if we average two children per couple. This is not a debatable point. It is a mathematical reality.

The big remaining challenge is on the educational front: how can we help literally billions of people in the world understand not only the need for change, but how that change can bring a life far better than they have today?

I am frequently asked if it is too late. My response is, Too late for what? Is it too late to save the Aral Sea? Yes, the Aral Sea is dead. Its fish have died; its fisheries have collapsed. Is it too late to save the glaciers in Glacier National Park in the United States? Most likely. They are already half gone and it would be virtually impossible now to reverse the rise in temperature in time to save them. Is it too late to avoid a rise in temperature from the buildup in greenhouse gases? Yes. A greenhouse gas-induced rise in temperature is apparently already under way. But is it too late to avoid runaway climate change? Perhaps not, if we quickly restructure the energy economy.

For many specifics, the answer is, Yes, it is too late. But there is a broader, more fundamental question: Is it too late to reverse the trends that will eventually lead to economic decline? Here I think the answer is no, not if we move quickly.

Perhaps the biggest single challenge we face is shifting from a carbon-based to a hydrogen-based energy economy, basically moving from fossil fuels to renewable sources of energy, such as solar, wind, and geothermal. How fast can we make this change? Can it be done before we trigger irreversible damage, such as a disastrous rise in sea level? We know from the U.S. response to the attack on Pearl Harbor that economic restructuring can occur at an incredible pace if a society is convinced of the need for it.

We study the archaeological sites of civilizations that moved onto economic paths that were environmentally destructive and could not make the needed course corrections in time. We face the same risk.

There is no middle path. Do we join together to build an economy that is sustainable? Or do we stay with our environmentally unsustainable economy until it declines? It is not a goal that can be compromised. One way or another, the choice will be made by our generation. But it will affect life on earth for all generations to come.

NaturalGist

- ***The knowledge base*** *and fact sheets all show that the environment is changing for the worse and resources are insufficient to sustain the burgeoning human population.*
- ***Inertia*** *at both the institutional and individual level needs to be removed in order to accelerate our transition to a 'sustainable' future.*
- ***We are late*** *to take action at the already declined frontiers of nature, such as dead Aral Sea, the declining fisheries and the inevitable rise in the temperature of the earth due to the excessive accumulation of the greenhouse gases.*
- ***The biggest challenge*** *towards the transition to a sustainable economy lies on the educational front as to how to make billions of people around the world understand that a 'change' is needed to bring forward a better life to live for.*
- ***But, we are not too late*** *to still reverse the trends of our economic patterns of consumptions. We can still catch the bus by reconstructing our energy economy in a major way by the switch over to a hydrogen- based economy from the carbon- based fossil economy.*
- ***To sum up:*** *the only thing constant is change; and it is in our hands to decide if the change will be mutually sustainable for man and the environment or at adverse cost of both.*

VI

Is Economic Value the same as Ecological Value

JAN VAN DER STRAATEN
Department of Leisure Studies/European Centre for Nature Conservation, Tilburg University
(Paper presented at the VII International Congress of Ecology INTECOL, Firenze 19-25 July 1998)

It is often argued that ecological principles have to be integrated into economic policies and into the economic decisions of stakeholders. However, to extent to which such an integration is possible is often not clear. The crucial question is what place can be given to nature and the environment in economic theories.

The first obstacle is that economic theory has its own theoretical framework which is based on the idea that economic value is measured on markets. Many parts of the ecosystem, however, are not traded and therefore do not have a market price.

On the other hand, ecological science has its own theoretical framework. Ecological value is, in principle, based on factors such as the complexity of the ecosystem, its connections with other ecosystems, the scarcity of the ecosystem, its vulnerability to environmental pollution, and its contribution to biodiversity. This implies that, in ecological theory, ecological value is not based on market prices. This causes many problems in the field of economic theory as well as in public policy.

Public policy decisions have to be based on certain elements being appropriate to provide sufficient information for that type of decision. In most cases, these elements include physical information, indicating, for example, the number of cars which will probably use a road to be constructed. But, on the other hand, decision makers want to be informed about the costs of the construction of the road. These costs can be calculated within rather well-defined margins.

But what are the benefits of the future use of that road? The simple answer is that it is the number of cars which will use the road. But this information is only expressed in physical terms, which are different from the monetary terms in which the costs of the road are expressed. Therefore, we prefer to 'translate' the physical information into monetary terms. The crucial question is, however, whether we really know all the costs and benefits of the road project if we want to include the environmental aspects, as they are in one way or another connected with economic costs and benefits, and are an integral part of the project.

In that case, we are confronted with questions such as: What are the costs of acid rain resulting from the emissions of acidifying substances by motor cars when they use the road? What are the costs of the global climate change resulting from the increased emissions of CO2 by these cars? And do we know the costs of the depletion of the stocks of fossil fuel resulting from the increased use of gasoline? We may thus conclude that crucial theoretical and practical questions arise as soon as environmental issues are a substantial part of the project in question.

When environmental questions and problems were not more than an unimportant side effect of economic activities, as was the case many decades ago, these problems could be neglected without having any serious effects on the outcome of traditional economic decision making. However, environmental problems can no longer be seen as a marginal part of the decision-making process. On the contrary, many authorities argue that they are in urgent need of sufficient information regarding the societal costs and benefits in all decisions where environmental issues are at stake, which is quite often the case.

This brings us to the central question to be discussed in this paper: To what extent is integration of ecological values into economic theory possible, given the current theoretical framework of economic theories. In the second section, we will pay attention to the concept of 'the environment'. What do we mean with this term?

We will pay particular attention to the extent to which the concept of the environment can influence the outcome of the economic process. In the third section, we will concentrate on the possibility of finding a market price based on the discussion of the environmental concept in the previous section. In the fourth section, the attempts to overcome the fundamental problems of the economic valuation of the ecosystems, as they have been developed by economists, will be discussed. Finally, we will indicate in which situations these methods can contribute to the decision-making process when environmental problems are involved. In addition, we will indicate some methods and concepts which can be used in the decision-making process in cases when economic decisions cannot contribute to the value of the ecosystem.

The 'environment'

In most economic textbooks, it is argued in the first chapter that labour, capital, and natural resources are the three production factors necessary for the production of economic goods wanted by consumers. Most of these textbooks, however, give more information about labour and capital than about these natural resources. What labour and capital are and how they can be used in the economic process is relatively clear, but this is not the case with the concept of natural resources.

Therefore, we need to clearly distinguish what these environmental production factors are. In our view, we have to come to conclusions in all cases where natural resources are used in the production or consumption process, regardless of whether or not they have a price. The crucial point is whether or not they are scarce, as this brings them in the realm of economics. Scarcity can, for example, influence the prices of agricultural products or fossil fuels. However, in many cases, there is no price, not because the goods are not scarce, but because there are no markets for these scarce goods. This is case with beautiful mountains, wilderness areas, clean water and clean air. They are scarce, but do not have a real price. Therefore, we pay attention to all scarce environmental inputs in the production and consumption process, whether or not they have a price.

Strictly speaking, the environment is restricted to all situations where abiotic elements can be defined. When biotic elements are dominant, we define it as nature. This implies that when we deal with tropical rain forests to be cut by international timber companies, we will define this as a destruction of nature. When, however, acid rain, which is abiotic, destroys the same forest, we define this as an environmental problem. Such a division

can have some arbitrary and confusing elements. Nevertheless, we need this distinction to avoid semantic discussions.

Here we follow Hueting (1984) and De Groot (1992), who argued that it is the functions of nature and the environment which can be used by mankind in the production and consumption processes. These functions therefore have an economic value.

Nature

The economic value of nature is quite complex. Nature is used in the economic process in many ways. Tourists prefer to visit unspoiled landscapes; mountain climbers enjoy mountains when they are not overloaded with human infrastructure such as parking places, ski tows, and cable cars. Furthermore, environmental groups such as Greenpeace argue that nature has an inherent value, regardless of its use in economic processes. Pearce (1993, p. 17) argues that the total economic value of nature is identical to the direct value + the indirect value + the optional value + the existence value.

The sum of direct value, indirect value, and optional is seen as the use value, while the existence value can be regarded as the non-use value. The sum of use value and non-use value gives us the total economic value. He gives the example of a tropical rain forest, where the direct value includes sustainable timber products, plant genetics, medicine, non-timber products, education, human habitat, and recreation. The indirect value is based on elements such as watershed protection, air pollution reduction, nutrient recycling, and micro-climate. The option value is based on the idea that, even in the case of the absence of current direct and indirect value, the asset can be relevant in the future.

The existence value includes intrinsic values and heritage and cultural values. The concept of biodiversity, which has been used recently in documents of the 1992 United Nations Conference in Rio de Janeiro, deals with use values as well as non-use values. Biodiversity is relevant in agriculture and forestry, so it has a direct use value which is to a certain extent articulated in the price of the product on the market. On the other hand, biodiversity is related to the rich variety of ecosystems all over the world, regardless of their use in market processes (Pearce and Moran, 1994; Barbier, et al., 1994.

Clearly, some of these values can be measured on a market and others not. A tropical rain forest will only have a recreational value if the forest is visited, which is not the case for many very important, isolated rain forests of high ecological value. Nature areas located in the vicinity of significant human settlements in Western countries will have a higher number of visitors living in the neighbourhood than Arctic destinations in the north of Russia.

The ecosystem, which is in principle the same concept as nature, is used in economic processes in many different ways. The agricultural sector, fisheries, and forestry all use the yields of the ecosystem as a product which can be sold on a market. However, the main parts of the ecosystem such as the availability of sufficient water, the level of sunlight, and the fertility of the soil, do not have a price. This use of the ecosystem is based on the ability of the ecosystem to create new life.

Furthermore, the fossil parts of ecosystems functioning in the past can be used in current economic processes. This is the case in the use of fossil fuels, which consist of the cumulations of carbons in the geological past, and minerals which are taken from the earth's crust for construction purposes. The use of these materials will lead to the depletion of fossil stocks, and additionally, when its waste products are emitted, result in serious environmental problems.

Environment

As argued previously, the concept of the environment is based on abiotic elements. Air pollution, water pollution, and the pollution of the soil are the main factors. It is not pollution alone which connects nature and the environment, it is also the so-called cleaning capacity of nature. Pollution can to a certain extent be absorbed by the ecocycles in the ecosystem. As far as pollution can be absorbed or neutralised, the capacity can be regarded as 'a free gift of nature', for which no price exists.

As soon as the level of discharge is higher than the possibility of the ecosystem to absorb and neutralise pollution, the current ecocycles will be damaged with materials which are normally not found in the ecocycles. Pollution with organic materials is different from that with anorganic (in most cases, fossil) materials. Non-organic elements are seldom found in ecocycles, which implies that the emission of these materials is alien to the ecosystem and will therefore cause serious damage with which the ecosystem cannot cope.

NaturalGist

- *The ecological approach, in which the value of ecosystems is based on their ecological value is, from the theoretical point of view, superior to the economic approach, where ecological values can only have economic relevancy so far as some monetary values can be connected with the ecological issue*
- *The values of nature and the environment cannot be precisely given many of its ecosystems has to be taken as a measure for value. However, as has been made clear by Martinez Allier (1987), this is not valid. This is a subjective choice which cannot be made without making many political decisions. This leads to the conclusions that the value of nature and the environment is based on political ideas and decisions.*
- *Economic theories is general do not pay sufficient attention to the problems of nature and the environment. Labour and capital issues attract much attention; choices made in economic and environmental is based on political ideas and decisions.*
- *Many methods to define costs and benefits in nature and environmental issues have been developed. All of them have their limitations, Some of them such as travel cost method and hedonic pricing cannot cope with future situations; others, such as CVM, can do this, but are quite hypothetical. Additionally, this method can only be used in well- defined and limited problems.*

VII

Green Accounting: The "Missing Link" between a Developing Nation and Sustainable Growth

PAVAN SUKHDEV, GIST

Reducing poverty is a key priority for governments in all developing countries. This involves combating disease, providing education, enabling fair access to employment opportunity, and also using natural resources judiciously with regard to their renewability, impact on local environments, and value to local populations. Managing improvements in all these areas, without a formal framework to quantify any of them in monetary terms, may sound absurd; however, that is in fact a reasonable job description for developing country governments. One of my earliest received wisdoms as a young finance professional 20 years ago was that "you can't manage what you can't measure". If that applies to the management of developing economies, then we have probably defined the greatest challenge for developing country governments: how to measure national wealth in order to grow it in a sustainable manner. That is a pre-requisite for framing policies which direct investment into areas which give the best return on investment, whilst avoiding the pitfalls of economic trajectories which expose them to unacceptable or terminal risk.

Much recent work on 'inclusive wealth' measurement (e.g. Arrow, Dasgupta & Maler, 2003) highlights the importance of holistic measures of wealth. National wealth should include not just a measure of manufactured assets and financial assets (physical capital), but also natural capital (oil, other minerals, forests, freshwater resources, cropland, fisheries, etc), human capital (knowledge and skills), and social capital (institutional and legal infrastructure, political maturity, social harmony, etc). Sustainable growth is defined as that which increases per-capita national wealth, defined in this 'inclusive' or holistic manner. 'Green Accounting' consists of modelling and pricing the non-marketed services of environmental assets, calculating the value of education as a generator of future incomes, present-valuing future liabilities in the form of pollution abatement costs and health costs etc. For any accounting period, the overall valuation exercise arrives at a revised value of net assets, and the difference year-on-year is the true measure of national savings, or "genuine savings".

The importance of this holistic approach, and of 'Green Accounting' as a methodology to implement it, cannot be overemphasized. It could make all the difference between a viable and sustainable economic trajectory for developing countries on the one hand, and on the other, one which spells disaster not just for them but for the whole of civilization.

The concept of man's "ecological footprint" can be used to understand why the Western model of development, characterized by a culture of consumerism and by heavy investment in physical infrastructure, is not in fact an option for developing nations. The ecological footprint of a person or a society is the amount of land needed to provide the

ecological services corresponding to the consumption needs of that person or society - food, water, energy, housing, waste absorption, etc. This average ecological footprint per person is estimated (e.g. Edward O. Wilson, "The Future of Life") at close to 10 hectares for the United States, but averages at about 1 hectare for developing nations. For every person on earth to reach US levels of consumption with existing levels of technology would require five times the available land area on earth! It appears that the only viable routes for sustainable use of the planet by our species are either to improve energy and materials usage efficiency fivefold, or to recognize and build human well-being in developing nations in a manner that costs the earth significantly less per capita than it did for the Western world, or a combination of the two.

Accounting - and National Accounting

During my 20 years in financial markets, I have heard many business leaders proudly declare that "our key assets are our people", meaning that the knowledge and expertise of their people, or their "human capital", is a key source of their business income. However, not one of these leaders' organizations reflects "our people" as an asset in its financial statements - as against land, buildings, cash balances, etc. Staff salary and bonus costs are an expense item in virtually all financial statements; however, with the possible exception of star footballers in football clubs, "people" are never shown as "assets". To be fair, corporate accounts are drawn up strictly in accordance with Companies Acts in respective reporting jurisdictions, to enable shareholders and creditors to get a "true and fair view" of the financial state of affairs of the company. Generally accepted accounting principles (GAAPs) are codified in detail (e.g. UK - SSAPs, USA - FASB rules), severely limiting the ability of any company to be "creative" in its accounting, even if it is for benign purposes. However, no such legislation constrains national governments from accounting for human capital and natural capital, and it is more a matter of convention.

The System of National Accounts (SNA) of the World Bank, which defined the most commonly used accounting convention, was devised as part of the global economic framework put in place after World War 2. SNA uses Gross Domestic Product (GDP) as a key measure of a country's progress, an emphasis which was accentuated by decades of reinforcement through the advisory approach and aid policies of the IMF and the World Bank. Whereas the balance sheet and Profit & Loss accounts of a company show not just income, but also net profit and the change in net asset value over an accounting period, GDP takes no account of changes in the value of a nation's assets - be they natural assets (forests, freshwater, sub-soil minerals, etc) or human assets (health, education, and skills of the population). It may be argued that "intangible" national assets, such as legal and institutional infrastructure, law and order, and quality of life (which are all aspects of social capital), are an excusable omission from national accounting. However, not to record the depletion of natural assets and human assets, which are so essential to wellbeing, cannot be other than a recipe for impoverishment.

Consider, for example, a catastrophe, such as violent, unseasonal, flash floods. The ensuing reconstruction of destroyed housing, roads and bridges would show up as an increase in GDP, and therefore as national income. The problem here is that this official "GDP growth" masks a significant increase in poverty - as evidenced by the loss of livelihoods and human lives, hardship and suffering of the displaced poor, loss of livestock and standing crops, loss of rich topsoil, etc - which, if properly and holistically accounted, would be a deduction from national wealth. Furthermore, there is no

recognition of the genesis of this ecological disaster - in all likelihood caused by the rampant destruction of forest cover - which had earlier ensured that heavy rainfall was absorbed by forest vegetation and released gradually through the seasons. A policy framer informed by SNA-based growth planning might be forgiven for not allocating resources to initiatives which genuinely address the problem, such as extensive afforestation of watersheds, pre-emptive resettlement away from flood plains, etc.

The emphasis of SNA on GDP as the key measure of growth will probably be studied by future generations as the single most significant design defect in the economic history of mankind. The proper alternative, Green Accounting, entails the estimation of prices for ALL national assets, including natural and human, and their inclusion in the 'financial statement' of the nation, so it is no mean task. However, as we describe below, there is a sufficient body of work and precedent which will enable developing countries to implement holistic Green Accounts, and thus enable citizens and governments to make the right choices - such as defending natural resources and conserving ecosystems rather than surrendering them at throwaway prices to logging interests for a relatively minor economic gain.

The premise on which national accounts were built was to serve primarily as broad indicators of aggregate output. Nowadays, national accounts are used to analyze resource allocation, productivity, growth, and income distribution. Hence, it is necessary to make appropriate adjustments in the framework and in the underlying concepts of national accounting. The UN's new manual on environmentally adjusted accounting (SEEA, 2003) provides an alternative approach across their sample of over a hundred countries. However, for developing countries, it remains insufficient as a policy input, as it still values natural assets primarily as resource inputs into production. It would not, for example, take into account the environmental values of forests, which, for their flood prevention, rainwater storage and drought prevention value alone, are worth significantly more then their accounted timber or carbon values.

Accounting for Human Capital

One of the earliest attempts to estimate the money value of a human being and to apply that to estimate a country's stock of human capital was made as early as 1691 by Sir William Petty. Table 1 gives the summary of various studies that measured human capital through history. It is noteworthy that the results of many different studies exhibit high ratios (5:1 is a rough median) for the value of human capital : physical capital, a result which underlines the significance of omitting this component from national wealth following the old SNA methodology.

Two approaches are possible; the cost-based approach and the income approach. The cost-based approach estimates human capital based on the assumption that the depreciated value of the dollar amount spent on those items defined as investments in human capital is equal to the stock of human capital. This is a backward-looking method because of its focus on the historical costs of production. The income-based approach (capitalized earnings procedure) measures the stock of human capital by summing the total discounted values of all the future income streams that all individuals belonging to the population in question expect to earn throughout their lifetime. It was first developed by Farr (1853), who estimated the capitalized value of earning capacity by calculating the present value of an individual's future earnings net

of personal living expenses. Jorgensen and Fraumeni (1989) provide a contemporary analysis and framework for the incomebased approach.

Accounting for Natural Capital

Not reflecting human capital explicitly in national accounts is a matter of concern, but it has arguably less impact on public wealth than the lack of recognition of natural capital. Health services are universally seen as essential for well-being, and education is an essential input to increase employment. Most governments, be they elected or not, and whether visionary or otherwise, will allocate available budgetary resources to health and education, at worst because they fear the electoral consequences of not doing so. However, with natural capital, the lack of wealth accounting can dangerously accentuate a bad track record of conservation and cause severe losses of public wealth which, nevertheless, escapes public notice.

This is because people are generally not aware of either the economic value of their natural heritage, or the extent of its depletion through bad government policy or poor enforcement of extant regulations. Perverse economic incentives for the destruction of forests arise due to the absence of markets or market prices for the environmental services of forests (see box below). Policy responses, such as more protected areas or steeper penalties for conversion of forest land, are among the answers which would arise if, in the first instance, national accounts valued forests properly.

- **Any measure of a nation / region's wealth should include not just a measure of Physical Capital, but also Natural Capital.**
- **Among others, 'Natural Capital' includes:**
  - **Oil**
  - **Minerals**
  - **Forests**
  - **Freshwater resources**
  - **Crop land**
  - **Pastures**
  - **Fisheries etc.**
- **Pursuit of short term development agendas at the expense of natural heritage ends up ruining under valued public assets**
- **This effectively worsens the well being of the average citizen, in particular the rural poor – in whose name many of the development projects are built**

Estimating the value/ ha of sustainable use of forests:

Timber & Fuel-wood	Rs 45,900	$1,020
Fodder	Rs 6,100	$136
Non-Timber Forest Produce	Rs 15,700	$349
Eco-Tourism	Rs 186,000	$4,133
Biodiversity	TBD	TBD
Carbon Storage	Rs 28,900	$642
Soil Loss Prevention	Rs 20,400	$453
Watershed Value	TBD	TBD
Flood & Drought Prevention	TBD	TBD
Total	> Rs 500,000	> $11,111

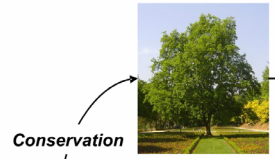
GAISP - An Indian Example

An example of Green Accounting methodology being applied in a developing nation is the recently launched Green Accounting for Indian States Project (GAISP, a project of GIST, the Green Indian States Trust), directed by a small group of professionals including the author. The Union of India has a federal structure, in which the 28 States and Union territories have a considerable and increasing degree of control on environmental, health, and education policies. Availability of primary data is not a problem, however the models being devised are complex and eight suites of adjustments are planned to be modelled over the next two years (see Table).

The aim of this project is to set up economic models for State-wise annual estimates of "genuine savings", i.e. savings after including adjustments for the creation or destruction of human capital and the destruction of natural capital. Publication of these results will enable policy makers and the public to engage in a timely and pertinent debate on the sustainability of growth.

GAISP results will be calculated State-wise, thus the project will enable inter-state comparisons of holistic economic performance to be made in an unbiased manner. GAISP will include in the Capital Account the value of investment in education and public health as well as the depletion of assets such as forest resources, agricultural cropland, grazing pastures, fresh water resources and mineral deposits.

A possible policy consequence of Green Accounting may be gradual increases in budgetary allocations towards improvements in education, public health, and local natural environments. All of these are key elements of national wealth in India, although at present they do not seem to receive adequate attention and investment to ensure the long-term sustainability of India's economic growth.



Conservation

Forests

Conversion

Forest Services	Benefits	Eco Value?	Mkt Price?
Flood Prevention	Avoidance of Flood Damage	✓	×
Drought Control	Stable Irrigation & Water Supply	✓	×
Carbon Storage	Slows down global warming	✓	×
Recreation & Health	Reduces burden of disease	✓	×
Non-timber Forest Products	Provide a livelihood for forest dwelling communities	✓	×
Sustainable Logging	Commercial Timber	✓	✓
Clear Felling	Commercial timber	✓	✓
Agriculture	Food grains & farm produce	✓	✓
Industrial & Urban areas	Factory & housing rents	✓	✓

Any measure Unless we take all these forest values into account, the 'conservation path' will inevitably be less economically attractive than the 'conversion' path. This will and does lead to pressure to destroy forests for 'development'

Green Accounting for Indian States Project
Planned Suite of Adjustments

Each of the Green Accounting adjustments to State Domestic Product (SDP) accounts will evaluate a particular area or related set of areas of adjustments, expected to be as follows:

- The Value of Timber, Carbon, Fuelwood & Non-Timber Forest Produce in India's Forests
- Estimating the Value of Agricultural Cropland and Pasture Land in India
- The Value of India's Sub-Soil Assets
- Eco-Tourism & Biodiversity Values in India
- Estimating the Value of Educational Capital Formation in India
- Investments in Health and Pollution Control and their Value to India
- The Environmental Values of Forest: Water Augmentation, Mitigating Soil Erosion and Food Damage Prevention
- Estimating the Value of Freshwater Resources in India

NaturalGist

- *"You can't manage what you can't measure". National wealth should include not just a measure of manufactured assets and financial assets (physical capital), but also natural capital (oil, other minerals, forests, freshwater resources, cropland, fisheries, etc), human capital (knowledge and skills), and social capital (institutional and legal infrastructure, political maturity, social harmony etc).*
- *Sustainable growth is defined as that which increases per-capita national wealth, defined in this 'inclusive' or holistic manner. Green Accounting consists of modeling and pricing the generator of future incomes, present- valuing future liabilities in the form of pollution abatement costs and health costs etc.*
- *The ecological footprint of a person or a society is the amount of land to provide the ecological services corresponding to the consumption needs of that person or society- food, water, energy, housing, waste absorption, etc. The average ecological footprint per person is estimated (e.g. Edward O. Wilson, "The Future of life") at close to 10 hectares for the United States, but averages at about 1 hectare for developing nations. For every person on earth to reach US levels of consumption with existing levels of technology would require five times the available land area on earth!*
- *The emphasis of SNA on GDP as the key measure of growth will probably be studied by future generations as the single most significant design defect in the economic history of mankind. The proper alternative, Green Accounting, entails the estimation of prices for ALL national assets, including natural and human, and their inclusion in the 'financial statement' of the nation, so it is no mean task.*
- *An example of Green Accounting methodology being applied in a developing nation is the recently launched Green Accounting for Indian States Project (GAISP, a project of GIST, the Green Indian Sates Trust). The aim of this project is to set up economic models foe state-wise annual estimates of "genuine savings", i.e. savings after including adjustments for the creation or destruction of human capital and the destruction of natural capital. Publication of these results will enable policy makers and the public to engage in a timely and pertinent debate on the sustainability of growth.*

VIII

It's Not Easy Being Green

NOAH WALLY & BRADLEY WHITEHEAD
Excerpted from "Harvard Business Review"

For years, the goals of business and the environment seemed hopelessly irreconcilable. According to common wisdom, what helped one would almost certainly harm the other. Yet nearly a decade of "green" initiatives in the world's corporations has given rise to a more optimistic mind-set, which promises the ultimate reconciliation of environmental and economic concerns. In this new world, both business and the environment can win. Being green is no longer a cost of doing business; it is a catalyst for constant innovation, new market opportunity, and wealth creation.

Everyone from Vice President Al Gore to Harvard Business School Professor Michael Porter has sung the praises of being green. In fact, Gore argues, making environmental improvements is often the best way to increase a company's efficiency and, therefore, profitability. Gore and other proponents of this new popular wisdom cite an increasing number of projects that benefit the environment and create financial value. As an example of such a "win-win" project, Gore points to 3M's "Pollution Prevention Pays" program, a group of over 3,000 mainly employee-generated projects, which have reduced 3M's emissions by over 1 billion pounds since 1975 while saving the company approximately $500 million.

Questioning today's win-win rhetoric is akin to arguing against motherhood and apple pie. After all, the idea that environmental initiatives will systematically increase profitability has tremendous appeal. Unfortunately, this popular idea is also unrealistic. Responding to environmental challenges has always been a costly and complicated proposition for managers. In fact, environmental costs at most companies are skyrocketing, with little economic payback in sight.

In industries such as petroleum and chemicals, which are already plagued with overcapacity, fierce competition, and declining margins, a company's ability to respond to environmental challenges in a cost-efficient manner may well determine its viability. A major North American chemical company, for example, was enjoying an internal rate of return of 55% on employee-generated environmental initiatives similar to the win-win opportunities Gore cites. But when those impressive returns were added to the internal rate of return on all corporate environmental projects, the return dropped to a negative 16%.We do not argue that win-win situations do not exist; in fact, they do, but they are very rare and will likely be overshadowed by the total cost of a company's environmental program. Win-win opportunities become insignificant in the face of the enormous environmental expenditures that will never generate a positive financial return.

Texaco, for example, plans to invest $1.5 billion per year over a five-year period on environmental compliance and emission reductions for a total investment of over $7 billion, an amount three times the book value of the company and twice its asset base.

In other words, the company plans to double its asset base on projects expected to provide little, if any, revenues. Can anyone argue convincingly that an investment of this magnitude will yield a positive financial return to shareholders? We doubt it.

We must question the current euphoric environmental rhetoric by asking if win-win solutions should be the foundation of a company's environmental strategy. At the risk of arguing against motherhood (and mother earth) we must answer no. Ambitious environmental goals have real economic costs. As a society, we may rightly choose those goals despite their costs, but we must do so knowingly. And we must not kid ourselves. Talk is cheap; environmental efforts are not.

But just because environmental managers should not continue to search exclusively for win-win solutions does not mean that they should return to their old ways of fighting, ignoring, and hamstringing any and all environmental regulatory efforts. On the contrary, being conscious of shareholder value while protecting the environment requires, among other things, a deep understanding of the environmental and strategic consequences of business decisions, collaboration with environmental groups and regulators, involvement in shaping legislation (and even avoiding the need for it), and a sincere commitment to cleaning up and preventing pollution. The challenge for managers today is knowing how to pick the shots that will have the greatest impact. To achieve truly sustainable environmental solutions, managers must concentrate on finding smarter and finer trade-offs between business and environmental concerns, acknowledging that, in almost all cases, it is impossible to get something for nothing.

Concentrating on enhancing the efficiency and effectiveness of environmental spending may not have the rhetorical appeal of the current win-win talk, but in the long run, such an approach will be far more effective. Consider DuPont, which has the equivalent of 35% of its share price invested in capital and operating expenditures related to protecting the environment. Rather than searching for elusive, but virtuous, win-win situations, DuPont can protect shareholder value more successfully by finding ways to improve its long-term environmental efficiency. A 15% improvement in efficiency, for instance, could yield nearly $3 per share.

Other companies in pollution-intensive industries would see similar results from efforts to improve environmental efficiency. We estimate that between one-quarter and one-half of an industry's market value is vulnerable to increased environmental costs. And while it is difficult to know how much value will actually be destroyed by the increased cost of environmental compliance, it is clear that managers face a daunting task. The recently reauthorized Clean Air Act, for example, is expected to cost U.S. petroleum refiners $37 billion, over $6 billion more than the book value of the entire industry. And stories like that will likely multiply. McKinsey & Company's 1991 worldwide survey of several hundred executives, The Corporate Response to the Environmental Challenge, shows that top managers expect environmental expenditures to double as a percentage of sales over the next decade.

Given that scenario, companies should seek to minimize the destruction of shareholder value that is likely to be caused by environmental costs rather than attempt to create value through environmental enhancements. Indeed, the current win-win rhetoric is not just misleading; it is dangerous. In an area like the environment, which requires long-term commitment and cooperation, untempered idealism is a luxury. By focusing on the

laudable but illusory goal of win-win solutions, corporations and policymakers are setting themselves up for a fall with shareholders and the public at large. Both constituencies will become cynical, disappointed, and uncooperative when the true costs of being green come to light. Companies are already beginning to question their public commitment to the environment, especially since such costly obligations often come at a time when many companies are undergoing dramatic expense restructurings and layoffs.

Evolving Eras of Environmental Management

The history of the complex relationship between business and the environment illuminates the appeal as well as the considerable danger of the win-win approach. As professors Kurt Fischer and Johan Schot outline in their introduction to Environmental Strategies for Industry, the current approach to environmental management developed in two eras over two decades, beginning in the early 1970s.In the first era, which lasted from roughly 1970 to 1985, companies faced with new regulations of high technical specificity did little more than comply with the regulations and often fought or stymied them. Fischer and Schot accurately describe this phase as one of "resistant adaptation." During this period, companies were generally unwilling to internalize environmental issues, a reluctance that was reflected in the delegation of environmental protection to local facilities, a widespread failure to create environmental performance-measurement systems, and a refusal to view environmental issues as realities that needed to be incorporated into business strategy.

During the mid to late 1980s, a shift in the regulatory context and the maturing of the environmental movement created an incentive for managers to look beyond the narrow, predominantly technical approach. With regulations focused more on ultimate environmental results and less on the mechanics of compliance, managers began to exercise greater discretion in their environmental response. For the first time, environmental strategy became possible.

Fischer and Schot call this second phase "embracing environmental issues without innovating." Because corporate response in the first era was minimal and grudging, companies were able to make easy, but often very significant, improvements in the second era. Between 1989 and 1991, for example, Texaco achieved a 40% reduction in its combined air, water, and solid-waste streams and a 58% reduction in its toxic emissions through pollution-control equipment, tighter monitoring and control systems, and the introduction of an improved waste-reduction process. Similarly, between 1988 and 1992, Georgia-Pacific secured a 65% reduction in dioxins and a 34% decrease in chloroform emissions by relying on substitute chemicals, upgraded equipment, and improved process controls.

The emergence of the win-win mind-set is a direct result of the extraordinary success companies achieved in reducing pollution in this second era. Many of the reduction programs made good financial sense, while few required truly fundamental changes in production processes or product designs. Anxious to demonstrate their commitment to environmental progress, companies were quick to tout their successes. Even informed observers easily came to the conclusion that continued environmental action could more than pay for itself.

Why Win-Win Won't Work

In a foreword to the new edition of Earth in the Balance, Vice President Al Gore writes, We can prosper by leading the environmental revolution and producing for the world marketplace the new products and technologies that foster economic progress without environmental destruction." While Gore focuses primarily on government's role, he clearly believes that many win-win opportunities exist for corporations and that trade-offs can largely be avoided through smart decision making and technological innovation.

In his brief but influential Scientific American article, Harvard Business School Professor Michael Porter echoes Gore's view, arguing that the perceived conflict between environmental protection and economic competitiveness is, in fact, a false dichotomy. "Strict environmental regulations do not inevitably hinder competitive advantage against foreign rivals; indeed, they often enhance it," Porter writes. "Properly constructed regulatory standards, which aim at outcomes and not methods, will encourage companies to re-engineer their technology. The result in many cases is a process that not only pollutes less but lowers costs or improves quality.

"In Gore and Porter's world, managers might redesign a product so that it uses fewer environmentally harmful or resource-depleting raw materials. If successful, that effort could also result in significant cuts in direct manufacturing costs and inventory savings and appeal to consumers' growing desire for environmentally friendly products.

That argument, with its rabbit-out-of-the-hat solutions to many environmental and economic ills, is certainly appealing. Who wouldn't be enamored of an approach that promises that a renewed concern for the environment will revive the country's economic and competitive outlook? Gore's book and Porter's persuasive arguments have unleashed — or at least reinforced -a school of thought that denies the necessity of trade-offs and encourages companies to pursue prosperity through green initiatives.

Yet while Gore and Porter give an inspirational rallying cry, they offer little specific guidance to managers. Porter writes mainly about how a country can gain competitive advantage through strict environmental policies, not about how individual companies might actually seek to gain competitive advantage by becoming green. But that hasn't stopped environmentalists from seizing on Porter's argument and urging businesses to capture the many opportunities to help the environment that await them.

Win-win rhetoric already pervades popular opinion. An April 1993 Times Mirror-Roper poll shows that over two-thirds of Americans do not believe the country must choose between environmental protection and economic development. Yet those who extrapolate a specific strategy for industry from Porter's argument are wrongly assuming that the recent spate of easy environmental wins can be carried on indefinitely. While tough environmental standards may yield significant positive results for the economy as a whole, individual companies will actually be battling increasingly complex environmental problems at a much higher cost than ever before.

For example, one large chemical company, anxious to capitalize on its early successes, committed to a program to reduce emissions of hazardous wastes. The company soon found that it was starving other important projects, like plant upgrades, and that roughly two-thirds of its capital budget went to environmental spending. Perhaps even more

alarming, nearly 80% of plant engineers' time was being consumed by environmental projects. Managers at this company are just beginning to understand that all their relatively easy environmental problems have already been solved and that the economic forces at work in the industry are making it increasingly difficult to find win-win solutions. The company is now exploring ways to achieve greater efficiency and perhaps even to reduce some of its commitments to the environment.

As environmental challenges become more complex and costs continue to skyrocket, win-win solutions will become increasingly scarce. Environmental costs have stubbornly continued to outpace both inflation and economic growth for the past two decades. Between 1972 and 1992, for instance, total annualized environmental protection costs for the United States tripled as a percentage of gross domestic product (GDP) from 0.88% to 2.39%, with a further increase to 2.47%, or around $200 billion, projected by the year 2000. In pollution-intensive sectors like oil and gas, the problem is much worse. Compound annual growth in environmental expenditures for a selection of oil and gas companies between 1987 and 1990 was 12.9%, compared with only 7.3% for employee benefits (including health care) and 2.7% for direct labor charges.

Costs are destined to increase even more, especially since the increase in regulations shows no signs of abating. One crude but indicative proxy is that the number of federal environmental acts in force has risen from 5 in 1972 to over 40 today, a spate of legislative activity that has been responsible for a twelve fold increase in the number of pages of federal environmental regulation over the same period. By 1992, Title 40 of the Federal Code contained over 12,000 pages of regulations. And several pieces of environmental legislation, such as the Clean Water Act and the Resources Conservation and Recovery Act, are currently on the congressional docket.

Even without additional regulations, however, progressively tighter standards within current regulations will push corporate environmental spending higher. For example, nitrogen oxides standards (which cover a major air pollutant that often comes from the coal burned to generate electricity) were originally set by the Clean Air Act at a limit of 0.5 pounds per million British thermal units (BTUs) for electric utilities. This standard was subsequently superseded by many states with tighter limits, culminating in 0.2 pounds per million BTUs standard to be achieved by 1999, which will result in a tenfold cost increase. While it may be possible to respond creatively to each new environmental regulation or enforcement, the burden on corporations is tremendous.

Moreover, within industries, the burden falls unevenly among companies. In the top ten companies in the oil industry, reported environmental expenditures vary from 5.1% to 1.3% of sales over a three-year period — a difference of roughly $800 million. And in steel, minimills enjoy a $10 to $15 environmental cost-per-ton advantage over traditional integrated producers.

Complicating the situation for environmental managers is the growing array of choices they have for how and when they will respond to environmental pressures. Managers today have so many choices that they aren't always sure what to do. Old-fashioned command-and-control regulations, which allow managers very little freedom, are giving way to market-based incentives, including tradable permits, pollution charges, and deposit refund systems. These new incentives do not tell a company what to do but

instead provide a clear set of financial incentives that are designed to influence behavior positively, much like a capital market.

The result? Senior managers must frequently juggle a number of issues without a means for setting priorities or a method for integrating those issues into business decision making. In McKinsey's survey, 92% of CEOs and board members stated that the environment should be one of their top three management priorities, and 85% claimed that one of their major goals should be to integrate environmental considerations into business strategy. At the same time, only 37% believed they successfully integrate the environment into everyday operations, and only 35% said they successfully adapt business strategy to anticipated environmental developments.

The Search for Solutions

Clearly, today's managers lack a framework that will allow them to turn their good intentions into reality. A number of executives are attempting to do just that. Among the most practical of those is Swiss industrialist Stephan Schmidheiny, who led the Business Council at the 1992 Earth Summit in Rio de Janeiro. In Changing Course, Schmidheiny and his colleagues at the Business Council, including ABB Chairman Percy Barnevik, retired 3M Chairman and CEO Allen Jacobson, Dow Chemical President and CEO Frank Popoff, and Nippon Steel Chairman Akira Miki, articulate a vision of "sustainable development," or the ability to meet the needs of the present generation without compromising the welfare of future generations. The authors do not claim that growth and the environment are mutually reinforcing. Rather, they argue that economic growth and environmental protection are inextricably linked.

The vision they offer is based on free trade, market prices that reflect the comprehensive societal impact of products and processes, more flexible regulations, and investors who pay greater heed to environmental considerations. In the cases Schmidheiny cites, he shows a clear understanding of the environmental issues managers must face. Yet Changing Course does not, nor does it aspire to, provide an all-encompassing framework for managers who must daily negotiate the conflicting demands of the market and the environment.

Schmidheiny leaves CEOs with no clear guideposts for which products or processes to work on first and how far to go in cleaning up and at what cost. Without that guidance, even the most environmentally sensitive CEO will be lost. The current crop of environmental texts suggests that competitive advantage can be found in effective environmental management, yet these texts offer only one-dimensional prescriptions. The common rallying cry of many environmental thinkers is that the environment must be integrated into everyday business decisions, yet few specify what that means.

Many corporations view the environment as a discrete functional area generating issues that are treated in isolation from "core" business issues. Writers on all ends of the spectrum, however, now agree that the outmoded functional approach must yield to a more integrated way of thinking.

In her book Costing the Earth, Frances Cairncross, the environment editor of The Economist, suggests that the total quality movement may be one vehicle through which environmental issues can be integrated into business as a whole. "In American

management terms," she writes, "environmental responsibility has become an aspect of the search for total quality.

"While Cairncross may be correct, most total quality environmental-management programs have a missionary focus on emissions reductions that doesn't take into account the cost at which that quality is obtained or, alternatively, the value created. Traditional cost-reduction efforts, on the other hand, err too much in the opposite direction by concentrating on quarterly costs without devoting sufficient attention to environmental impact and the longer term costs and liabilities.

The Path to Pragmatism

Instead of focusing on win-win solutions, companies would be better off focusing on the "trade-off zone," where environmental benefit is weighed judiciously against value destruction. Only a focus on value rather than compliance, emissions, or quarterly costs can provide managers with the information to set priorities and develop appropriate business responses. This does not mean that managers should obstruct environmental regulatory efforts. Instead, managers must pick their shots carefully. In a world where you cannot do everything, only a value-based approach allows informed trade-offs between costs and benefits.

Much work remains to define all the elements of a value-based approach. Broadly speaking, such an approach must be systematic, integrated, and flexible. Managers must set clear priorities based on the potential impact on shareholder value and the amount of discretion they have to deal with the environmental problem at hand; they must make environmental decisions in the context of the company's needs and strategy; and they must be able to exercise different options as an uncertain future unfolds.

Within this framework, environmental issues can be broken down into three broad categories: strategic, operational, and technical. (See the chart, "A Triage of Environmental Issues.") Each type requires a distinct managerial approach. Together they represent a way of thinking about the environment that goes beyond incremental, reactive, and functional approaches, which are now reaching the limits of their cost-effectiveness.

Some environmental issues are strategic because their impact on value is high enough either to put core elements of the business at risk or to fundamentally alter a company's cost structure, and because managers have considerable discretion about how to respond. A good example is the issue of chlorine-free paper production facing the pulp and paper industry. Opinion is sharply divided on when, and even whether, government regulation will prohibit the use of chlorine in the paper manufacturing process. The value implications for pulp and paper companies are enormous, not only because of the absolute cost of chlorine-free production but also because some companies are likely, by virtue of their plant configuration or other reasons, to enjoy a relative competitive advantage in this form of manufacture. Meanwhile, the level of discretion in how to respond is considerable. While Louisiana-Pacific has started to prepare its organization for chlorine-free paper production, many other industry participants are fighting tooth and nail to undermine proposed legislation.

As that situation suggests, one key decision managers must make about each major environmental problem they face is whether to lead or lag behind their competitors on environmental issues. In some cases, a company will want to pursue an environmental strategy in which it gets well in front of regulations or public opinion, as Louisiana-Pacific did. In other cases, a corporation may be best served by moving in lockstep with industry leaders or reacting only in response to external pressures. The decision to lead or lag regulations is something of a management catch-22. If a company lags, it may find itself on the receiving end of unfavorable regulations, but if the company leads, its actions could increase near-term production costs and leave the company vulnerable to its competitors.

Managers will find that their options can be broken down into those that help them shape events, like forming partnerships with stakeholders, and those that help them develop an optimal response to events, like reallocating resource dollars and redesigning production processes. To prepare a strategy, managers must decide where they want to be on the spectrum from strict compliance to environmental leadership.

Operational issues are those where the impact on value ranges from medium to high, but managers' scope for discretionary response is generally low. Management's task with these issues is to ensure that minimum expenditures achieve maximum environmental impact. The example of broad emissions control, again from the pulp and paper industry, illustrates the point. While annual expenditures for complying with regulations controlling air, water, and solid-waste emissions are measured in the hundreds of millions of dollars, companies often have little choice about whether or how to comply.

The challenge with these issues is to view environmental costs as manageable, not as a set of mandates for which a blank check is the only solution. The first step is understanding how much is being spent on emission control and why. The second step is devising an approach that ensures that maximum environmental impact is achieved at minimum cost.

Finally, there are those issues that are largely technical, where the degree of managerial discretion varies from high to low, but relatively little value is tied up with any individual issue. The cumulative weight of thousands of these decisions, how' ever, can have an adverse effect on shareholder value. Managers must have the necessary information to make informed trade-offs between cost and environmental control. Business unit managers seldom have adequate information about even current environmental costs let alone possible future liabilities or pressures. The best way to provide that information is to create systems to track and disseminate emissions data on a cross-functional basis, provide environmental cost accounting, and perform thorough, opportunity-oriented — as opposed to compliance-oriented — third-party audits. That approach is in contrast to current "worst practice," prevalent in the McKinsey survey, which can be summed up with this attitude: "There are enough problems that will find us without our having to find new ones.

"For all environmental issues, shareholder value, rather than compliance, emissions, or costs, is the critical unifying metric. That approach is environmentally sound, but it's also hardheaded, informed by business experience, and, as a result, much more likely to be truly sustainable over the long term.

NaturalGist

- ***Being green*** *is no longer a cost of doing business; it is a catalyst for constant innovation, new market opportunity and wealth creation.*
- ***It's costly*** *and complicated for managers to respond to environmental challenges. In fact, environmental cost are skyrocketing, with little economic payback in sight & ambitious environmental goals have real economic costs.*
- ***Views of many*** *corporations towards environment are that of a discrete functional area generating issues that are treated in isolation from" core" business issues. Instead, the outmoded functional approach must yield to a more integrated way of thinking.*
- ***Options can generally*** *be broken down into those that help managers shape events, like forming partnerships with stakeholders, and those that help them develop an optimal response to events, like reallocating resource dollars and redesigning production processes. To prepare a strategy, managers must decide where they want to be on the spectrum from strict compliance to environmental leadership.*
- ***To sum up:*** *Win Win situations that today's companies adopt will eventually cost more for an organization instead companies need to adopt strategies which have inherently integrated environmental policies and standard as their core value.*

IX

Who will the Police The Protectors?

BITTU SAHGAL, SANCTUARY MAGAZINE

Ecosystem services have been used by humans to great advantage since the beginning of human history, not only have economists failed to evaluate such services effectively but also they have failed to understand the complexity and integrity of these services that interweave our lives with nature, and as a result, these vital public assets have consistently been taken for granted and utilized for personal gains. This error of judgment on the part of economists has resulted in the mass destruction of forests, coasts and corals, mountains, grasslands and wetlands.

Apart from helping to moderate climate and to harvest the rain, such ecosystems have also feed millions of humans on a daily basis – for instance the fish in our rivers, lakes and coasts. The consequence of such destruction is evident all around us in the shape and form of climate change.

To take just one specific example, for centuries, the Sundarbans has served as an enormous sponge-like buffer against the often-savage storms and tidal surges of the Bay of Bengal. It is a refuge to countless and, in many cases, rare species of flora and fauna. It is an astonishingly productive marine nursery. And it is a green cathedral for nature-starved humanity. Now, in an era of climate change, the Sundarbans offers the greatest service of all: along with the remnants of what were once unbroken forests the length and breadth of India, in its storage of carbon, this mangrove forest provides the key to India's agriculture, food and economic security. Elsewhere throughout the world, tiger-and-wildlife-inhabited forests perform these same vital, unsung climate control services.

The science, and now even the financial benefits, of the role of forests in reducing greenhouse gas emissions are incontrovertible. Compromising the health of forests such as the Sundarbans would release large amounts of carbon dioxide into the atmosphere. Preserving them would ensure that they would continue to remove Co2 from the atmosphere, and sequester or "lock it up", as all forests do. How does this work? Through photosynthesis, trees and plants absorb carbon dioxide (the most dominant greenhouse gas), from the atmosphere, and then release the oxygen after storing the carbon as wood and leaves. This is 'carbon storage' mechanism, an ingenious plan of nature. Depending on the species, trees can be about 20 per cent carbon by weight, and they and the overall biomass of forests act as a 'carbon sink.' The organic matter in forest soils, such as the humus produced when dead plant material decomposes, also acts as a carbon store. Coal and oil are part of the planet's biomass – when we burn them, we release their carbon stores, when we don't, they continue to retain their carbon.

According to the U.N.'s Food and Agriculture Organization (FAO), the world's forests and forest soils store more than one trillion tons of carbon, twice the amount in the

atmosphere. On the other side of the coin, destruction of forests releases almost 7.5 gigatonnes of Co2 into the atmosphere each year. The FAO urges not only reduction in deforestation, but afforestation (new plantings) and reforestation (replanting of deforested areas). A vital caveat is that simply replacing biodiverse forests with monocultures – a common (mal)practice of World Bank forestry projects – is far less effective in stemming climate change (and protecting local wildlife and human populations) than protecting forests in the first place, or allowing biodiverse forests to re-grow.

In 2006, a study on the Economics of Climate Change was commissioned by the U. K. Treasury. Led by Sir Nicholas Stern, Head of the Government Economic Service, it suggested that reducing deforestation offers a major opportunity to reduce emissions at relatively low cost. The study found that in the eight countries responsible for 70 per cent of emissions from land use, just 1.5 acres of forest land could be worth as much as $2,500 to 3,200 in terms of carbon storage at a carbon price of $35-$50. This same land would provide a return of just $2 for pastoral use, $1,000 for soy and palm oil conversion and a one-time return of $236-$1,035 for timber sales. Of course, the valuation of other ecosystem services such as soil conservation, food production and flood and drought control should drive the value of forest lands much higher.

The study's researchers found that for an average price of $27.25 per ton of carbon dioxide in the emissions exchange market, "deforestation can potentially be virtually eliminated." The study concludes that there is a significant potential for reduced deforestation to mitigate the costs of cutting greenhouse emissions. As for the wood we need for our daily living, timber, like any other food or cash crop, can easily be grown on farms set aside for the purpose.

As great a role as the Sundarbans has to play in combating climate change, its vulnerability to its effects are just as great. It has been estimated that rising sea levels have already flooded 7,500 hectares in the Sundarbans. Two islands – Lohachara and Suparibhanga – have been submerged, a third – Ghoramara – is two-thirds submerged, and a dozen more are under threat. Along with the threat to the forest itself, are the attendant risks to the tiger and all of the other wild animals that rely on its protection.

Even if we are thoughtful enough to protect this mangrove wonderland from all of the other threats we pose to it, we will have failed the Sundarbans and its tigers if we allow climate change to progress unchallenged. Caught between inhospitable agricultural and urban areas to the north, east and west, and the rising seas to the south, tigers and other wildlife will literally have nowhere to run. Millions of humans living in the 24 Parganas District, of course, will probably end up as urban refugees in Kolkata.

Even as we speak, scores of industrial projects wish to turn the Sundarbans mangrove ecosystem to non-forest, commercial use ranging from international steamer channels, mega-tourism projects, nuclear reactors to -- in one unbelievable case -- a thermal plant fed by mangrove wood.

No one has thus far tabulated the true financial cost of such decisions. If NaturenomicsTM results in a better understanding of such costs and benefits, it could prove to be the most significant work in the development history of India.

NaturalGist

- ***Priceless Ecosystems:*** *Although ecosystems is complex and an integral part of life on earth and its assets vital, we have used it for personal gains without trying to understand its implications.*
- ***Nature Sink:*** *According to Food and Agriculture Organizations, forests alone account for storing one trillion tons of carbon, twice the amount in the atmosphere.*
- ***Stern's Report:*** *The study's researchers found for an average price of $ 27.25 per ton of carbon dioxide in the emissions exchange market, "deforestation can potentially be virtually eliminated." Apart from the price based on Carbon storage capacity, which is just $ 2,500 to 3,200 for 1.5 acres of forest land at a carbon price of $ 35-$50, the valuation of other ecosystems services such as soil conservation, food production and flood and drought control should drive the value of forest lands much higher.*
- ***Immediate Actions:*** *Drastic measurements are required to avoid further deforestation, and derive a methodology to evaluate the cost and implications of the economist's decisions which are driven mainly and mostly by the market.*

X

Food Security - Agricultural Bio-Diversity

YAMINI KURANI, gms

Agriculture and its allied sectors like fisheries are a tradition, which for centuries, has shaped the thought, culture and economic life of people around the world. It, therefore, continues to be central to all strategies for planned socio-economic development of many countries including India. Rapid growth of agriculture is essential not only to achieve self-reliance at national level but also for household food security and to bring about equity in distribution of income and wealth resulting in rapid reduction in poverty levels.

"Agriculture is the backbone of the Indian economy and the villages are the life lines of growth of India".

Agriculture has made lot of progress in terms of growth in output, yields and area under many crops. It has gone through a series of successful revolutions starting with the "Green revolution (food grains), a White revolution (Milk), a Yellow Revolution (Oilseeds) and a Blue revolution (Fishery)".

However the growth of agriculture has slackened during the Nineties. The world population has topped 6 billion people and is predicted to double in the next 50 years. Ensuring an adequate food supply for this booming population is going to be a major challenge in the years to come especially in developing countries where most of the population growth is concentrated. For instance, agriculture is a very important sector for the sustained growth of the Indian economy where 70% of the rural household and 8% of urban households are still principally dependent on agriculture.

Agriculture is at the heart of food security and hence when agriculture is challenged, so is food security.

Feeding Population Vs Growth in Output

The United Nation (UN), 2001 report indicates that the world population will grow from 7.2 billion (2015) to 9.3 billion (2050). This acceleration in demographic growth and the gradual saturation in per capita food consumption for parts of the world population are important factors that will contribute to the growth of food demand and, at the world level, also of production. The world food consumption grew by average 19 %. Of the seven countries with a population of over 100 million (China, Indonesia, Brazil, India, Pakistan, Nigeria and Bangladesh), besides Bangladesh the rest remains at very high levels of per capita food consumption. In India, the projections indicate that population will be 1.5 billion by 2050 which will only increase the demand for an already stressed food production. Rising population and per capita income push up the demand, which needs to be met through enhanced productivity.

Agricultural output has more than kept up with population growth. Better plant varieties, major increases in the use of fertilizers, a doubling of the irrigated area, more effective control of insects and pests, improved strains of livestock and poultry, and wider use of nutritionally balanced feeds have enabled food production to outpace population. However despite this increase, there are over 850 million undernourished people in the world today. Hence it is not a question of "feeding the world" but "keeping the world fed" wherein lies true "food security".

Worldwide, some 1 billion people in 70 of the lower income countries are hungry, and the situation could grow worse in the poorest countries. Ironically, most of these people live in rural areas where food is produced. But food availability does not guarantee food security, which depends also on the ability to buy food and to utilize it effectively. Individual health and education levels, as well as local conditions such as safety of the water supply, affect the ability to utilize food effectively.

The broader reasons for food insecurity are many: war, poverty, population growth, environmental degradation, limited agricultural technology, ineffective policies, and disease. Large-scale scarcity, however, is not on the list since the growth rate in world food production has at last surpassed population growth, meaning more food available per person. But this abundance is distributed unevenly. Many low-income countries have difficulty producing enough food and are thus food-insecure on a national level. More common is inequality of food consumption within countries-the result of uneven purchasing power. This problem exists in even in the highest income and food surplus countries like the United States.

Natural resources base like land, water, forest and the biodiversity being the foundations for both food security as well as environmental sustainability has been irreversibly damaged owing to the increasing food demand and consequently food insecurity. Agricultural production can only be sustained on a long term basis if the resource base like land, water and forest on which it is based are not degraded.

Land resource and its management

The constant increase in the demand of the burgeoning population for food, fodder, fuel and shelter puts a tremendous pressure on our land resources always resulting in a continuous decline of the cultivable land area at a very fast rate. Vegetation that is cleared for varied human activities results in accelerated run-off which in turn gives rise to soil erosion and landscape degradation. These are among glaring environmental problems badly affecting soil productivity and continuously turning productive lands into wastelands.

Among the different processes responsible for land degradation, erosion of soil (through water and wind) is the most destructive. Efficient land resource management needs to be given adequate attention to increase the productive capacity of land and to prevent it from deterioration. Suitable location, specific soil conservation and land reclamation measures based on soil survey on watershed basis needs due priority.

Shifting cultivation which involves clearing a patch of forest land, cultivating it for two to three years and then abandoning it for 10-20 years to allow the natural forest to grow back and the soil to regain its fertility helps in retaining useful trees and plant varieties.

The Jhum cycle as it is called practices conservation and taking care of the ecological balance.

However, with the population pressure, communities wanting to grow more food have cleared greater chunks of forest lands and returned to the fallow plots much sooner than 10-20 years. The length of the fallow phase between two successive cropping phases has come down to even two to three years in some places. This has resulted in soil degradation; fall in yield, lower returns, and reduction in green cover.

It is this change in traditional practice, arising out of changing conditions, that has given jhum agriculture a bad name. Separately, forests are being exploited for timber and hills are being flattened for soil and stones. Often, this denuding of the forest too is blamed upon jhum cultivation.

Agro Chemicals

Despite the fact that an extensive use of fertilizers and effective control of pests and insects through pesticides has been largely responsible for a quantum jump in the agricultural production, their injudicious use has given rise to a number of environmental issues.

There has been a phenomenal increase in the use of pesticides in the world over the last three decades to combat pest attack. The multifarious harmful consequences of its indiscriminate use have posed a serious threat to the ecosystem. And so has the per capita consumption of fertilizers which has been increasing. Although pesticides have always played an important role to prevent crop losses caused by crop pests, their indiscriminate use has given rise to grave consequences such as residual toxicity in food, feed, fodder, environmental pollution, development of resistance in pests to pesticides, destruction of predators and parasites and pest resurgence etc

Environmental pollution such as eutrophication and nitrate contamination of the surface and ground water resources are also caused by such agro-chemicals.

Moreover, pesticides and fertilizers can be expected to be over -used due to risk aversion among farmers. This means that farmers will prefer to over-use them rather than under use them, the latter option being associated with risks of unacceptable increases in the variance of the profit from crop yield. In view of the fact that increased use of pesticides has been seriously endangering the environmental sustainability, integrated approach to pest management needs adequate importance to make the agriculture eco-friendly.

With increasing awareness on the ill effects of pesticides however, and the increasing popularity of Genetically Modified food, a decreasing trend in the extent of pesticide use has been gradually observed.

Genetically Modified (GM Food)

Genetically Modified (GM) foods promise to meet the growing need of the population, this need in a number of ways, which may help in improving food availability, nutritional quality and shelf life of harvested produce and in developing plants resistant to insect pests, disease pathogens and herbicides.

However, as is true with all innovations and changes involving complex systems, there will always be trade-offs. Making the best choices will always be a matter of weighing the risks against the benefits, so as to avoid or mitigate the unwanted consequences, and intelligently deciding which to accept and which to reject. Genetically modified crops (GMCs) have attracted many critics because of their potential impacts on biodiversity, toxicity to non-target organisms, cross-resistance in pests, the higher prices of seeds and foods, monopoly of companies, patent and regulatory approval, and safety to consumers. Some consider that GMCs are unwanted, unsafe and unnecessary, and can lead to an increasing depletion of bio-diversity in agriculture while others favour their introduction and use. The debate about its advantages and disadvantages continues among a wide spectrum of people from different walks of life.

Loss of Crop Diversity

Existence of the strains with vast genetic diversity within the same crop species provides basis for crop improvement. Apart from physical & biological adaptation, a host of economic, cultural, religious, and survival factors have played a role in diversification for instance several varieties of rice and other crops were grown in many parts of India just for their use during festivals, marriages, or other auspicious occasions; several others were grown for their taste, color or smell; yet others for their pesticide or soil fertilization characteristics.

Considering the case of India, like many large tropical countries, it is characterized by a complex mosaic of distinct agro- ecosystem differentiated by their climate, soil, geological, vegetation, crop- growing and other features. According to agricultural scientists at least 166-food crop have originated in India, including rice, pigeon pea, turmeric, ginger, pepper etc. However Enormous exploitation of the forest resources for human activity has given rise to loss of valuable gene pools of different crop species including their wild relatives.

And with present intensive agriculture, continuous cultivation of a limited number of high yielding and economically profitable cultivars of choice, often the end result is the narrowing of genetic biodiversity. It in turn not only aggravates the infestation of insect pests and diseases but also raises concern about the stability of production. Depletion of genetic diversity, an unfettered outcome of the current trend of cultivation, seriously threatens the future progress of the genetic improvement of crop.

This erosion of agricultural bio- diversity threatens the long term stability & sustainability of agriculture itself in many ways. Firstly, it erodes the genetic base on which scientists depends for continuous improvement of crops. Secondly, by opting for high yield varieties (HYV's), farmers becomes increasingly dependent on the industry dominated market and the Government.

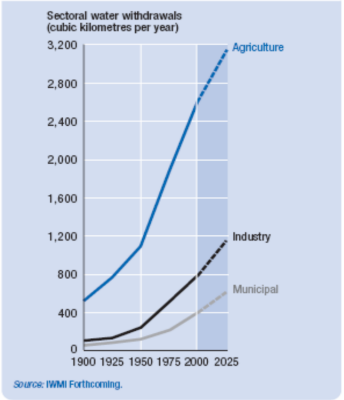
Water resources and its management

Agriculture singularly remains the dominant user of water resources and the gap between population growth and demand for water has also tremendously increased: as the world becomes richer and more industrialized, each person in it has been using more water. In developing countries agriculture still accounts for more than 80% of water consumption. The agricultural sector faces the real challenge. People have a minimum basic water requirement of 20-50 liters each day. Compare this with the 3,500 liters to produce enough food for a daily minimum of 3,000 calories. In other

words, it takes roughly 70 times more water to produce food than people use for domestic purposes. Growing a single kilo of rice takes 2,000-5,000 liters of water. But some foods are thirstier than others. It takes eight times more water to grow a tonne of sugar than a tonne of wheat.

It is estimated that 40% of all crops grown in the world today are grown using irrigation. The practice of irrigation can increase the productivity of crops on what would otherwise be rain-fed agriculture. It can also expand agriculture into areas where it would not otherwise be practiced due to aridity. Such uses lead to vast quantities of water exploitation and also cause extensive pollution, primarily by introducing non point source contaminants. Runoff from agricultural fields often contains fertilizers, animal manure, or pesticides that together form a major source of water pollution.

Agriculture is the still largest user of water



The national Policy on Water, 2002 (India) declares water as scarce and precious natural resource to be planned, developed and conserved as such and in an integrated and environmentally sound basis. Water resources in India will decline in future due to increased urbanization and industrialization.

A World Bank Survey reveals that most of the India's irrigation projects suffer from deficiencies of design, construction and maintenance which are causing poor drainage resulting in water logging, loss of large volume of water, low water use efficiency, loss of large amount of fertilizers etc.

The measures that can be adopted for recommended production technology and crop planning is to increase water use efficiency, crop diversification, Integrated watershed development to use rainwater, ground water, soil water and runoff water efficiently, artificial recharge of ground water through series of check dams in natural streams, percolation tanks and recharge wells etc.

Unsustainable Way "Back to Traditional Farming"

With increasing requirement and demand for resources across the verticals of land, water and the environment in terms of agriculture, one of the few sustainable ways of restoring the balance would be to revert "back to traditional farming".

Traditional farming systems have emerged over centuries of cultural and biological evolution and represent accumulated experiences of indigenous farmers interacting with the environment without access to external inputs, capital, or modern scientific knowledge. Using inventive self-reliance, experiential knowledge, and locally available resources, traditional farmers have often developed farming systems with sustained yields.

Perhaps the greatest challenge to understanding how traditional farmers maintain, preserve and manage biodiversity is to recognize the complexity of their production

systems. However with the tremendous pressure exerted by the population explosion hinders the reversion to such primitive methods.

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Runoff from agricultural fields often contains fertilizers, animal manure, or pesticides that together form a major source of water pollution. The national Policy on Water, 2002 (India) declares water as scarce and precious natural resource to be planned, developed farming systems with sustained yields. Perhaps the greatest challenge to understanding how traditional farmers maintain, preserve and manage biodiversity is to recognize the complexity of their production systems. However with the tremendous pressure exerted by the population explosion hinders the reversion to such primitive methods.

Organic Farming - A Way towards Sustainable Agriculture

"The commercial industrial technologies that are used in agriculture today to feed the world... are not inherently sustainable," A survey of recent studies comparing the productivity of organic practices to conventional agriculture provides an excellent example of the wide range of benefits which can expect from a conversion to sustainable agricultural methods.

"To the consumers, Organic Agriculture offers safe food and to the farmers better profit margins. It is therefore, a win-win option offering business opportunities without compromising ecological balance and soil equity".

Organic agriculture is a holistic approach based on principles and practices defined as Standards, which restores ecological balance by re-establishing natural cycles thus resulting in improved soil health, gradually increasing land productivity, safe food, social justice and value added employment opportunities at farm level.

It hardly needs to be emphasized that in a country where land is a limited resource, and soil fertility a limiting factor, the only way of increasing the resource base is through increased productivity and for this purpose use of external inputs. For this reason, optimum use of inorganic fertilizers supplemented with farm - green manures, crop residue, industrial wastes and biological nitrogen fixation techniques is indispensable. This is more important in view of the fact that soils of India having low organic matter content are generally poor in fertility. Due to soil depletion inadequate use of fertilizers Indian agriculture is operating at a net negative balance of plant nutrients. India would need about 25 millions of NPK in addition to 10 million tonnes of organic and bio-fertilizer sources to produce about 246 million tonnes of food grain required by 2010.

Conclusion

For every human being, today is a reality and tomorrow is a possibility meaning the hungry need food today and not just promises for tomorrow. India produces so much food today that it can ensure food for everybody but as the population is growing and

the per capita land and water availability is decreasing, producing sufficient food for everyone could be difficult. To overcome this problem we have to produce more crops but produce it differently in a manner that high yields can be obtained in perpetuity without associated ecological or social form. Farming systems' intensification, diversification and value addition are extremely important to generate the needed on farm and non farm employment. An awareness for food security has to be spread and there is a need for greater research in the field of breeding crop varieties, having the quality characteristics needed for food processing and exports.

There is no time to relax, both on the production and consumption fronts. The stock of 65 million tonnes should not lull us into complacency. Concurrent attention to production and consumption is important. Enhancing production through an ever green revolution is a priority task. However, eliminating widespread endemic hunger is both a national responsibility and an ethical obligation.

The biggest question remains to be answered - Can we feed a growing population with biologically diverse agriculture? And can farmers achieve livelihood security through diversity? It is evident that there is great potential to increase and sustain food production through a mix of strategies to revive diversity.

M.S Swaminathan's epilogue to his book "From Rio de Janerio to Johannesburg" ends with the concluding lines of W.H.Auden's poem September 1, 1939, in a hope that this decade would see the emergence of global crops of hunger fighters which would ensure that every child, woman, and man, would have an opportunity of healthy and productive life.

"Hunger allows no choice
To the citizen or the police;
We must love one another or die.

Defenseless under the night
Our world in stupor lies;
Yet, dotted everywhere,
Ironic points of light
Flash out wherever the Just
Exchange their messages:
May I, composed like them
Of Eros and of dust,
Beleaguered by the same
Negation and despair,
Show an affirming flame."

Organic Food Security through Naturenomics™ Way

Globally Managed Services (gms) is also working at the grass root level under its trust Balipara Foundation (BF) to bring about the Green Revolution in the North East through its subsidiary companies. These involve work across the value chain - from growing organic produce to aggregation and retail sales of fresh produce from all over the North East. The company believes that it's only through empowerment at the grass root levels that the overarching aim be achieved. Towards this end, it has tied up with not-for-profit organic foundations in India and has set up a Joint Venture Company to focus on

converting a large proportion of land in Assam as certified organic land. The company, through its out reach program has already enrolled over 1,500 farmers and the target is to convert over 5,000 farmers by the year end. In aggregate these would represent over 15,000 ha of land coverage.

The Balipara Foundation (BF) focuses on Organic farming practices and revival of Endemic trees and Plants with commercial values-empowering local communities to "feed themselves", therefore providing for food security, whilst ensuring that the fragile ecological equilibrium does not degenerate in areas of:

- Traditional Agriculture
- Floriculture
- Indigenous Medicinal and Aromatic Plants
- Indigenous and Endemic Tree Plantations
- Wild Crops

NaturalGist

- ***Feeding Population:*** *The gradual saturation in per capita food consumption for parts of the world population will contribute to slow the growth of food demand and, at the world level, also of production. Despite the drastic fall in the growth rates of both population and aggregate demand and production, the absolute annual increments continue to be large.*
- ***Land resource and its management:*** *The constant increase in the demand of the burgeoning population puts a tremendous pressure on our land resources. With the population pressure, communities wanting to grow more food have cleared greater chunks of forest lands leading to depletion in forest cover and increasing wastelands.*
- ***Water resources and its management:*** *Agriculture singularly remains the dominant user of water resources. As the world becomes richer and more industrialized, each person in it has been using more water. The agricultural sector faces the real challenge with increasing water loss.*
- ***Organic Farming- A way towards Sustainable Agriculture:*** *The holistic approach based on principles and practices defined as Standards, which restores ecological balance, increases land productivity, safe food, social justice and value added employment opportunities at the farming level. Sustainable agricultural practices can both feed people and protect oceans, forests and other ecosystems that harbor biological diversity.*
- ***Achieving Sustainable Agriculture development through Naturenomics:*** *Globally Managed Services (gms) works at the grass root level under its trust Balipara Foundation (BF) to bring about the Green Revolution in the North East through its subsidiary companies. These involve work across the value chain – from growing organic produce to aggregation and retail sales of fresh produce from all over the North East. The company believes that only through empowerment at the grass root levels will the overarching aim be achieved.*

XI

Water for Life & Livelihood

GAUTAM NARANG, gms

"Water, water everywhere, not any drop to drink," laments the sailor in Samuel Coleridge's Rime of the Ancient Mariner.

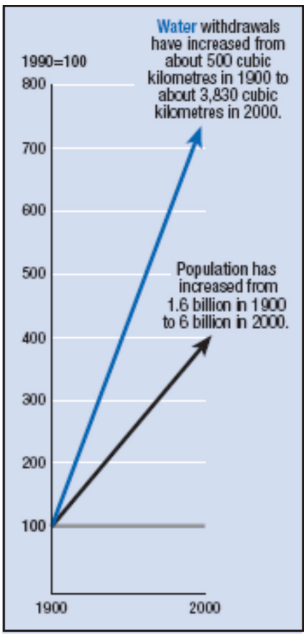
Growing Water Demand

Is the world running out of water? With rise in population and demands on the world's water expanding, and as the argument runs, the future points to a "gloomy arithmetic" of shortage.

Water stress is reflected in ecological stress. River systems that no longer reach the sea, shrinking lakes and sinking groundwater tables are among the most noticeable symptoms of water overuse. The decline of river systems from the Colorado River in the United States to the Yellow River in China is a highly visible product of overuse. Less visible, but no less detrimental to human development is rapid depletion of groundwater in South Asia. In parts of India groundwater tables are falling by more than 1 meter a year, jeopardizing future agricultural production.

Population

Water use has been growing much faster than population for at least a century and that trend is continuing. Over the past hundred years population quadrupled, while water use grew by a factor of seven. As the world got wealthier, it also became thirstier. This can be seen in the table on the right. But looking to the future, it is clear that the pattern of demand for water will continue to change, which also leads us to a question how will the world quench the thirst of another 2.4 billion adding to the present population of over 6 billion people by 2050 from a water resource base that is already under acute stress?



With many of the most water-stressed countries experiencing very high population growth rates, per capita availability is shrinking fast. By 2025 more than 3 billion people could be living in water-stressed countries and 14 countries will slip from water stress to water scarcity.

Changing water patterns in Sector with increasing population In 1900 industry used an estimated 6% of the world's water. It now uses four times that share. Over the same period municipalities' share of water tripled, to 9%.

Irrigated agriculture will remain the largest user of water it currently accounts for more than 80% of use in developing countries.

Looking to the future, it is clear that the pattern of demand for water will continue to change. As urbanization and the growth of manufacturing continue to gather pace, demand for water from industry and municipalities will continue to grow. At the same time population and income growth will boost demand for irrigation water to meet food production requirements.

The human pressure on fresh water supply is not only limited to increased water withdrawals. Increased human activities also destroy water. The quality of groundwater in industrialized countries has deteriorated due to nitrogen leaching from over-intensive agriculture. The state of affairs in developing countries is even more pressing. Close to 75% of all industrial waste and 90-95% of sewage in the developing world is discharged into surface waters without any treatment.

Stressed fresh water Supply

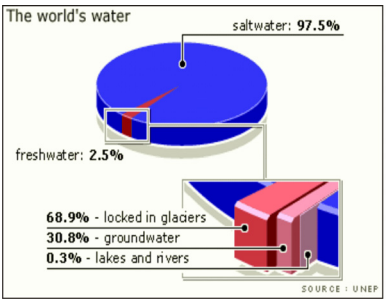
Up to 40% of the world's population lives in water scarce regions. Scarcity of fresh water seen both in terms of rising demands or water depletion and pollution is a critical problem.

Steep increase in population, consumption, and the desire for better living has placed a greater strain on the security of fresh water supply. It is estimated that water use for human purposes has multiplied six-fold in the past 100 years. These projections translate into doubling of global water consumption every 20 years, more than twice the rate of human population growth.
Hydrologists typically assess scarcity by looking at the population-water equation. As noted,
the convention is to treat 1,700 cubic meters per person as the national threshold for meeting water requirements for agriculture, industry, energy and the environment.

Availability below 1,000 cubic meters is held to represent a state of "water scarcity"-and below 500 cubic meters, "absolute scarcity".

Reservoir of Water

One of the largest concerns around the world today is Depletion of freshwater. Although water is one of the most common resources on the planet, only 2.5% of it can actually be consumed, and the rest is salt water. Of that 2.5%, two-thirds is confined to glaciers and permanent snow cover. Only a fraction of the world's water is liquid freshwater, and it is increasingly the subject of conflict and strife as it becomes less available with increasing population.



Availability of fresh water

Unlike oil or coal, water is an infinitely renewable resource. In a natural cycle rainwater falls from the clouds, returns to the salty sea through freshwater rivers, and evaporates back to the clouds. The cycle explains why there will always be water, but supply is finite. Planet

Earth's hydrological system pumps and transfers about 44,000 cubic kilometers of water to the land each year, equivalent to 6,900 cubic metres for everyone on the planet. A large part of this flow is accounted for by uncontrollable floodwaters, or water too remote for effective human use. Even so, the world has far more water than the 1,700 cubic metres per person minimum threshold that hydrologists by convention treat as the amount needed to grow food, support industries and maintain the environment.

At one level the world's water is like the world's wealth. Globally, there is more than enough to go round but the problem is that some countries get a lot more than others. Almost a quarter of the world's supply of fresh water is in Lake Baikal in sparsely populated Siberia. Differences in availability across and within regions further highlight the distribution problem. With 31% of global freshwater resources, Latin America has 12 times more water per person than South Asia. Some places, such as Brazil and Canada, get far more water than they can use; others, such as countries in the Middle East, get much less than they need.

Today, about 700 million people in 43 countries live below the water-stress threshold. With average annual availability of about 1,200 cubic metres per person the Middle East is the world's most water-stressed region; only Iraq, Iran, Lebanon and Turkey are above the threshold. Palestinians, especially in Gaza, experience some of the world's most acute water scarcity about 320 cubic metres per person. Sub-Saharan Africa has the largest number of water-stressed countries of any region. Almost a quarter of Sub-Saharan Africa's population lives in a water-stressed country today and that share is rising. With many of the most water-stressed countries experiencing very high population growth rates, per capita availability is shrinking fast.

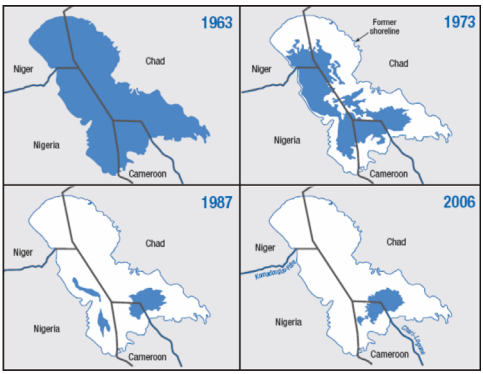
In some areas, water withdrawals are so high, relative to supply that surface water supplies are literally shrinking and groundwater reserves are being depleted faster than they can be replenished by precipitation. This can translate into increased costs of water supply for economic activities and for daily human needs.

Shrinking Lakes, Drying Rivers

Mismanagement of international water basins threatens water security in some very direct ways. Shrinking lakes and drying rivers affect livelihoods in agriculture and fisheries, deteriorating water quality has harmful consequences for health, and unpredictable disruptions in water flows can exacerbate the effects of droughts and floods.

Lake Chad

The lake is one-tenth the size it was 40 years ago. Failed rains and drought have been major factors but so has human agency. Between 1966 and 1975, when the lake shrank by a third, low rainfall was almost entirely to blame. But between 1983 and 1994 irrigation demands quadrupled, rapidly depleting an already shrinking resource and setting in train rapid losses of water. Weak cooperation

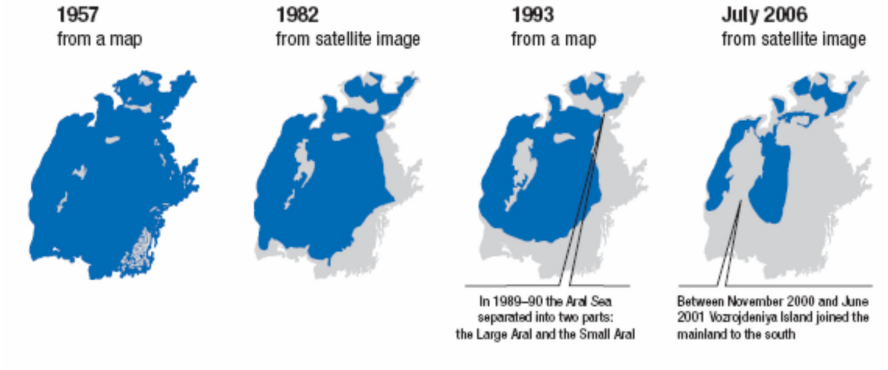


among the Lake Chad basin countries offers part of the explanation. Environmental decline and the erosion of livelihoods and productive potential have gone hand in hand. Over fishing is now institutionalized, with scant regard to rules meant to regulate use among Chad, Cameroon, Niger and Nigeria. Badly planned irrigation projects have also contributed to the crisis.

The environmental consequences of unsustainable water use can eventually feed back to disrupt infrastructure investments.

Diverting Rivers from Aral Sea

Half a century ago technological ingenuity, ideological zeal and political ambition persuaded Soviet planners that the Syr Darya and the Amu Darya, the great rivers of Central Asia, were being wasted. These rivers were carrying the snowmelt from high mountains into the closed basin of the Aral Sea, then the world's fourth largest lake. Diverting the water into production was seen as a route to greater wealth, with the loss of the Aral Sea a small price to pay. As one contemporary authority put it: "The drying up of the Aral Sea is far more advantageous than preserving it, Cultivation of cotton alone will pay for the existing Aral Sea [and] the disappearance of the Sea will not affect the region's landscape.



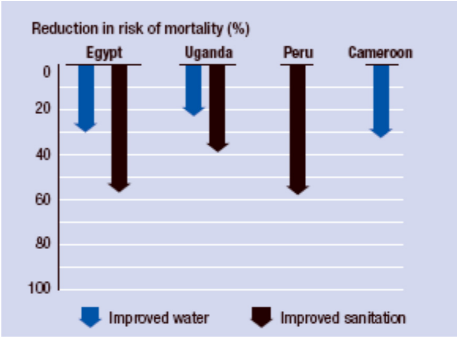
The diversion of water to support cotton through an inefficient irrigation system strangled the Aral Sea.

Lake Chad and the Aral Sea illustrate in an extreme way what happens when water flows are radically changed. In both cases water shortages have been a central part of the problem. However, water scarcity has been engineered literally in the Aral Sea through human intervention and diversion, highlighting the role of policies in fostering unsustainable water use patterns.

Water War

Water for Life

The crisis here is about the widespread violation of the basic human right to water. That violation results in nearly 2m avoidable child deaths, huge gender inequalities and losses in wealth creation. Unclean water is trapping millions of the world's poorest people in cycles of deprivation.



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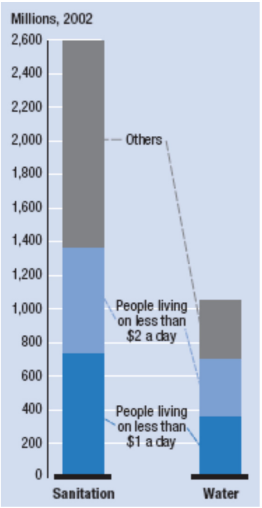
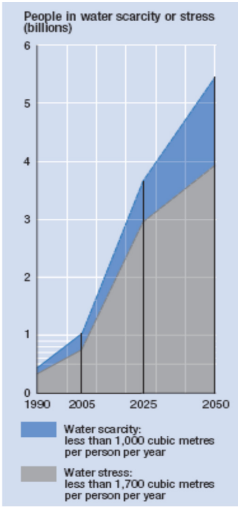
Water for Livelihood

Chronic water stress poses a huge threat to human development. That threat is visible in the collapse of ecological systems, intensifying competition for water, and crossborder tensions.





Climate change and Water Security

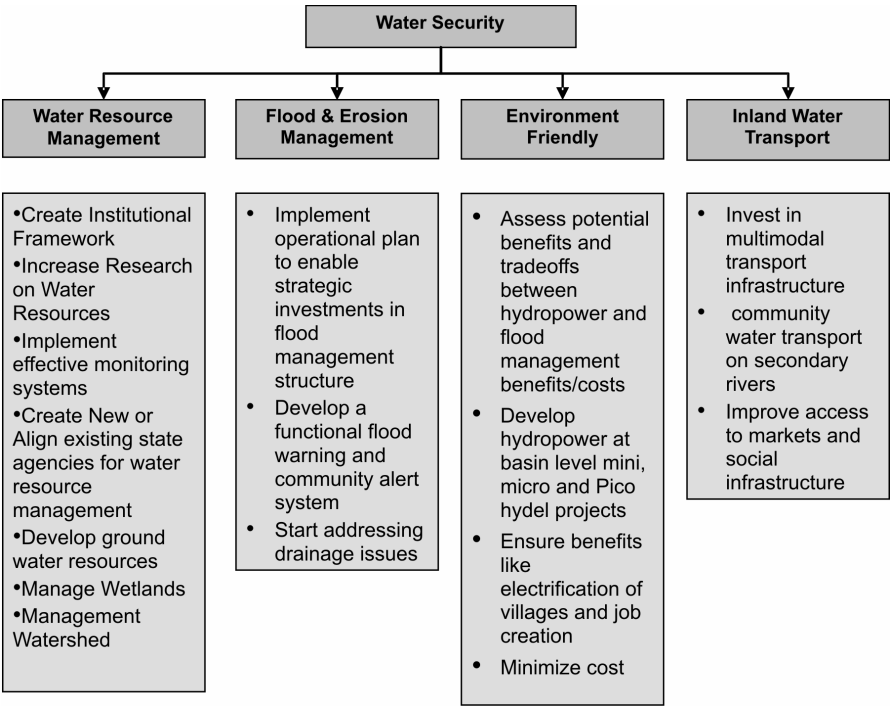
Global warming may already be with us, but the much greater warming forecast for the 21st century will produce vast changes in evaporation and precipitation, allied to a more unpredictable hydrological cycle. Higher air temperatures will increase evaporation from the world's oceans, intensifying the water cycle. They will also mean faster evaporation of water from land, so that less rainfall reaches rivers. These changes will be accompanied by new rainfall patterns and more extreme weather events, including floods and droughts.

In many parts of the world glaciers act as water banks. They store ice and snow in the winter and release it slowly as temperatures rise, sending flows of water down to agricultural producers in lowland areas. Today, these banks are melting at an accelerating rate. And as glaciers retreat, water stocks are being depleted on a large scale. Rising sea levels will be among the most powerful determinants of water security for a large share of the world's population in the 21st century. Increased salinization could dramatically reduce freshwater availability for many countries, while coastal flooding threatens millions of livelihoods.

Water Management the Naturenomics™ way...

Water Security

The main idea is to create a framework that will allow us to securities water regions where it is in abundance and create optimal use that will benefit the regions economy. There is significant potential for renewable natural resources to generate benefits at the regional and local levels. However, these resources alone, without enabling institutional frameworks and an integrated vision, will not bring development. An initial effort has to be made to develop such an integrated view and to show how the different sectors are linked to each other, and also how the macro and micro levels are connected.



NaturalGist

- ***Growing Demand of water:*** *How will the world feed another 2.4 billion adding to the present population of over 6 billion people by 2050 from a water, resource base that is already under acute stress?*
- ***Population:*** *Water use has been growing much faster than population for at least a century and that trend is continuing. Over the past hundred years population quadrupled, while water use grew by a factor of seven. By 2025 more than 3 billion people could be living in water- stressed countries and 14 countries will slip from water stress to water scarcity.*
- ***Availability of Freshwater:*** *Although water is one of the most common resources on the planet, only 2.5% of it is freshwater and of that also 2.5% can be used as the rest is locked in the form of ice gaps. Only a fraction of the world's water is liquid freshwater, and it is increasingly the subject of conflict and strife as it becomes less available.*
- ***Inequitable water distribution:*** *At one level the world's water is like the world's wealth. Globally, there is more than enough to go round but the problem is that some countries get a lot more than others. For example almost a quarter of the world's supply of fresh water is in Lake Baikal in sparsely populated Siberia. Differences is in availability across and within regions further highlight the distribution problem.*
- ***Water Scarcity:*** *A water Security framework which will lead to water Resource Management, Flood & Erosion Management, hydropower projects, in a Naturenomics way.*

XII

Towards a Greener Future

KALPESH POPAT, gms

The risks associated with climate change are now well documented and at the same time widely debated. Businesses and policy-makers needs to work together and invest in the development of technology that will be energy efficient or in other words "Carbon Positive". Toyota, British Petroleum (BP), Indian Tobacco Corporation (ITC) are few amongst many other companies who have taken voluntary initiative to save the only home we have. But the task is gigantic and will need the hand of all.

Environment Social Responsibility (ESR)™, a business division initiative under the NaturenomicsTM framework, helps firms develop a 360 degree approach to sustainable profits by managing natural assets and their operating environment in a sustainable manner. A general idea revolves around:

Reusing of the natural resource by means of recycle. Example:

- **Managed Forestry,** under which case the ecosystem and bio-diversity are protected by continuous regeneration of the forest, and at the same time generating revenue through cultivation.
- **Managed Water,** wherein the rivers, lakes are maintained and kept clean and recharged by third party who will want to generate revenue by providing navigation facility through water, distribution of drinking water, mineral water system, water for irrigation facility, to generate the hydro energy, and / or simply by encouraging tourism.

Right Use of the natural resource, by value addition. Example:

- Using Wind and Solar power to generate energy and thereby reducing the need of coal based power plants.
- Using Forest, Land, Ocean for Carbon Sequestration and thereby offsetting the Co2 generated by Power and Industry sector.

Innovation, by means of investment in Research & Development, Example:

- Fuel cells, where in hydrogen is used as fuel to generate energy.
- Energy efficient products ranging from computers, lights, motors, and fuel efficient vehicles leading a path towards ultimate eco-friendly car that runs on alternate fuel technology.

At the forefront of environment sustainability is ITC. Presented below is an excerpt from the firms Annual Report which highlights leading edge initiatives in the environment sustainability space:

ITC does it Green

As a company that strives to be 'Citizen First', ITC attaches critical importance to its responsibility to contribute to the 'Triple Bottom Line', namely the augmentation of economic, ecological and social capital.

This commitment finds expression in the Company's sustainable development philosophy, which recognizes the need to not only preserve but also enrich precious environmental resources while providing a safe and healthy workplace for its employees.

The Amsterdam-based Global Reporting Initiative has recognized ITC's Sustainability Report 2006 to be the first in India and one of the first 10 reports globally to conform to G3, the latest Sustainability Reporting Guidelines. CII-ITC is engaged in creating awareness, promoting thought leadership and building capacity among Indian enterprises on issues relating to sustainable development.

Social Forestry Project

ITC, in collaboration with the programmes of the Government of Andhra Pradesh, initiated Social Forestry Project under which 9,069 hectares were covered till date, resulting into revenue generations through cut plantations for 10,510 poor households spanning across 380 villages.

To-date 876 households harvested their plantation earning a total of 4 crores. The farmers own income have been invested wisely into productive assests to ensure a long-term virtuous cycle of development, called Village Development Fund which has now grown to Rs 46 lakhs by the close of the financial year.

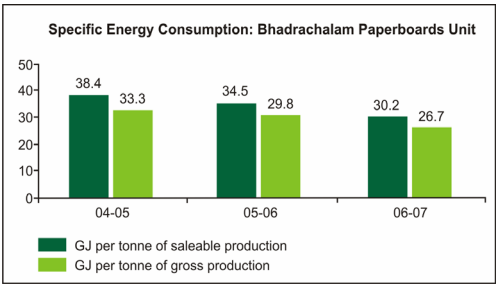
Soil & Moisture Conservation

Soil & Moisture Conservation programme created a total of 1,531 large and small water harvesting structures, in identified moisture stressed districts through soil and moisture conservation works covering an area of 26, 704 hectares and 21, 399 farmers in 460 villages.

This resulted in a significant shift towards a double-cropping regime in these areas as a result of effective ground water recharge.

Being Carbon Positive

ITC continues to make progress in creating positive environment through Energy conservation and Carbon Sequestration through forestry.



Energy Conservation

Threshing units achieved a 20.8% reduction, Cigarette and Paper

businesses achieved 14.8% and 9.3% reduction, respectively.

Co2 Sequestration

The total Co2 (equivalent) emitted by ITC units in 2006-07 amounted to 1,143 kilo tonnes (1,202 KT in 2005-06). At the same time ITC also helped sequester 2,025 KT of Co2 (1,244 KT in 2005-06) hence maintaining the status of 'Carbon Positive Company' for the second year in a row.

Raw materials sustainability

Wood being the major source of fibre for the paper and paperboard industry. ITC's paperboards mill at Bhadrachalam manufactured over 283,470 tonnes of paperboards in 2006-07, required 273,656 tonnes of wood.

ITC's strategy revolved around providing opportunities to the economically backward by helping them raise plantations under its forestry project. At the same time ITC's R & D has evolved high yielding, site specific, disease resistant clones resulting into distribution of 119 million high quality saplings to farmers during the year.

Apart from increasing the green cover this effort also contributes to in-situ moisture conservation, ground water recharge and significant reduction in top soil losses due to wind and water erosion.

Water Positive: Five Years In A Row

India faces a turbulent water future. With over 16% of the global population having access to less than 3% land mass and less than 4% fresh water resources in the world, water scarcity in India is likely to worsen over the years.

By implementing water audit recommendations, deploying advanced technology, increasing awareness and improving resource management, ITC's Packaging & Printing business achieved 33% reduction, the Leaf business 21 %, the Cigarette business 13% and Paperboards & Specialty Papers business 6.3 % reduction in water consumption this year.

ITC also continued to invest in creating additional rainwater harvesting capacity both within the Company and through watershed development projects in socially relevant areas. As a result a total of 23.6 Million KL RWH potential was created till date.

Zero Solid Waste

The Central Pollution Control Board has reported that even in large and medium cities in India, the major mode of solid waste disposal is by land filling/dumping.

In most cases, the dumping sites are not only serious health hazards to people living in the neighbourhood but are liable to contaminate ground water too.

ITC's unique endeavour to recycle all the solid waste generated by the Company's operations has resulted in overall solid waste recycling to 96.2 % in the 4th quarter of 2006-07

NaturalGist

- ***Business and policy-makers*** *need to work together and invest in the development and deployment of low carbon fossil fuel technology.*
- ***Radical innovation*** *is required in automobiles industry. Automobiles of the future must increase both environmental, safety and driving performance. At the same time, these solutions should also take into account the convenience and comfort.*
- ***Hybrid technologies*** *can be adopted for fuel cell vehicles and are key technologies for the development of the ultimate eco car.*
- ***Alternative Energy*** *has made progress in four low- carbon technologies: solar, wind, hydrogen power and gas power.*
- ***Biofuels*** *were seen as another major contributor to global energy of future, helping to reduce for fossil- derived hydrocarbons and support in CHG emissions.*
- ***Enrich Environment:*** *The need is not only to preserve but also enrich precious environmental resources while providing a safe and healthy workplace for the employees.*
- ***Zero waste*** *leading to solid waste management. Effluent Water Recycling and Rain water harvesting is the key to minimize the depletion of the limited resources and thereby achieve sustainability.*
- ***To sum up:*** *the mantra 'reduce, reuse and recycle' should now go hand in hand with securitizing of our natural resources.*

XIII

Preparing for a Low-Carbon Future

CHRISTOPH GROBBEL, JIRI MALY, AND MICHAEL MOLITOR, MCKINSEY & CO.

Tackling carbon exposure is more than good environmental stewardship; it could also protect a company's share price in the near term and create a long-term competitive advantage.

Although corporate liability for carbon emissions has been overshadowed by louder calls for governance reform, it has risen inexorably on the shareholder's agenda. Large institutional investors, such as Calpers and the pension funds of New York State and New York City, are pushing companies to report their carbon "footprint"-the total amount of carbon dioxide that they and their suppliers emit-and to define their risk exposure to regulations that limit emissions. The Carbon Disclosure Project, a group representing institutional investors managing $10 trillion in assets, has sent questionnaires to 500 of the world's largest companies (including airlines, automobile manufacturers, insurers, power generators, retailers, steelmakers, and technology companies) asking them to explain their emissions policies and strategies. The project then publicizes the response (or lack of one) for investors to note.

This intensifying level of scrutiny isn't simply a call for environmental stewardship, although that might play a role. Rather, it is born of concern that over the next 5 to 15 years the way a company manages its carbon exposure could create or destroy shareholder value. The companies with the most to lose, at least initially, are those whose production processes generate a lot of greenhouse gases, particularly carbon dioxide. Businesses (such as airlines, auto manufacturers, and logistics companies) that make or rely on products that generate carbon dioxide must also be wary. Even companies that fall into neither category must pay close attention. Rising input costs-for energy or transportation, say-will affect companies of every stripe, from retailers that consume energy in their stores to consumer product companies that design packaging, and investors will increasingly hold them responsible for managing emissions. Managers who fail to respond to calls for more transparency and better planning will face greater public censure or even charges of breach of duty, say shareholder activists. They might also find the share price of their companies discounted in capital markets.

The new pressure may come as a jolt to executives, many of whom are unsure how to respond in a climate of regulatory uncertainty. The United Nations' Kyoto Protocol, which requires industrialized countries to reduce greenhouse gas emissions to about 95 percent of their 1990 levels by 2012, went into force with Russia's ratification in late 2004. But several key players-particularly the United States and Australia-haven't signed on. In the absence of universal ratification, individual governments at the supranational, national, regional, and state levels are coming up with their own regulations on carbon emissions: the European Union's Emission Trading Scheme comes into force in January 2005, for example, and state and regional governments in Australia, Canada, Japan, the United States, and elsewhere are also setting new rules.

The particulars differ, but the bottom line is the same: emitting carbon and other substances will become more expensive, and shareholders want to know how executives plan to manage these costs.

Although all companies will experience the consequences of increased regulation, the big emitters will be the first to feel the pressure. Companies in the cement, oil-refining, power, pulp and paper, and steel industries will likely soon be subject to cap-and-trade schemes in Europe, North America, and Japan-and, eventually, in the developing worldas countries and regions try to meet the goals of the Kyoto agreement. When programs come into force, executives in these industries will have to weigh the trade-offs of maintaining their current emissions, buying allowances and credits, or reducing their carbon output and selling their allotted credits. Understanding the cost of emissions in these industries will in turn help executives from others to identify areas in their own supply chains where costs are likely to rise. Companies in all industries, whether or not they emit carbon in their production processes or produce goods that emit carbon, should set up new tracking and reporting processes to keep shareholders informed. Many companies will also need to work with regulators to shape the rules and make them as clear as possible.

The economic impact

For big emitters, the direct costs of emission credits are relatively easy to understand: in a cap-and-trade scheme, companies that exceed their allotted level must purchase additional credits or allowances at open-market prices from their competitors. Companies thus have an incentive to cut their emissions, and the incentive grows if they reduce emissions below the cap, because they can then sell surplus credits to companies that are over the limit. Decreasing the need for credits-through smart investments in cleaner technology, for example-will thus become an important strategic consideration, as will using import barriers or other means to fend off competition from companies (often in less regulated countries) that have lower emission costs.

We studied the likely impact of regulation and emission costs on the economics of several carbon-intensive industries in Europe and found surprising differences among them differences that are also likely to characterize other regions. Carbon regulation, for example, will raise costs for all European steel producers, but those that face greater competition from cheaper imports, such as makers of flat-steel products (used for car bodies), could suffer more than makers of long products (used in construction), which are less exposed to foreign substitutes. Cement manufacturers might actually benefit from carbon regulation: their emission costs will mostly be covered by allocated allowances, and since the threat of imports in cement is fairly low they will be able to pass on to customers any costs they do incur. Some cement producers could do even better by investing in a more carbonefficient process that uses slag, a by-product of steel production. In fact, the value of slag is likely to rise owing to this demand, thereby helping to offset the cost of carbon regulation in the steel industry.

Oil refiners face a mixed prognosis. Reduced demand for common residual fuel oil (which is used to generate power in some parts of the world and emits more carbon dioxide than do other fuels, and far more than natural gas) should help keep down the price of heavy crude oil. That could benefit the more complex refiners, which can convert it into motor fuels. However, a drop in demand for petroleum would hurt the entire industry.

These dynamics show why companies in industries whose production processes emit a lot of carbon should compare their competitors' exposure to carbon caps with their own. As they do so, many will revisit their strategies. Some oil companies, for instance, are going to find that certain investments-such as updated refinery technology to convert cheaper, heavier crude oil into motor fuels-will begin to look attractive. Other types of companies will look hard at whether they can go on conducting business as usual: for example, steel mills using basic oxygen furnaces that emit high levels of carbon dioxide to produce flat and rolled products could be better off shutting down production and selling carbon credits.

For companies in all industries, the efforts of big emitters to comply with and thriv e under cap-and-trade schemes will have a number of implications. One is that the price of energy, insurance, and carbon-intensive commodities such as steel, processed minerals, and paper is likely to rise as regulators impose caps on greenhouse gas emissions. Another is that executives could find that carbon regulation inspires new growth opportunities, which might arise in low-emission versions of familiar products (advanced diesel engines or natural-gas power generation, say). The opportunities could also involve emerging substitute technologies, such as carbon sequestration (removing emissions from the production process and then storing them underground or injecting them into oil and gas wells to improve yields) and advanced technologies that convert coal into cleaner-burning liquid or gas fuels. Some companies might consider changing their portfolios to sell products with a lower carbon footprint, though such analyses are complex. More greenhouse gases are emitted during the manufacturing processes of cars made of aluminum rather than steel, for example, but these cars, being lighter, burn less fuel and so generate less carbon dioxide over their lifetimes.

Move to reduce emissions

Given the high probability that heavy carbon emitters, depending on where they operate, will sooner or later become subject to cap-and-trade regulations, and the intense interest of shareholder groups in the meantime, these companies should immediately try to cut emissions by taking "no-regrets" moves. Some are straightforward: fixing leaks, reducing waste, and keeping up with preventive maintenance. But before executives decide on any complex and long-term move, they will have to compare the cost of two alternatives reducing emissions or buying more credits-by factoring the cost of carbon emissions, as a financial variable, into their capital-investment planning. Heavy emitters, like all other companies, will also need a sourcing strategy to manage the impact of carbon regulation on the cost of key inputs, such as electricity.

In addition, executives will have to understand where the emission boundaries fall within the value chains of their companies and how they can make choices that minimize their exposure to carbon-induced risk. An aluminum producer, for example, can reduce its own emissions by switching to processes that emit lower levels of greenhouse gases or use less electricity. It can also influence emissions further up the value chain by purchasing either electricity from a "green" power generator or the emission credits it needs from the market (thereby creating a demand for other companies to generate those credits) and by providing incentives to suppliers or even funding their investments in cleaner processes.

The company might take these steps not out of altruism but because it could then label its aluminum "carbon reduced" or "carbon free." Eventually, consumers might demand

carbon-reduced cars because banks and auto insurers, spurred by a desire to reduce the damage that climate change wreaks on their own portfolios, offered better terms for such vehicles.

Less heavy emitters will also want to evaluate the amount of carbon they emit and consume. In 2002 Colgate-Palmolive, for example, began estimating the emissions (mostly generated by purchased electricity) from its manufacturing and research facilities and asked a third party to verify the findings. It also redesigned its packaging to reduce the amount of fuel needed to transport finished products.

As a company works toward a sustainable approach to the carbon issue, it develops an internal culture and skills that help it meet regulations when they are implemented, thus potentially gaining a competitive advantage. In 2004 Shell Canada and its partners, for instance, won approval for expanding operations in the oil sands of Athabasca, in Alberta.

The reason, in part, was that the company had already improved on environmental targets set by regulators and was more experienced than its competitors at communicating a project's environmental impact to community leaders and at involving them in its decisions.

Track and report financial risks

Most companies, regardless of their carbon footprint, will have difficulty responding to shareholders' calls for more transparency and accountability on carbon emissions, especially because reporting standards for carbon monitoring are not well defined. Almost every company above a certain size, in nearly every industry, must learn how to account for the quantity of carbon dioxide emitted from or consumed by its business.

Financial analysts, who have been calling for more transparency, are helping to develop global reporting standards to aid in the rating of companies. In Europe's utility sector, for example, several new variables make it possible to measure carbon emissions against production or revenue, although these variables are still new and their relationship to the more common financial metrics is untested. Other efforts to quantify the risk induced by carbon emissions include the investment guidelines that the finance initiative of the United Nations Environment Programme will publish in the summer of 2005 and the Goldman Sachs Energy Environmental and Social Index for leading oil companies. The index includes five measures of climate change and ranks companies accordingly, but it offers only a general link to corporate valuations. Ceres, a coalition of US companies, investor groups, and environmental organizations, uses a similar method to analyze oil refiners. These approaches highlight differences among companies, thereby helping to identify leaders and laggards, but have yet to quantify the connection between movement in the indexes and the long-term performance of a company's shares. Companies in heavy-emitting industries will probably be the first affected by standards for measuring carbon accountability. But executives from all industries should be involved in the development of these standards in order to ensure that they are efficient and that the accounting is logical.

Help shape regulations

Uncertainty about future regulations is the biggest risk in the carbon equation: executives need long-term assurances on credits and emission levels to factor them into plans for expensive capital investments. Both the Kyoto Protocol and the EU's Emission Trading Scheme set preliminary goals, but it is unclear what will happen thereafter.

Working to delay or derail regulations sends the wrong message to concerned shareholders and could leave management unprepared for inevitable changes in the regulatory environment and in the resulting industry economics. By helping to shape the regulations, executives can reduce the level of uncertainty and make the rules as clear and fair to their industries as possible. In Germany, for example, some chief executives in the power industry saw the Emission Trading Scheme as a threat to the financial health of their companies, which relied on coal and lignite to generate electricity. But by working with regulators, these executives won a four-year window of opportunity for transferring the allowances of the old plants to cleaner new ones, thus subsidizing their construction.

Policy makers like the arrangement because the new coal plants emit less carbon dioxide than their predecessors, at a cost three to four times lower than that of heavily subsidized wind-power plants. Environmentalists like the almost 30 percent reduction in carbon dioxide emissions.

As heavy-emitting industries gird themselves to comply with cap-and-trade schemes, and as investor groups begin to pressure all big businesses to disclose their emission policies and strategies, companies in every industry must act preemptively rather than stonewalling or merely reacting to regulations. In this way, executives can show that they understand the risks from their companies' carbon footprint and are working to reduce the exposure.

Managing product emissions

Carbon regulations have so far focused mostly on the direct sources of emissions created when goods are produced or power is generated. But products-such as auto, airplane, and other engines-that emit carbon dioxide when they are used are also a big part of the carbon equation. Most of them are employed in the transportation sector, which, in addition to airlines and automotive companies, encompasses trucking, railroads, post and parcel services, forwarding and logistics, urban transit, and travel and tour operators (including rental-car fleets). All in all, this sector generates about 20 percent of the world's greenhouse gas emissions, and its share is growing more rapidly than those of other sectors. Since carbon-trading schemes for hundreds of millions of car owners would be difficult to implement and manage, regulation in this sector will probably focus on fuel-efficiency requirements and fleet reductions. New rules in California, for example, aim to reduce emissions from commercial fleets and other passenger vehicles by 30 percent as of 2017, and the United Kingdom bases taxes on corporate cars solely on their carbon dioxide emissions.

Executives in any sector (including agribusiness and forestry) whose product emissions are a concern will have to cope with regulations to reduce emissions from products and from the delivery of services. To meet fuel-efficiency product emission targets, for example, automobile manufacturers will need to reconsider their product mix and

customer segmentation plans and to invest in new automotive technologies. Licensing and partnerships will become increasingly important for acquiring new technology and developing products and revenue streams. Toyota Motor, for example, is licensing its Prius hybrid-engine technology to Ford Motor for a relatively small sport utility vehicle, the Escape, and Renault is supplying Nissan with diesel engines.

Airlines have fewer options. Aircraft engines are already very efficient, but airlines could reduce their emissions at airports by improving their aircraft-taxiing procedures and managing auxiliary power units more effectively. Even so, an expected rise in air traffic throughout the world, especially in Asia, will outweigh minor improvements of this kind as well as new aircraft designs. Airlines have thus far avoided carbon regulation, and in many cases jet fuel is taxed lightly or not at all, unlike fuel for cars and trains. But that free ride could end: the EU wants to include airlines in its Emission Trading Scheme after 2008.

Closer scrutiny should prompt companies in the transportation sector to work closely with regulators to shape the rules that will affect it. Auto manufacturers, for example, might want to seek tradable credits for any low-emission vehicles they produce, either to use against their own manufacturing emissions or to sell to other companies. And fleet operators, including big logistics companies such as FedEx and UPS, should seek to earn credits for running low-emission autos and trucks, thereby further increasing demand for low-carbon vehicles and generating even more credits for auto manufacturers.

The authors wish to thank Richard Duke for his contributions to this article.

NaturalGist

- ***Carbon Disclosure Project:*** *Tackling carbon exposure is more than good environmental stewardship; it could also protect a company's share in the near term and create a long – term competitive advantage. Large institutional investors, such as Calpers and the pension funds of New York State and New York City, are pushing companies to report their carbon "footprint" – the total amount of carbon dioxide that they and their suppliers emit.*
- ***Carbon Management:*** *Over the next 5 to 15 years the way a company manages its carbon exposure could create or destroy shareholder value.*
- ***The economic impact:*** *Companies in industries whose production processes emit a lot of carbon should compare their competitor's exposure to carbon caps with their own. As they do so. Many will revisit their strategies. Some companies might consider changing their portfolios to sell products with lower carbon footprint, though such analyses are complex. More greenhouse gases are emitted during the manufacturing processes of cars made of aluminum rather than steel, for example, but these cars, being lighter, burn less fuel and so generate less carbon dioxide over their lifetimes.*
- ***More to reduce emissions:*** *Before executives decide on any complex and long term move, they will have to compare the cost of two alternatives- reducing emissions or buying more credits from a company with smaller carbon footprint.*
- ***Track and report financial risks:*** *As reporting standards for carbon monitoring are not well defined, most companies, regardless of their carbon footprint, will have difficulty responding to shareholders' calls for more transparency, are helping to develop global reporting standards to aid in the rating of companies.*
- ***Speed up shaping regulations:*** *Working to delay or derail regulations sends the wrong message to concerned shareholders and could leave management unprepared for unevitable changes in the regulatory environment and in the resulting industry economics.*
- ***Managing product emissions:*** *Executives in any sector (including agribusiness and forestry) whose emissions are a concern will have a scope with regulations to reduce emissions from products and from the delivery of services. Example, to meet fuel- efficiency for the automobile manufacturers.*

XIV

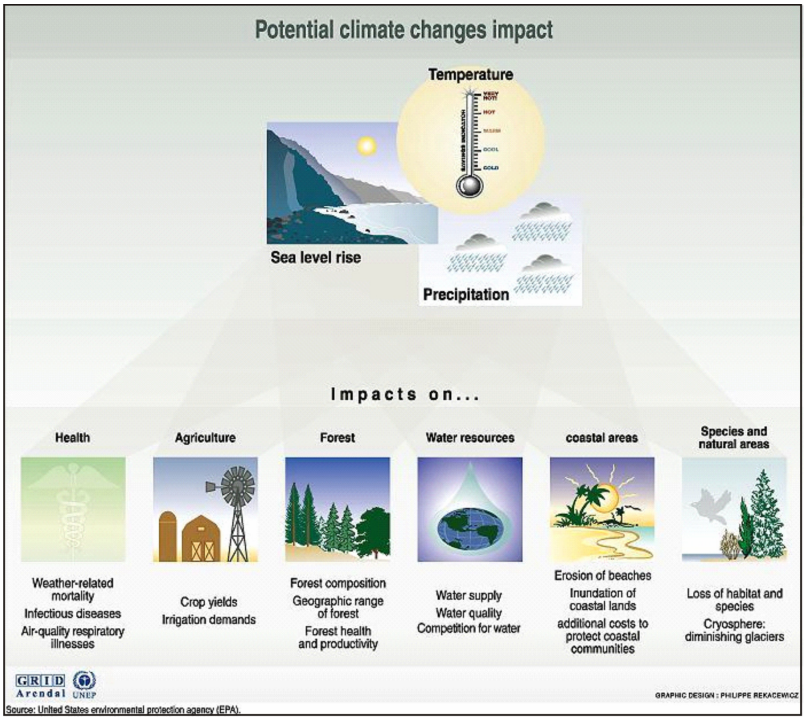
Global Warming - Mitigation and/or Adaptation

RATI BHATTACHARYA, gms

Climate change and its related consequences are interlinked with every aspect of the living world, that it can be perceived as a 'web' where every living entity is a mere thread in the web and whatever we do to the web we do to ourselves.

The 'Web' of Global Climate Change

The models of climate change serve as the tool to understand and evaluate the impacts of the changing climate and the associated global warming on various different sectors ranging from agriculture, industry, energy, to forestry, natural ecosystems and most importantly the direct and indirect impacts on human health. The climate change impacts can thus sharply be divided into the market and non-market impacts. Agriculture, forestry, fishery, energy, water, transportation, capital loss, dry land loss and natural disasters like floods, hurricanes and cyclones can be classified as the market damages whereas wetland loss, loss of biodiversity and species loss can be classified under the non-market damages



As seen from the figure, we would be hit badly across the following sectors:

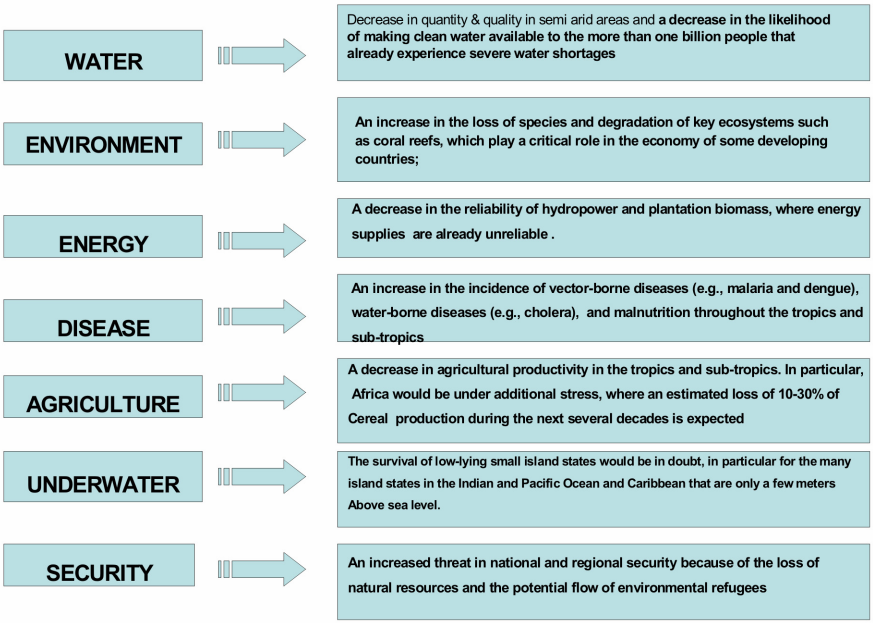


Figure 1: Characterizing impacts of climate change across various sectors

Mitigation and Adaptation - The solutions to Climate change

The issue of 'how to deal' with this increasing threat from global warming particularly in a developing country has to be addressed from all possible approaches both at an individual level and from the government's level. The formulation of an appropriate policy response towards the climate change forms the most integral part of dealing with this threat which puts both-the people and the economy of the country, at risk.

'Mitigation' and 'Adaptation' are the two options to fight against the global threats of climate change.

The Road to Nirvana - Curbing Emissions

Slowing and ultimately reducing man-made CO2 emissions is a complex challenge as fossil fuel usage is not likely to cease any time soon, either in industrialized or less developed countries.

Therefore, a variety of strategies are needed to reduce CO2 emissions and remove carbon from the atmosphere in order to mitigate the potential effects of climate change. These processes are refered to as 'Mitigation'.

What is Mitigation?

Mitigation is a proactive action taken in the present towards preventing the long term effects due to climate change and global warming. Mitigation basically focuses on the cut down of Green House Gas (GHG) emissions.

The resultant effect of this decrease in the green house gases is not necessarily felt in the region involved in particular process of mitigation. This is so because mitigation of the GHG revolves around those changes that are being made in the global carbon cycle. Thus, the impact of what mitigation activities are being practiced today will be felt only by the future generations. Mitigation can be thus addressed as a "global" phenomenon to which every region needs to contribute.

Potential solutions through mitigation include two broad frameworks –

- **Reduction** (also known as short term reductions) and
- **Carbon Capture Storage (CCS)** also known as Carbon Sequestration (long term reductions).

Short term reductions are achieved through processes which act towards the immediate 'cut – down' of the 'sources' of carbon dioxide. Whereas the medium for the long term emission reduction processes aims to enhance the 'sink' of the carbon dioxide. Sequestration of carbon forms one the prominent tool in this process. It ensures the lock of carbon dioxide inside the earth's layer.

No practical means are known for capturing CO2 from the exhaust of "mobile sources," such as automobiles.

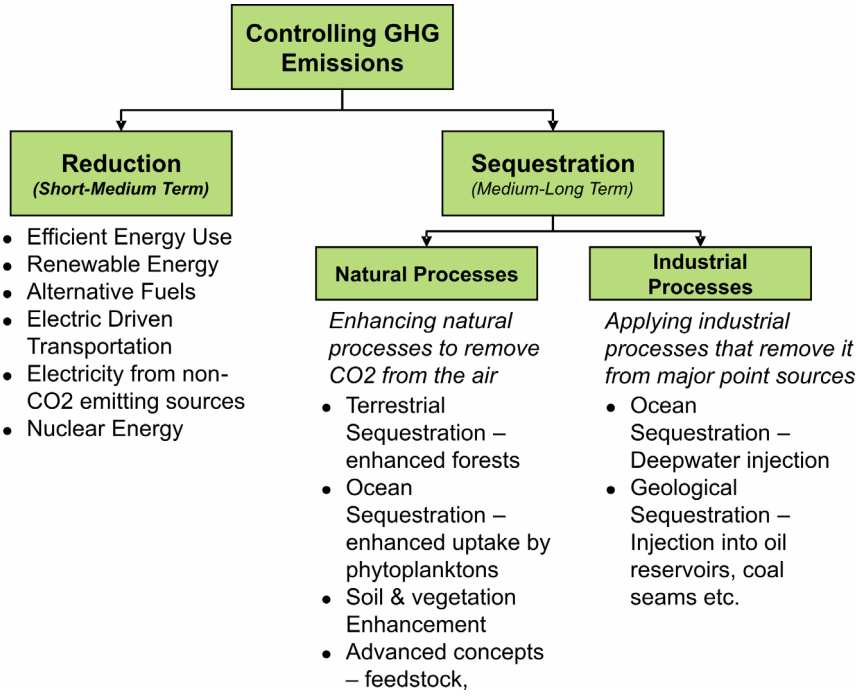


Figure 2: The potential 2 board solution frameworks for controlling GHG (Mitigation Strategies)

Kyoto Protocol - The most effective mitigation tool

On February 16, 2005, the Kyoto Protocol, an international and legally binding agreement to reduce GHG emissions worldwide, entered into force. The Kyoto Protocol supplements the United Nations Framework Convention on Climate Change (UNFCC or the Convention) and it stipulates action which requires industrialized countries to reduce their carbon emissions by an average of 5.2 per cent below their 1990 levels in the period 2008-12. The Protocol recognizes that climate change is a consequence of emissions from the developed world and therefore places the burden of emissions reductions on these countries.

141 countries currently ratify Kyoto Protocol and account for 61% of GHG's. Both the United Sates and Australia have rejected the Protocol. The Protocol also allows these countries the option of deciding which of the six GHG's it controls as part of their national reductions strategy.

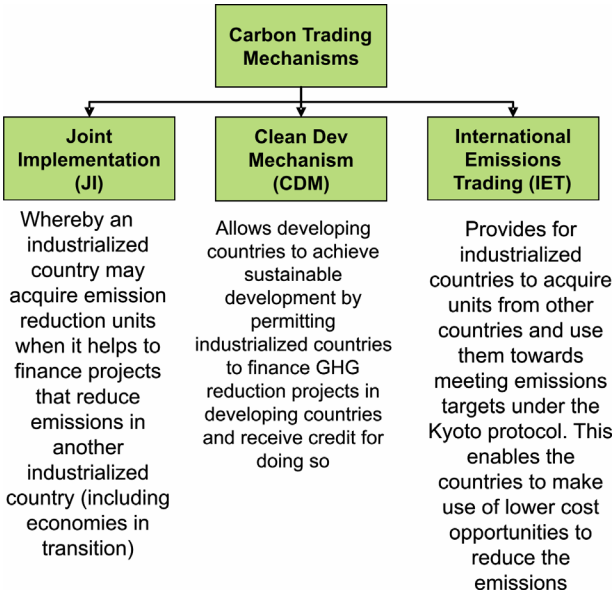


Figure 3: Market Mechanisms under the Kyoto Protocol

Looking beyond Kyoto?

Mitigation under the Kyoto protocol projects to deliver huge cut in the emission by the end of 2012. Between 2008 and 2012, Kyoto has a target to reduce the emissions by 12.5% (Refer to figure 4) through its flexible market mechanisms. Between these years, the nonsinks projects under the Clean Development Mechanism (CDM) are expected to lead to reductions of 50-375 megatons of carbon (MtC) per year.

The Kyoto protocol however is insufficient and inadequate in many dimensions. Kyoto is acutely flawed in the way it permits the North to "achieve" the reductions. This can be

done either actually, through measurable reductions in emissions, or notionally, through trading in "carbon credits" determined by assigning arbitrary, often fictitious, values to different activities (or their avoidance). Northern corporations can buy credits from the South by supporting "Clean Development Mechanism" projects - and not reduce the poisons and heat they are pumping into the atmosphere. So flawed are some of these CDM projects that if implemented, estimates a Dutch study, they will reduce global emissions by less than 0.1 per cent, not even a respectable fraction of Kyoto's paltry target.

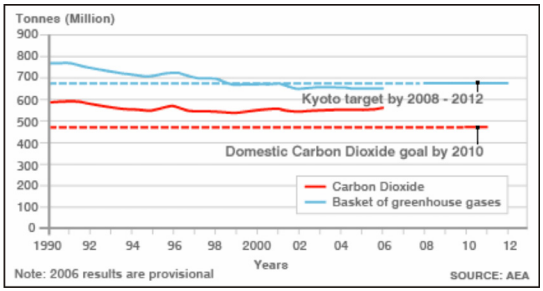


Figure 4: Projected Target levels of emission reductions under the Kyoto Protocol

Also, it is extremely likely that a "Kyoto Forever" scenario will not stabilize concentrations. Non-Annex I emissions are quickly overtaking those of the OECD and the economies in transition (see Figure 5). Hence, meeting the ultimate concentration goal of the Framework Convention would eventually require the participation of developing countries.

In addition, the Kyoto Protocol appears inconsistent with a cost-effective long-term strategy for stabilizing CO2 concentrations.

Thus, it can be very well seen that, mitigation can help 'cut-down' the emissions only in the long term scenario. The current concentration of carbon dioxide (CO2) is 380 parts per million (ppm) - 36 per cent higher than before the Industrial Revolution, and rising by 20 ppm or more every decade. This puts across the straight indication that the damage due to this already increased concentration of carbon dioxide in the atmosphere will be felt in very near future. This is so because mitigation of the GHG revolves around what changes are being made in the global carbon cycle. Not just the northern countries, but fast-growing economies of the south, are pumping out huge amounts of GHGs. At the beginning of this century, the world was about 1° Celsius warmer than 200 years ago.

This change has been enough to disrupt the delicate balances between the complex subsystems that make up the world's climate, including different streams and winds, hot and cold marine currents and circulations, and rainfall patterns. The effects of global warming are already visible through changes in weather patterns and breeding cycles of disease-causing microbes and insects. Recent years have seen many extreme weather events (for example, the heat wave of 2003, which killed 35,000 in Western Europe, or last winter's snowfall in Dubai), and increased ferocity of hurricanes and cyclones (whose intensity has doubled over 30 years).

Thus, the impact of what mitigation activities are being practiced today will be felt only by the future generations. Mitigation can be thus addressed as a "global" phenomenon to which every region needs to contribute. Hence it increasingly makes it important to switch over to the 'Adaptation' to the threats of global warming.

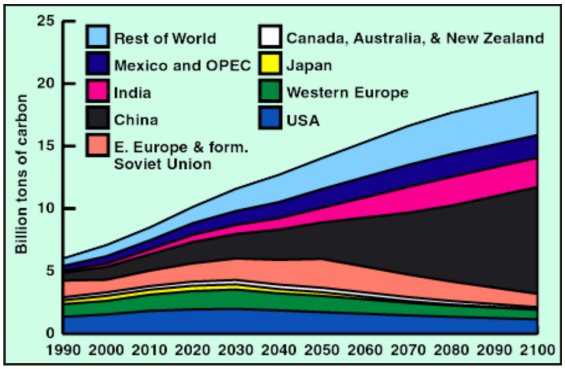


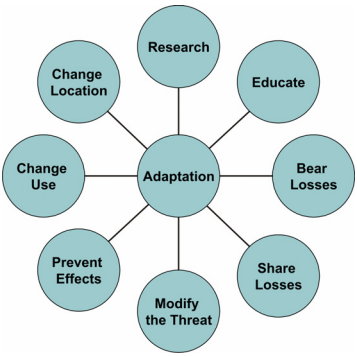
Figure 5: In spite of the Kyoto Mechanisms, the OECD will continue to expand their emission

Also, while assessing the mitigation potential as a response option towards the climate change impacts, it needs to be understood that barring a few sectors, like agriculture, energy and forestry, mitigation as a response tool cannot be seen from the perspective of sector specific impacts. Thus, in the recent past, the focus of the climate policies has been gradually shifting towards adaptation as a policy option towards the changing climate and the associated global warming.

Adaptation - The need of the time

The adaptation policies focus on taking steps to make the social and the environmental system more resilient towards the climate change. Adaptation is thus a very broad phenomenon, which varies at individual level, depending upon the effects of the changing climate on that particular factor of concern and its adaptive capacity. The adaptation strategies would actually help us adapt to the already done damages by the increased level of carbon dioxide.

A commonly used classification group adaptation potential into 8 measures:



- **Bear Losses** - This acts as a baseline of "doing nothing" for comparison with other adaptation measures. It refers to bearing or accepting the losses. In theory, bearing losses occurs when those affected have no capacity to respond in any other way, as for extremely poor communities or where the costs of adaptation measures are considered to be too high in relation to risks of expected damages from the climate change.

- **Share Losses** - This type of adaptation response involves sharing the losses among a given community. Such actions takes place traditional societies or high -end, basically urban areas. For traditional societies, the mechanisms operative for sharing losses are in forms of extended families and village level or similar small scale communities. But for high-end societies sharing of the losses occur through public relief, rehabilitation, reconstructions paid from public or government funds. Sharing of losses can also be achieved through private insurance.

- **Modify the Threat** - For some risks from the climate change, it is possible to exercise a degree of control over the environment itself. For example in case of expected floods, the relative measures of adaptation that can be exercised over the given region include building of dams, dikes and levees etc. From a broader prospective, the adaptations measures for modification of the increasing threats from the global warming, is through a decrease in the GHG gases.

- **Prevent Effects** - A frequently used set of adaptation measures involves steps to prevent the effects of climate change and variability. For example in the agricultural sector, the measures to prevent the effects of climate change would include better irrigation, temperature resilient crops etc.

- **Change Use** - Where the threat of climate change makes the continuation of an economic activity impossible or extremely risky, consideration can be given towards changing the use. For example, a farmer may choose to substitute a more drought - tolerant crop or switch to varieties with lower moisture.

- **Change Location** - A more extreme response is to change the location of economic activities. There is considerable speculation, for example about relocating major crops and farming regions away from areas of increase acidity and heat to areas that currently cooler and which become more attractive for some crops in the future Research - The process of adaptation can also be advanced by research into new technologies and new methods of adaptations.

- **Educate, inform and encourage behavioral changes** - Another type of adaptation is the dissemination of knowledge through education and public information campaign, leading to behavioral changes.

A win - win situation with adaptation strategies

Global warming is now forcing the businesses to evolve like never before. Inevitably, some firms will die out as a result of the harsh physical and regulatory shifts, but the firms that are able to **'Pick up the opportunities'** will prosper even under the growing threats of global warming.

Climate change has already given birth to number of green companies. Hewlett – Packard has been a leader in recycling high - tech trash like old pc and printers, this American technology company cut the amount of waste generated by its plants by 5% in a single year. Royal Dutch Shell ranks best among the big oil companies on a list of the most environmentally correct corporations. Shell has managed to reduce its emissions by improving the energy efficiency at its refineries and reducing continuous flaring of associated gas at its oil production sites.

Conclusions

On the policy front, the Mitigation and adaptation are seen as the two most prominent tools as the response options towards climate change.

Though most commonly used methodology is modeled as mitigation and which is also the most well defined strategy to fight the consequences of the global warming. But there is a strong prospect that these mitigation strategies, alone as the policy options cannot slow down the changing climate at a fast rate enough to avoid the significant impacts.

Thus recently there has been a shift of focus of the decision makers towards the inclusion of the adaptation responses as a major or equivalent share of the climate policies. Particularly from the respective of a developing country like India, there is a need to address the climate policies as a sustainable blend of the two approaches of mitigation and adaptation, without any particular weight age being given to either. Instead, Mitigation and Adaptation need to go hand in hand. As the benefits of mitigation would lead to the future stabilization of the climate but the Adaptation measures would help to cope up with the impacts of climate change occurring on the present generations.

Achieving the Balance between Mitigation & Adaptation - The Naturenomics™ way

The 'Sustainability' path on a policy front towards the climate change threats can be achieved through the concept of Naturenomics™

Naturenomics™ relates to the designing and implementing of a sustainable ecology driven economy. This concept ensures the preservation of the natural assets of land, water and air and thus helps to formulate methodologies and action paths to drive sustainable business from these assets. It can be seen as a blueprint for the management of carbon 'sources' and 'sinks' through the 'security' of the fundamental natural resource bases of the planet earth.

Figure below illustrates these fundamental secure paths and the consequent carbon management strategies through these paths. As seen in the figure, NaturenomicsTM as a concept advocates the security across 5 main resources of the earth, namely forestry, water, agriculture, infrastructure and energy.

The security across the forestry sector through substantial carbon sequestration projects would lead to the enhancement of the carbon 'sinks' and hence help to mitigate the carbon dioxide from the atmosphere.

The security across the water resources would result in better utilization and management practices across this sector, the development of hydro projects would lead to the 'cutdown' of the sources of carbon, whereas on the other hand better water management practices would help us adapt to the water scarcity scenario.

The security across the agricultural sector through strategies like development of better and drought resistant crops and through new breakthrough approaches like organic farming would help to adapt to the ever increasing threats of climate change on this sector.

Similarly the security across our infrastructural services through strategies like development of 'eco - townships' would lead the way in defining the adaptation approach on the biggest community level possible. On the other hand, the introduction of the biodiesels as an alternative fuel option in the transportation sector would lead to mitigate the sources of carbon.

And finally the security across the energy sector would lead to large scale cut - down of the anthropogenic sources of carbon.

Thus Naturenomics™ forms our best way out in towards the threat of climate change and global warming.

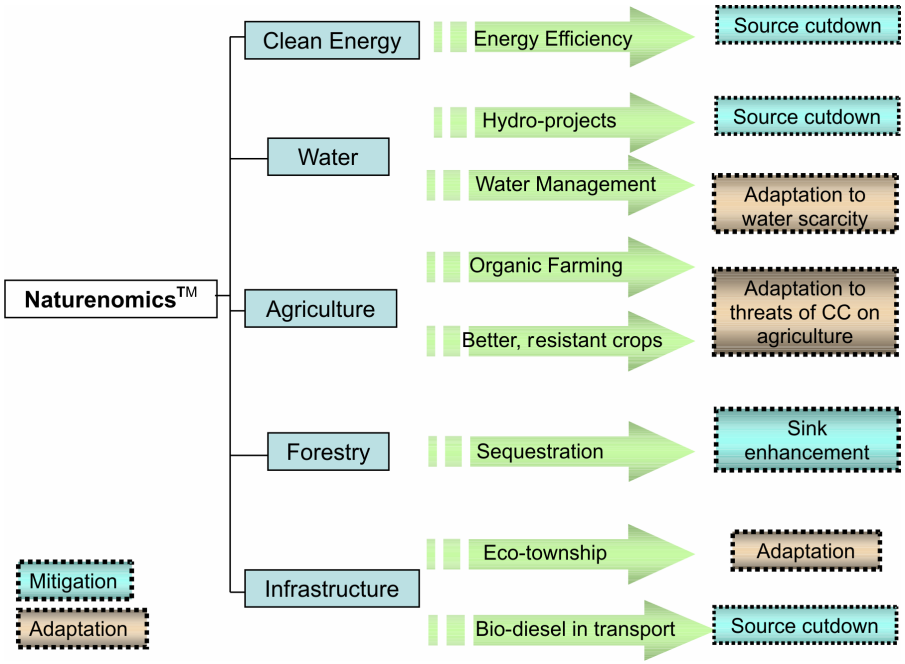


Figure 6: Representing the strategies through the NaturenomicsTM concept for achieving the sustainable blend between mitigation and adaptation

NaturalGist

- ***Web of Climate Change:*** *Climate change and its related consequences are interlinked with every aspect of the living world, that it can be perceived as a 'Web' where every living entity is a mere thread in the web and whatever we do to the web we do to ourselves.*
- ***Mitigation:*** *Mitigation is a proactive action taken in the present towards preventing the long term effects due to long term effects due to climatic change and global warming. Mitigation basically focuses on the cut down of Green House Gas(GHG) emissions.*
- ***Adaption:*** *Mitigation alone cannot help prevent the drastic impacts of the climatic change, which brings us to Adaptation. The adaptation policies focuses on taking steps to make the social and the environmental systems more resilient towards the climatic change. Adaptation is thus a very broad phenomenon, which varies at individual level, depending upon the effects of the changing climate on that particular factor of concern and its adaptive capacity.*

XIV

Green Travels – Travelling Through Natural Assets

"The challenge is how to keep the world's most esteemed monuments from being loved to death"

KRISHNA KUMAR SINGH, gms

Background & Context

Travel is the largest category within the definition of entertainment and within travel, leisure travel is the biggest segment. However the definition and meaning of leisure travel, like all things in life is changing. For the better part of last century, travel evoked mainly destinations in the West – urbanized examples of concrete, steel and industrialization which highlighted the might of the human mind and its ingenuity. Over the last decade or so, however, this is now changing.

Travelers all over the world, particularly in the West prefer to go to natural settings and more pristine surroundings – untouched by the human hand yet. This is leading to a booming segment of unexplored getaways:

Thus, despite recent challenges (SARS, bird flu, terrorism, tsunami, etc), we are entering a golden age of travel. Already seen by many as the world's largest industry, travel and tourism is poised for even greater growth in the years to come.

Economies around the world are en-cashing on this tourism boom. For example, the travel account surplus of developing countries has increased by over 16 times - primarily on account of the impressive growth of inbound tourism. An another statistic is eye opening - in the 49 Least developed Countries (LDC's), total tourism receipts have more than doubled and tourism is now the second largest source of foreign exchange earnings for these countries.

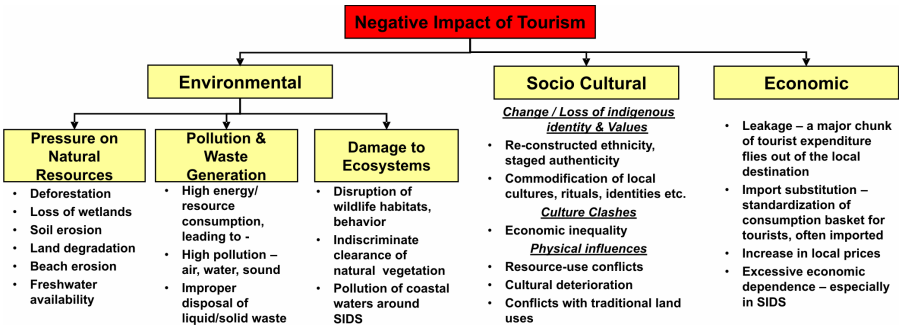
CORAL TRIANGLE, INDONESIA

- Home to one of the most diverse collections of marine life in the world - more than 3,000 species of fish; 600 varieties of coral (75% of all recorded species).
- Growing threat to this eco-system from over-fishing as well as destructive fishing.
- Highly desirable species like grouper and Napoleon wrasse have already been fished to near extinction.
- Rising sea temperatures have also increased periods of coral bleaching, which kills the reefs.

Most emerging eco-tourism hotspots lie in the LDC's and the SIDS – because development hasn't reached their shores, they are, often regions endowed with natural, untouched beauty. Without tourism built on the principles of sustainable use of the local resources, most Small Island Developing States (SIDS) are likely to collapse – since tourism is the only source of income.

Thus, tourism destinations now face the 'Sustainability Bugbear'.

The #1 threat to tourist treasures, paradoxically, is tourism itself. At the heart of the 'Sustainability Bugbear' is the strategy of quick returns on tourism investment – a strategy of mass tourism business models, adopted by most of the LDC's. As a result, the Impact is that the Life-cycle of a tourist destination – from discovery, to development, to eventual decline, attributed to a site's overuse and subsequent deterioration of key attractions or facilities. Along this tourism value chain are other attributes - continual landscape modifications, natural area habitat degradation and debasement of the cultural resource base



To partake of the phenomenal growth potential that tourism offers and for the industry to contribute meaningfully to regional tourism development, a coordinated approach is needed

Sustainable Use of Tourism Resources

We define Sustainable Use of Tourism Resources as:

- **Sustainable:** 'Securitize' for generations to enjoy'
- **Use:** 'Active harnessing management, not rampant exploitation'
- **Resources:** 'Holistic Resource Management of Destination assets; Local community; Local culture and heritage; Supporting industries; Management & staff and finally, Energy

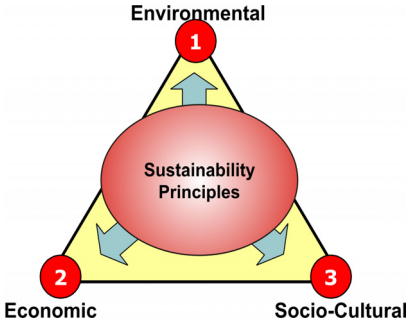
However achieving 'Sustainability' is not an end goal – rather it's a path, with continuous refinements and enhancement of services serving as milestones along the journey. Thus, sustainable tourism is a continuous process and it requires constant monitoring of impacts, introducing the necessary preventive and/or corrective measures whenever necessary

For this, however, it is important to, in the first place, measure current levels of key sustainability indicators:

- **Early Warning Indicators:** e.g., decline in numbers of tourists who intend to return
- **Indicators of Stresses on the System:** e.g., water shortages, breakdown of existing infrastructure, crime indices, garbage pile-up, dirt etc.
- **Measures of the current state of the Industry:** e.g., occupancy rate, tourist satisfaction etc.

- **Measures of the Tourism Impact on Biophysical / socio-economic Environments:** e.g. indices of the level of deforestation, changes of consumption patterns and income levels in local communities
- **Measures of Management Effort:** e.g., cleanup cost for contamination (coastal / town / city) etc.
- **Measures of Management Effect, Results or Performance:** e.g., changed pollution levels, greater number of returning tourists

Unlocking the 3 Pillars of Sustainability



Environmental: Define & Optimize use of environmental resources that constitute a key element in tourism development, maintaining essential ecological processes and helping to conserve natural heritage and biodiversity. Critical pointers:

- Protection of Valuable Natural Assets
- Protecting Critical Eco-systems (fragile sites, endangered species)
- Managing Scarce Natural Resources
- Energy Management (Energy Saving, Efficiency, Renewables)
- Limiting Environmental Impacts of Tourism Activity

Economic: Ensure viable, long-term economic operations, providing socio-economic benefits to all stakeholders that are fairly distributed and social services to host communities. Critical pointers:

- Leakages (Imported Goods, Foreign Exchange, Internal Leakage, External Leakage, Invisible Leakage)
- Employment (Training, Quality, Skills, Turnover, Seasonality, Pay Levels)
- Community & Destination (Economic Benefits)
- Commercialization, Globalization, Modernization (and their inevitable positive & negative outcomes)

Socio-Cultural: Respect the socio-cultural authenticity of host communities, conserve their built and living cultural heritage and traditional values, and contribute to inter-cultural understanding and tolerance. Tourism cannot be planned or managed in isolation from the environments, economies and communities that are part of the destination Critical pointers:

- Wellbeing of Host Communities (Local Satisfaction With Tourism; Effects of Tourism on Communities; Access by Local Residents to Key Assets; Gender Equity; Sex Tourism etc.)
- Sustaining & Conserving Cultural / Built Assets & heritage (cultural sites, monuments, damage, maintenance, designation, preservation)
- Community Participation in Tourism (Community Involvement & Awareness)

A suitable balance between the above three pillars leads not just to a destinations its long-term sustainability but also, in a virtuous cycle, also lead to the competitiveness of the destination and businesses.

Base-lining 'Sustainability' – Key Pointers

The objective of base-lining sustainability, is to outline the key tourism assets in a destination, and identify potential areas of strength as well as challenges – viewed from a consumer prism.

Destination – Key Assets

- Destination assets: local, complementary attractions, natural and cultural assets, infrastructure and support services
- Community support: active participation, common objectives
- Workforce: availability, skill levels
- Management capacity: skill levels, funding available
- Economic opportunities: for businesses, employment
- Product and market opportunities: unique, authentic products, product market match, niche markets
- Community enhancement: socio-cultural benefits
- Conservation: tourism's contribution to natural and cultural heritage

Destination – Key Challenges

- Lack of tourist appeal: few significant or unique tourism attractions, poor accessibility, lack of basic infrastructure (vs 'high-rise' infra)
- No vision: uncertainties in direction, lack of understanding or cohesion in the destination community
- Preparedness: lack of plans, training needs, funds, alternative priorities
- Environmental impacts: disturbance of loss of habitat, increased use of (and constraints) resources, waste
- Cultural degradation: daily lives, customs and practices disrupted
- Poor quality: tourist dissatisfaction, lack of standards
- External threats: regulations, travel security, environmental impacts.

Accreditation, Certification, Monitoring & Evaluation

Base-lining sustainability is only the first step. Although experience has shown that a participatory process in base-lining 'Sustainability' by mapping key tourism resources throws up other assets or potential for the destination, the path to continual sustainability can only be through a rigorous method of Accreditation, Certification, Monitoring & Evaluation.

Various sub-sectors within the tourism value chain, such as hotel and catering, recreation and entertainment, transportation, travel agencies and tour operators have set up their own industry awards, eco-labels and voluntary codes of conduct etc.

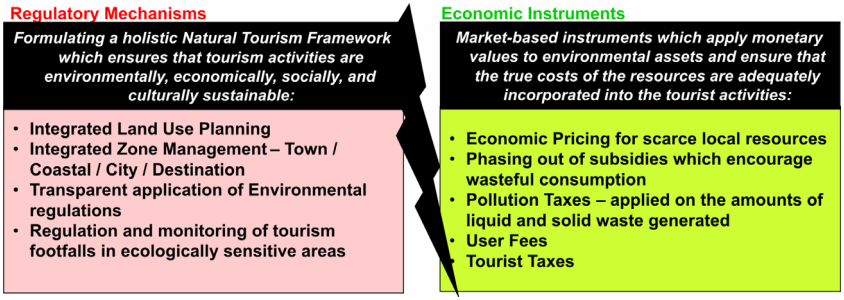
Examples of such accreditation programs include the WTTC Green Globe Certification, ECoNNET; IHEI – led by a consortium of hotel chains; the Blue Flag program etc. A

reference industry benchmark is the International Ecotourism Standard (IES), which is articulated around 11 key principles:

1. Ecotourism policy, performance and framework:
   - Operator's commitment to uphold ecotourism principles
   - Implementation of proper management systems to measure, analyse and improve performance.
2. Natural area focus
   - "Direct and personal experience of nature" – prime focus of eco-tourism property.
3. Interpretation and education
   - Should enable visitors to better understand, appreciate and enjoy the natural environment and cultural context in which it operates.
4. Ecologically compatible infrastructure
   - Buildings and amenities do not dominate the visual landscape and have minimal impact on the environment.
5. Ecologically sustainable practices
   - Should employ ecologically sustainable practices - waste management, energy efficiency, water conservation, treatment of wastewater and effluents, biodiversity conservation, air quality, lighting, noise etc.
6. Contribution to conservation
   - Contributions to conservation projects - in the form of direct on-the-ground actions or monetary or in-kind gifts to organisations involved in such projects.
7. Benefit to local communities
   - Contribution by employing local people, sourcing local products and services, sales of locally made handicrafts and souvenirs and cash or in-kind contributions to local projects.
8. Cultural respect and sensitivity
   - Sensitive to local cultures
   - Local cultural values are treated appropriately, legitimate aspirations of the local people are met while depicting their culture.
9. Customer satisfaction
   - Gather, analyse and act upon customer feedback to ensure that their products meet and even exceed customer satisfaction.
10. Responsible marketing
    - Provision of accurate and responsible information to enable potential customers to have realistic expectations.
11. Minimal impact codes of conduct
    - Develop / adopt a minimal impact code of conduct to have the least effect on the natural, social and cultural environment.

However, Accreditation, Certification, Monitoring & Evaluation methodologies are not a panacea. For example,

- Most standards are set for hotels (68%), and very few for tour operators (7%), and the latter are mainly for ecotourism ground operators, not the outbound operators in tourism generating countries, with the access to the market.
- From a global governance point of view, tourism certification is resource-based and incentive-led – not market-led and therefore it has little impact.
- Confused message given to tourists (are we promoting a clean, un-spoilt destination or a sustainable place?) has limited its power.
- Certification systems currently require external funding.



This is where, the role of the government is key – introducing Regulatory Mechanisms & Economic Instruments are key enablers to achieving sustainability.

The major challenge for governments is to formulate and effectively apply an appropriate mix of regulatory and economic instruments for sustainable natural resources management.

India Tourism

India has several 'Tourism Assets' around which products for tourism can be developed. We believe the 'tourism product' is the consumer experience, which needs to be unique and differentiated. Rich consumer experience can be created within each of the verticals of nature, culture and religion, or across these verticals within a particular state or across 2 or 3 states

- **Nature:**
  - Rich bio-diversity, virgin and unexplored terrain, national parks, wildlife sanctuaries and forest reserves together offer themselves as an ideal package for Nature-based tourism.
  - Taken together, these can be developed as international wildlife and nature destinations because of their exotic appeal. Coupled with adventure tourism assets, they offer a truly niche product.
- **Culture:**
  - The integrated development of areas around the rich and spectacularly diverse cultural heritage sites provides an opportunity for the development of culture tourism across several destinations throughout India.

- The numerous tribes and their multifaceted fairs and festivals can be a powerful magnet for attracting tourists.

- **Religion:**
  - India's most unique tourism product which offers tremendous value is Religion-theme tourism.
  - The North East, with its confluence of three religions (Hinduism, Buddhism and Christianity) captures the essence of Indian culture for international and Indian visitors to offer a unique theme-based packages.

India is just clambering onto the tourism bandwagon. However, in its pursuit to cash in on the booming tourism wave, we must not loose sight of ecological principles around which to base the tourism product. We believe that there are some key questions that need to be debated:

- Should India be a 'mass' or a 'class' tourist destination?
- Should the focus be on domestic Indian / regional tourists instead of international tourists?
- Is the support industry sustainable because of political, societal, seasonal and operational issues?
- By promoting eco-tourism what will be the check on commercialisation? Will this lead to a dilution of controls by the protected area management to fuel recreational needs?
- How would one involve the host community in the tourism process with a view to attain competitiveness, for example heightening the intensity of interpretive and educational values and strengthening the environmental and cultural value, both in its manifestation and knowledge resource base?

Rural Tourism

Emerging trends now indicate that travelers all over the world, particularly the discerning travelers, are preferring to go to natural settings and more pristine surroundings – relatively untouched by the human hand yet. This is leading to a fast growing segment of 'unexplored getaways'.

Relatively unexplored and with a rich cultural heritage, we believe that India is perfectly positioned to take advantage of this global shift and capture a large portion of global tourism footfalls within the segment of these discerning travellers, and which could, translate as a major revenue driver for 'green India'.

We believe that 'green India' is perfectly positioned to be a pioneer in rural tourism. The villages surroundings important tourism assets can be converted into rural tourism idyll's - offering not just access to the main tourist attraction, but a chance to experience the real experience of living as the locals - including partaking of the local brews, meals and taking part in the rituals and customs practised.

Do's and Don't's:

Do's	Don't's
• Bring out a common Sustainable Tourism Policy—which highlights a coherent and cohesive set of strategic policies. • Enact a common tourism trade act and set up single-window tourism facilitation center. • Devise a marketing brand focusing on the sustainability theme as the key underlying theme under the overarching umbrella of the specific destination theme. • Develop an 'eco-supportive infrastructure' to attract and sustain tourist inflow. • Earmark a fixed percentage of retained earnings from the tourism inflow towards converting reference sites as eco-spots	• Can we have Sustained tourism development which has respect for the ecology? • Can we not create concrete jungles out there, but, instead, use existing infrastructure — where possible.? • Can we, for instance, have model Villages - where nothing is changed - only some hygiene facilities provided. • Can India pioneer the whole concept of working with Nature - building upon using local architectural themes, resources and materials Vs imposing foreign concrete structures in the middle of virgin territory?

NaturalGist

- ***Travel and Tourism*** *with the changing face to travel, natural settings and more pristine surroundings untouched by the human hand yet has led to a booming segment of unexplored getaways. We are entering a golden age of travel whereby tourism destinations now face the 'Sustainability Bugbear'.*
- ***Threat Tourism:*** *paradoxically the greatest threat to tourism is tourism itself. The strategy of mass tourism business models, adopted by most of the least developed countries has a great impact on life cycle of a tourist destinations- from discovery, to development, to eventual decline, attributed to a site's overuse and subsequent deterioration of key attraction or facilities.*
- ***Sustainable Use of Tourism Resources:*** *Securitization for the generations to come through active harnessing management and not rampant exploitation. Sustainable tourism is a continuous process and it requires constant monitoring of impacts, introducing the necessary preventiv4e and or/ corrective measures whenever necessary.*
- ***Base Lining 'Sustainability':*** *The objective of base- lining sustainability is to outline the key tourism assets in a destination, and identify potential areas of strength as well as challenges – viewed from a consumer prism.*
- ***To sum up:*** *India has several 'Tourism Assets' around which products for tourism can be developed. But all these projects and sites need to be environmental on the tourist himself.*

XVI

North-East of India - Cradle of Naturenomics™

PRABIR BANERJEA, gms

North East India - Context

India, particularly, the North-East, is one of the twelve-mega hot-spots of bio-diversity in the world, and hence represents one of the few remaining regions of convergence of diverse nature-based assets. The North East, being at the confluence of three major geographical realms of the world (Indian, Chinese and Indo-Malayan), is extremely rich in floral and faunal biodiversity with several endemic species. The following are examples of the bio-diversity of North East India:

- **Plants and trees:**
  - 7,500 species of plants, including flowering plants (as many as 700 species of orchids)
  - 500 species of ferns
  - 500 species of mosses, etc

- **Animals, mammals, birds, reptiles and fish**
  - 183 species of animals
  - 236 species of fish
  - 541 types of birds
  - 160 species of mammals
  - 137 species of reptiles, etc

This bio-diversity of North East India naturally lends itself to the development of a Naturenomics™ based economy.

Underlying components of the North East's bio-diversity

At the heart of the bio-diversity of the North East are its tremendous land and water resources.

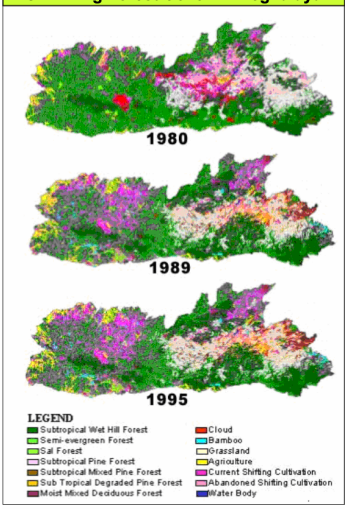
In terms of land resources, even though the North Eastern states make up for only about 8% of the total geographical area of the country, they have about 25% of the country's total forest areas (nearly 70% forest cover) supporting about 30% of the total growing stock of the forest of the country.

In terms of water resources, the North East is extremely rich in rivers, led by the mighty Brahmaputra, lakes, and other natural water bodies. In addition, this region is also one of the rainiest regions of the world, being fed with two monsoons. Rain water further enhances the existing water resources in this region. The regions extensive water resources lead to several species of water living organisms thriving in this environment.

Threats to the North East's bio-diversity

Over the last 20 years, the North East's bio-diversity has been severely challenged due to human and natural factors which have impacted its land and water resources. The key human led challenges are:

Shrinking Forest Cover in Meghalaya



- *Rapid population growth of the North Eastern states:* this poses a tremendous threat to the existing forest cover and the biodiversity of the area. This rapid increase in population, in terms of both absolute and density, means that the fragile capacity of the region to absorb human presence is challenged

- *Land use patterns:* examples of intensive human land uses include agriculture, industrial and settlement. These land uses dramatically alter the ecological character of the land where they occur, and they tend to be permanent modifications at ecological time scales

- *Large scale deforestation:* this is rampant throughout the North East. The conversion of forest areas is more towards non-forest category than into other land cover types. The increase in grassland has also been due to conversion of moist deciduous forests and tropical semi evergreen forests. The increase in area of tea gardens is due to proximity of moist deciduous forest to tea garden areas

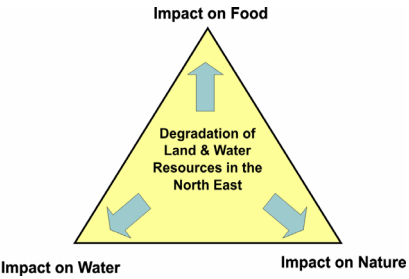
- *Manmade threats:* for example, unplanned and inefficient construction of dams has a significantly damaging impact on the natural surroundings resulting in flooding, relocation of population masses, and even changing courses of rivers

In addition to human-induced disturbance, the North East is also severely prone to natural disturbance. It is one of the worst affected areas of different natural calamities like flood. Taken together, the two magnify the impact on bio-diversity, affecting ecological entities from species to whole communities and ecosystems.

The implications of human and natural threats to the bio-diversity of the North East are far ranging in terms of the ecological equilibrium of the region. Some of the key implications are:

- *Impact on food*
  - The impact on soil structure due to soil erosion directly impacts the fertility of the soil, resulting in lower productivity of the land for agricultural purposes
  - Food shortage in large and fast growing population geographic pockets
  - Neglect of the water resources reduces the numbers of edible water organisms such as fish

- *Impact on water*
  - Wastage of water
  - Shortage of water
- *Impact on nature*
  - Extinction of plants, animals, birds, etc
  - Dramatic changes in climate
  - Damaging impact of floods, landslides, etc
  - Changing courses of rivers



Land and Water Security

In order to arrest the declining bio-diversity of the North East, it is critical to secure its land and water resources. Ensuring Security means creating a strategy and plan to control and manage the human and natural (wherever possible) factors which are contributing to the erosion of the land and water resources of the region, which results in the declining bio-diversity of the North East.

Land security would include (examples):

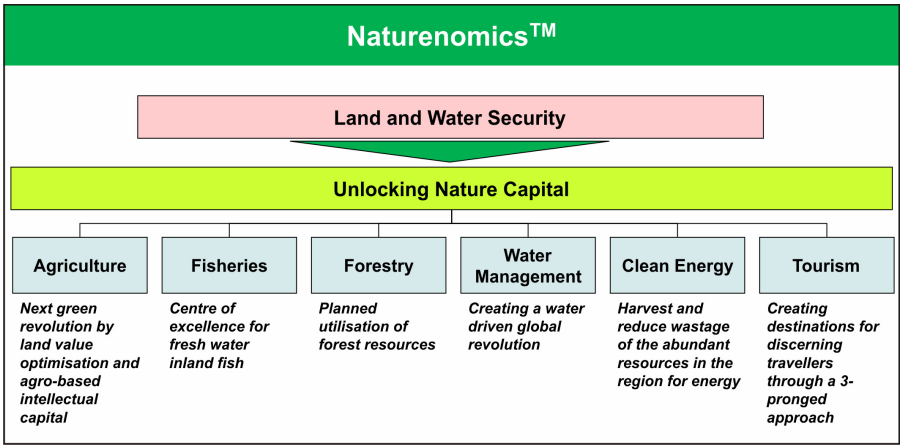
- *Economic value addition of agricultural land:* growing plants and crops with value added potential such as organic cultivation, medicinal and herbal plants, floriculture, bamboo, reinvention of tea plantations, etc
- *Regeneration of agricultural land:* land under agriculture has been degenerated if its essential nutrients due to constant cropping and use of chemicals. Once land yields decline, farmers move to other more fertile lands, which are most often forests. This cycle continues resulting in mass deforestation. Organic regeneration of land will return to it its natural nutrients thereby enhancing the productivity of the land
- *Protection of green cover:* protection of existing forests, and increasing forest cover if possible
- *Maintaining the natural habitat:* protecting endangered species of plants, trees, and living organisms by maintaining (and enhancing) their natural habitat
- *Managing land use and migration:* planned urbanization, and creating village based opportunities to reduce migration to urban areas
- *Managed exploration of natural resources:* planned management and minimised wastage of land based natural resources such as oil, natural gas, coal, etc

Water security would include strategies around (examples):

- *Maintaining the natural habitat:* creating an environment for water based living organisms to thrive
- *Rain water management:* harvesting rain water, particularly in the monsoon season to alleviate water shortage challenges
- *River water management:* managing the abundant rivers in the North East for:
  - *cost effective power (not necessarily hydro-electric) by using environment friendly technologies*
  - *developing navigable waterways*
  - *improving irrigation*

Unlocking Nature Capital

Successful security of the land and water resources of the North East would result in the creation of nature capital in the region, which will fuel the growth of the regional economy. Nature capital can be created through:



- Agriculture - creating the next green revolution by optimising the economic value add of land, and developing agro-based intellectual capital
  - value added cultivation - redefining the types of crops to be cultivated based on demand and economic value add, using the optimal mix of techniques based on multiple cropping, seasonal cropping, single cropping, etc
  - radically enhanced productivity of land under agriculture through organic regeneration
  - reinvention of the tea industry to create sustainable global competitiveness and livelihood. Tea is the oldest and most organised agricultural sector in the North East with world class scale and skills. In a hub and spoke model, tea estates would be the hubs for aggregation of agricultural output around the tea estates.
  - This would impact most villages around the tea estates, resulting in the economic upliftment of the local communities around the tea estates creating intellectual capital for agricultural practices

- Fishery - centre of excellence for fresh water inland fish
  - thriving and abundant fresh water fish
  - best practices and intellectual capital for fish culture

- Forestry - planned utilisation of resources
  - carbon sequestration
  - commercial wood - e.g. bamboo, timber, etc

- Water management - creating a water driven revolution
  - water refineries to harvest sources of water like rain water to manage water shortage
  - managing rivers for navigation, irrigation, power, etc
- Fossilised fuels - harvest and reduce wastage of the abundant resources in the region for energy
  - Wind
  - Solar
  - Natural gas
  - Small hydel
- Tourism - creating destination for discerning travellers through a 3-pronged approach
  - Nature: leverage the region's natural diversity
  - Culture: cultural uniqueness
  - Religion: confluence of Hinduism, Buddhism and Christianity

Each of these industries will support symbiotic industries which will create the multiplier effect in the regional economy. Investment in nature capital is critical to restore, sustain and expand the ecosystem.

Possible Operating Structure

The possible operating structure could consist of 3 broad components, with subcomponents within each. The operating team will be guided by a Steering Committee comprising the Chief Ministers of the 8 North Eastern states (including Sikkim), and other selected representatives from the constituents involved.

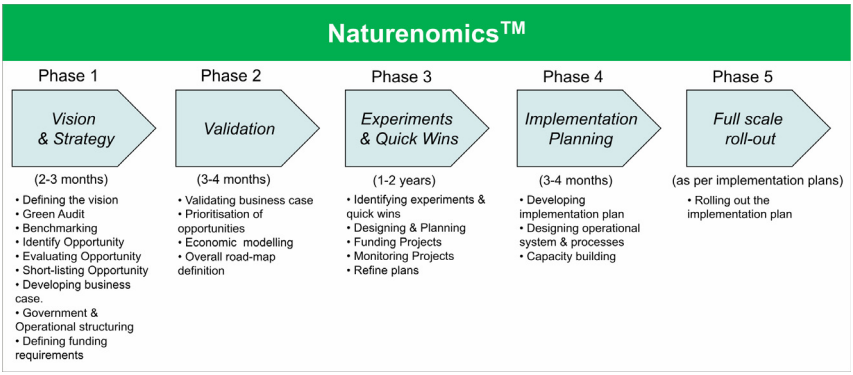
The core operating structure will consist of the following components, and sub components:

- Strategy and Monitoring: This component will be responsible for developing the vision and strategy, and monitoring the operationalisation of that vision and strategy. It will consist of:
  - The core strategy team
  - Advisors for strategy development
  - Partners for implementation
- Implementation and Delivery: Teams will be formed for implementation and delivery, within a matrix structure of the 8 North Eastern states and the departments related to the focus 'nature capital industries' (eg. agriculture, water management, etc) within each state
- Support: Departments within the states that will provide support services for the implementation and delivery of the vision and strategy. This will consist of:
  - Human resources management
  - ICT
  - Finance
  - Capacity building

We also recommend assembling an Advisory Committee comprising of experts from a cross-section of areas - government, public sector and private sector, to guide the development of the vision and strategy, and its implementation and delivery.

Suggested Approach

We would suggest a 5 phased approach to migrating the North East towards Naturenomics™. These are:



The North East has lagged behind India and the rest of the world in economic development. Emulating industrialisation strategies of other states of India will only ensure an uncompetitive 'me too' regional economy. We strongly recommend the alternative and differentiated approach of NaturenomicsTM for the North East's economic development by nurturing its differentiated asset - NATURE.

NaturalGist

- ***North- East India:*** *Is one of the twelve- mega hot- spots of bio- diversity in the world, and hence represents one of the few remaining regions of convergence of diverse nature- based assets. It is extremely rich in floral and faunal biodiversity with several epidemic species. This leads itself to being the*
- ***NE India Land resources:*** *Even though the North Eastern states make up for only about 8% of the total geographical area of the country, they have about 25% of the country's total forest areas.*
- ***NE India Water Resources:*** *The North East extremely rich in rivers, led by the mighty Brahmaputra, lakes, and other natural water bodies and one of the rainiest region being fed by two monsoons.*
- ***Biodiversity:*** *At the heart of all the North East's biodiversity are its land and water resource.*
- ***Biodiversity under threat:*** *The North East's biodiversity is now under threat due to rapid population growth, changing land use patterns, large scale deforestation and manmade threats. This is degrading the land and water resources in the North East extremely impacting food, water and nature.*
- ***Food & Water Security:*** *Ensuring the security of food and water resources in the North East is critical to unlock nature capital which will fuel the growth of the regional economy. Nature Capital can be worked through the focus on agriculture, fisheries, forestry, water, clean energy and tourism.*
- ***5-Phased Approach:*** *A 5-phased approach should be developed to migrate the North East towards Naturenomics™.*

XVII

Design to Win

PHILANTHROPY'S ROLE IN THE FIGHT AGAINST GLOBAL WARMING

Source: Design to win report by California Environmental Associates

As scientific evidence of climate change has become clearer and more compelling, the prescription for changing course seems to have become more muddled and mysterious.

Philanthropists who are concerned about climate change are inundated with a dizzying array of often contradictory options and opinions. Never before have donors, foundations, policymakers and the general public confronted such a complex, far-reaching crisis.

Questions go by unanswered, as more and more time is lost. Should they back renewable power sources, such as wind and solar, or try to clean up coal-fired plants, or preserve biodiversity? Given the global scale of the predicament, where in the world should they allocate their precious resources? Which philanthropic investments will get the most carbon out of the atmosphere?

Left unattended, human-induced climate change could overshadow all our other efforts to cure diseases, reduce poverty. Global, collective action is paramount. The stakes – and hurdles – could not be any higher.

FIGURE 1: Design to Win Strategy

Prioritizing the initiatives is of utmost importance. We were guided by philanthropy's comparative advantages. Politicians are fixated on the next election; CEOs are focused on next quarter's numbers. Philanthropists, by contrast, have longer time horizons and can tolerate more risk. Besides being more patient investors, philanthropists have a strong tradition of filling gaps, spurring step-changes in technology and pursuing programming that transcends both national boundaries and economic sectors. Such capacities are exactly what are needed to tackle global warming.

To clear the clouds of questions overhead, we tried to identify the priorities that will draw a road map for successful investment plans.

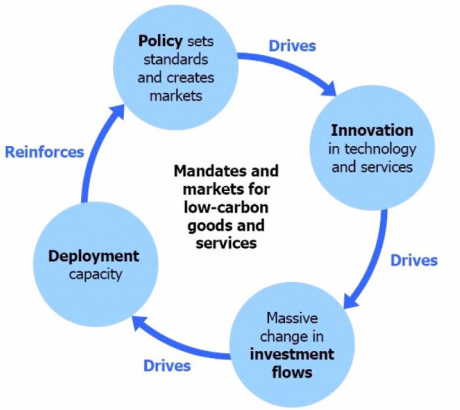
FIRST, DON'T LOSE:
Catastrophic climate change – far worse than anything we have experienced – will be unavoidable if we don't prevent a massive "lock-in" of emissions from new coal-fired power plants, long-lived industrial infrastructure, inefficient buildings, car-centric cities, and irreversible deforestation.

The urgent need to avoid locking in emissions is a function of how our biosphere behaves. Carbon dioxide (CO2) and other heat-trapping gases persist in the atmosphere for centuries, so decisions made in the next 5 to 10 years will alter the Earth's climate for generations to come.

- **New coal plants** are the most troublesome source of lock-in. China is now building the equivalent of two, 500-megawatt coal plants every week.
- **New factories,** offices, stores and homes threaten to lock-in still more carbon emissions if they're not designed correctly.
- **Need to act immediately,** each year the task will get tougher. The amount of emissions reduction needed will rise; at the same time, the share of mitigation we can identify will fall.

Policy reform
The global community must overcome the collective action problems that have hobbled international climate agreements.

Strong financial signals are necessary to spark real collective action. Either through an emissions cap or other means, we must put a price on carbon to force businesses, consumers and governments to pay for their pollution.



- **Carbon Price Tag** will in turn force the investment to shift towards cleaner solutions.
- **Carbon Cap** at home and abroad, new policies must limit carbon emissions from a wide range of sectors and activities. Calibrate emissions caps and targets to stabilize Co2 concentrations as close as possible to 450 ppm and limit global warming to 2 degrees Celsius.

- **Facilitate R&D cooperation** to accelerate the development, demonstration and diffusion of low-carbon technologies will allow industries and nations around the world to fulfill their obligations.
- **Promote supplier certifications** and "Carbon content" product labels to increase customer awareness and demand for manufacturer efficiency.

Concentrate efforts geographically

While USA and Europe are responsible for more than one-third of greenhouse gas emissions comparatively, China and India has much lower level of emissions, there is still time to influence energy investments and shape of booming mega-cities, where the greatest mitigation potential lies.

- **Role of Developed Nation:** Although developing nations offer some of the greatest mitigation opportunities, these countries cannot – and should not – shoulder the burden. Richer nations, which are the best equipped to deal with the effects of climate change, must help the most.
- **Target Global Economy:** Atmospheric science tells us that to stabilize CO2e levels at 450 ppm, we must reduce emissions by at least 30 gigatons in 2030. To achieve this mitigation must be found in every sector of the global economy.

Target five Key Sector

There are no silver bullets – we must simultaneously act on a number of fronts in each key sector: Power, Industry, Buildings, Transportation, Forestry.

To achieve our goal of reducing 2030 emissions by 30 gigatons, we must simultaneously search for mitigation opportunities in each of these sectors. Unless we reshape these building blocks of the world economy, the Earth's climate will undergo its most rapid and profound transformation since the last Ice Age.

- **Power generation** is the largest source of emissions and the sector with the highest global mitigation potential – 6 gigatons.
- **Promote Alternatives:** Minimize the need for coal - fired power plants, and promote alternatives, such as wind and solar energy plants.
- **Carbon Capture and Sequestration (CCS):** By the time wind, solar and other technologies are up to sufficient scale, the battle against global warming could be lost, hence CCS is a key solution to keep us in the game.
- **The industrial sector** threatens to cause both direct and indirect lock-in of new emissions sources. A factory is built to last, so an inefficient design will saddle the atmosphere with more carbon for decades to come.
- **To slash industrial emissions,** philanthropy should promote new standards and utility reforms that will motivate firms to design long-lived assets with energy in mind.
- **The building sector** – which accounts for nearly a fourth of 2030 emissions and offers 4 gigatons of mitigation potential – faces major lock-in challenges: Developers must pay extra to make buildings more efficient, but it's the occupants who reap the savings; similarly, landlords have little incentive to buy more efficient refrigerators or air conditioners if their renters foot the electric bill.
- **Transportation:** By 2030, the number of autos in China is projected to quintuple to 150 million; in India, a thirteen-fold increase is expected. Philanthropy must address vehicle efficiency, fuels and vehicle travel.

- **Urban planning:** Urban planning that causes city residents to depend on private vehicles – rather than bikes, buses, trains or their own two feet – amounts to a critical lock-in of carbon. Urban planning should include: mixed-use developments that co-locate homes, offices and shops; parking and congestion fees that discourage driving; more pedestrian-friendly cityscapes that encourage walking; and dedicated lanes for bikes and three-wheeled vehicles.
- **Forestry:** When a jungle is cleared for farming, grazing or development, the biosphere loses yet another vital "sink" where carbon is naturally sequestered. To add insult to injury, burning down a tropical forest liberates the carbon stored in the plants.

Our survey of the philanthropic field identified current annual funding of about $200 million for climate issues, with only a portion devoted to the Design to Win priorities listed above. This amount pales in comparison to the $3.2 billion U.S. foundations invested in health programs in 2004 alone, and the $3.1 billion devoted annually to education.2 Based on our interviews with climate and energy experts, we estimate that additional funding of about $600 million is needed annually to implement Design to Win's strategies.

We recommend, in the broadest of terms, a three-part menu of investments:

1. Support existing NGOs with deep knowledge of local conditions and needed strategies; cultivate new organizations where necessary.
2. Create nation-specific expertise to facilitate grant making. Organizations that have the local capacity and expertise are needed to oversee highly leveraged, strategic interventions.
3. Build International Best Practice Centers for critical "don't lose" sectors to accelerate the diffusion of knowledge and innovation, either by establishing new institutions or linking existing organizations in loose networks.

NaturalGist

- ***Linking carbon markets and deforestation:*** *Based on the science, monitoring, policy prescriptions and lessons from pilot projects, we must facilitate the flow of international capital to the residents, land managers and government agencies that protect forests.*
- ***Facilitate R & D cooperation:*** *Accelerating the development, demonstrate and diffusion of low- carbon technologies will allow industries and nations around the world to fulfill their objectives.*
- ***Improve International treaties:*** *Philanthropists should support efforts to include critical nations, such as the U.S; China and India, and crucial sectors, such as forestry, so that treaties have a tangible on emissions.*
- ***The Good News:*** *is that we already have the technology and Know- how to achieve the carbon reductions upto 80%. The Key lies in rapidly deploying such technologies in our power plants, buildings, factories and vehicles, and improving land management practices.*
- ***Role of Philanthropy:*** *Philanthropy can play a pivotal role in this transformation. But donors and foundations must be strategic and choose interventions with the most potential to set the world on a low- carbon course.*

About the Contributors

Alem Ao is from Nagaland and works as a research consultant with Globally Managed Services (GMS), Mumbai. He holds a Bachelors Degree in Mass Media with Journalism as his specialized area from St. Xavier's College, Mumbai. He has worked for Mansworld Magazine and free-lanced for a number of lifestyle publications.

Bittu Sahgal is the Editor of Sanctuary magazine and the Founder of Kids for Tigers, the Sanctuary Tiger Programme. He believes that children have the power to force adults to "do the right thing" by our planet and our country. His life revolves around campaigns to save the wildlife of India and their forest home. He is also working with others to impress upon Indian leaders the need to take the climate change threat more seriously – particularly the fact that perhaps over 20% of all greenhouse gas emmissions are a result of deforestation.

California Environmental Associates (CEA) has provided businesses and public institutions with a range of environmental management, regulatory compliance, and sustainable business solutions. CEA aims to transform markets, business practices, and policy to create economic incentives that will yield positive environmental outcomes.

Dipak Kripalani - Co-founder and CEO, GMS
Dipak is responsible for developing and guiding the GMS strategy, building deep relationships with clients and ensuring that GMS delivery is aligned to customer needs. In addition, Dipak closely looks at possible investment opportunities and ventures for GMS, and is closely involved in the strategic management of these investments and ventures.

Dipak is the co-architect of the thought process at GMS of developing the theme of NaturenomicsTM (which relates to capital formation through the creation of ecologically 'compliant' assets in a sustainable manner). Through GMS, he has been a co-founder of several initiatives under the Naturenomics™ theme - GMODI (promotes organic cultivation among farmers with market linkages), AgriQuest (hub-and-spoke community farming and aggregation with forward market access), FarmQuest (large agricultural land banks for organized cultivation), and NatureFirst (focused on restoring the balance between nature and economics through clean environment, carbon management and water management).

Dipak has also set up other entrepreneurial ventures in healthcare such as Advent Healthcare (a facilitator in the healthcare industry in India), and Med-Ind Healthcare (integrated managed healthcare services provider). In addition, Dipak continues to be an advisor to the Board and management of Max Healthcare (one of India's largest private healthcare services providers).

Over the last few years, Dipak has become keenly involved in the social sector and focuses on fund raising in the area of philanthropy, and creating sustainability frameworks for social sector initiatives.

Through his experience, he has built skills in conceptualising and operationalising businesses, ranging from strategy formulation to putting these businesses on the ground.

Dipak has been instrumental in operationalising several businesses such as netdecisions in Asia, Agilisys in the UK and Marconi in India. His experience encompasses a wide range of industries including FMCG, agriculture, food processing, telecommunications, technology, outsourcing and healthcare.

Till 2002, Dipak was with netdecisions, a technology solutions provider, where he was responsible for creating their business in Singapore and building client relationships in Asia and UK. Prior to netdecisions, Dipak was a senior consultant with Monitor Company, a leading strategy consulting firm where he spent 6 years advising clients in the Asia- Pacific region. Dipak has extensive knowledge of doing business in India, South East Asia, the Far East, UK and USA.

Dipak holds an MBA from The George Washington University, Washington DC.

Gautam Narang works with Globally Managed Services (GMS), Mumbai. Experienced in primary and secondary research work in the fields of Environment, Agriculture and Socio Economic Issues, he also specializes in research analysis .He has done BMS (Bachelor of Management studies) with specialization in Marketing, graduate from the Mumbai University.

Kalpesh Popat is a Project Manager with Globally Managed Services (GMS), Mumbai. He was a Technical Architect for Agilisys in software development. He has worked on a wide range of projects with different clients like visitbritain.com, Kensington Mortgage, and Lotus Arts De Vivre, Thailand.

Krishna Kumar Singh is based out of Mumbai from where he looks after the management & delivery of gms projects. Prior to joining gms, he was with Agilisys and was based out of York. He was part of the innovative North Yorks ICT Partnership - the first public private partnership to e-enable government services. An Economics graduate from the Bombay University, Krishna started his career with an equity and business research firm and has had a varied breadth of experience - from authoring columns on the Primary market in a leading Indian business daily to handling marketing activities for the world's first global mobile satellite telecommunication system to conducting due diligence and program implementation for e-enabling IT in government to preparing business cases and financial models to agriculture.

Lester R. Brown is President of Earth Policy Institute, a non-profit, interdisciplinary research organization based in Washington, D.C. he is widely known as the founder and former President of the World watch Institute. During a career that began with tomato farming, Brown has been honored with numerous prizes, including the MacArthur "Genius" Fellowship, the United Nations Environment Prize, and Japan's Blue Planet Prize. He lives in Washington D.C.

McKinsey & Co. - Christoph Grobbel is a consultant in McKinsey's Cologne office, Jiri Maly is a principal in the Toronto office, and Michael Molitor is chief executive of the Carbon Management Group.

Nittin Machhar the Creative Mind of GMS. Apart from designing this book, he is handling the IT-Administration of EVIIVO India, prior to these positions, he worked on various stream of projects ranging from Designing & Information Technology for Lotus Art De Vivre, Thailand, as IT-Manager, in Manba Finance, as IT Manager, in Tally Solutions, as Data Manager, and before that in Mehul Enterprise from where he started his professional journey which now span across 9 years.

Noah Walley is a Vice president of Morgan Stanley Dean Whiter, and is also a Vice President of MSDWVP, Inc., located in the New York offices of Morgan Stanley dean Whiter, prior to these positions, he focused on the telecommunications, technology, and environmental industries for the private equity firms of Bachow & associates and Desai capital management, and also worked as a consultant for McKinsey &company. In addition to his work at MSDWVP, Inc., he serves as a director of business Development Services, Osprey Systems, Inc. and total Networks Solution.

Pavan Sukhdev is Managing Director and Head of CIB Global Markets in India. He joined Deutsche Bank and Global Markets in1994, and since then his assignments have included heading the Global Markets division (1994-1998) and building a leading financial markets business for the bank in India.

- Chief Operating Officer for the Bank's Asian Global Markets business 1998-99) based in Singapore, managing the Bank's money markets trading and liquidity for the Asia-Pacific region (1999-2003), based in Singapore
- Chief Operating Officer for the Bank's global "Emerging Markets" business (2003-2004) based in London
- (current assignment, based in Mumbai) as Head of Business Process Re-engineering for Global Markets (combined Debt and Equity division), including running the Division's "Off-shoring" strategy which is focused on India.

Pavan is an experienced trader and structurer of currency, interest rate, and credit products. Before joining Deutsche Bank, he worked for 11 years with ANZ Bank, both in India and in London in various financial markets trading, sales, and management roles.

Pavan was deeply involved in the evolution of India's currency & interest rate & derivatives markets from 1993 to 1998. He was a member of several key Reserve Bank of India (RBI) committees for the development of India's financial markets. In 1997 he co-founded "FIMMDA", India's association for fixed income markets, money markets and derivatives.

He pioneered the introduction into India of the 'Overnight Index Swap' (OIS), which is today India's most liquid traded interest rate swap instrument.

Pavan pursues long-standing interests in nature conservation and environmental economics through his work with charities in India and UK.

Founder and Director of India's "Green Accounting for Indian States Project" an independent initiative to provide comprehensive metrics to support sustainable development policymaking at the State level in India.

Chairperson of "Conservation Action Trust" (CAT), an Indian NGO dedicated to achieving environmental sustainability and security through the proper conservation and use of natural resources

Prabir Banerjea is located in gms Guwahati office from where he manages gms' projects in the East and North East region of India.

Prabir brings with himself 26 years of experience in sales and marketing having worked in Reckitt & Colman and VST Industries, with specific experience in the categories of FMCG, pharma and tobacco products.

Prabir joined from VST Industries, where he was head of Sales and Marketing reporting to the Managing Director, and where his primary responsibilities were distribution, logistics, improving brand health measures, development of new brand mix elements, geographical expansion, and building an effective sales team.

Prabir has sound knowledge of packaging and consumer research, and has worked extensively with design agencies in India and abroad.

Ranjit Barthakur - Co-founder and Chairman, GMS

Ranjit heads the overall GMS operations, and brings over 30 years of successful experience in managing and leading companies in a wide range of industries, including FMCG, telecommunications, tourism, technology, outsourcing and healthcare.

Ranjit is the chief architect of the thought process at GMS of developing the theme of NaturenomicsTM (which relates to capital formation through the creation of ecologically 'compliant' assets in a sustainable manner). With the experience of having successfully run large complex commercial ventures he is well positioned to bring his management and operational expertise to the field of Naturenomics™.

Ranjit, through GMS, has been a co-founder of several initiatives under the Naturenomics™ theme - Balipara Foundation (promoting agriculture and bio-diversity based community initiatives), GMODI (promotes organic cultivation among farmers with market linkages), AgriQuest (hub-and-spoke community farming and aggregation with forward market access), FarmQuest (large agricultural land banks for organized cultivation), NatureFirst (focused on restoring the balance between nature and economics through clean environment, carbon management and water management), and River Journeys and Bungalows of India (nature based tourism business).
Ranjit also works closely with the Government of India in his role as a member of the Planning Commission's Steering Committee on Tourism, bringing in his expertise in ecotourism. In addition, Ranjit is an Economic and Investment Advisor to the Chief Minister of Assam, promoting Naturenomics™ as a way of economic development in the state and region.

Ranjit has also set up other entrepreneurial ventures such as Agilisys (a leading technology solutions provider), Advent Healthcare (a facilitator in the healthcare industry in India), Med-Ind Healthcare (integrated managed healthcare services provider). In addition, Ranjit continues to be an advisor to the Board and management of large groups like Max Healthcare (one of India's largest private healthcare services providers), Anand Group (one of India's largest automobile components groups), and Airtel (India's largest mobile telecom service providers) in the North East.

Ranjit firmly believes in social entrepreneurship, and has been keenly involved in the following key initiatives:

- Chairman of Operational Smile in India (voluntary organization doing exemplary work to correct cleft lips, cleft palates and other facial deformities in children around the world)
- First socio-economic study of the Manas National Park, Assam and was responsible for studies and action on preservation of the greater and lesser adjutant stock, the Himalayan Salamander, the brown antler deer, etc.
- Supported and was the responsible for the Pygmy Hog Captive Breeding Programme, and in that context was closely working with the Jersey Wildlife Trust, UK.
- Worked closely with the Wild Fowl Trust, Slimbridge, UK, in studying the captive breeding programme of the White Winged Wood Duck
- Ranjit was the Chairman of World Wildlife Fund (Eastern India) and was responsible for creating the national conservation corps including giving birth to the North Eastern Chapter in Guwahati, Assam, India
- Pioneered the case of supporting the education of children whose parents were martyred by poachers through a trust - Wildlife Afforestation & Nature Trust (WANT)
- Principal Advisor to Sanctuary Asia, India's leading wildlife, conservation and environment magazine and thought leader. Along with Bittu Sehgal (founder of Sanctuary Asia), Ranjit has co-authored "The Kaziranga Inheritance" giving birth to the "Inheritance" series of books from Sanctuary Asia.
- Additionally Ranjit is focusing his activities on the recently founded 'Balipara Foundation'

Prior to becoming an entrepreneur, Ranjit was CEO of Orange in India, Chairman of Marconi in the Indian Sub-continent, and held senior positions in sales and marketing at ITC, one of India's leading FMCG companies. Ranjit has extensive hands-on experience in diverse geographic markets like India, South East Asia, Japan, Russia, Middle East, UK, Europe and USA.

Rati Bhattacharya is a research analyst with Globally Managed Services (GMS). She has done her Post graduation in Environment Management from GGSIPU, Delhi in 2007. Rati has worked on various research projects which include Climate change modeling studies for India, plan out of environment management system at NFL (National Fertilizer limited) and solid waste management project at IIT. She has also completed two research papers on climate change modeling studies done for India, which are now in process of publication in 'current science' and 'climate policy' journal.

Sachin Salian is a Research analyst with Globally Managed Services (GMS), Mumbai. Experienced in various sectors of research in Environment, Agriculture and Socio Economic Issues, he also specializes in primary and secondary research analysis. Sachin's research interest areas are agriculture and environment. He has worked with Mangal Exports, Mumbai as a Documentation Assistant for 1 year.

Samir Menon, the President of GlobLinc LLC, Co-founder of NatureFirst, and Director International of GMS, has over a decade of experience of developing successful businesses that require cross border transactions. He has set up two successful ventures in India, including Monitor Company's India operations and a 300 person software development and research center for a UK-based startup. He also set up a

consulting organization in the US as the front end for this center. His main area of expertise is in the growth sectors of technology, media and telecom as well as application of technology in areas like retail. He has lived and worked in over 10 countries across 3 continents.

Yamini Kurani is a Project Manager with Globally Managed Services (GMS), Mumbai. Experienced in conducting field / secondary research in various sectors such as Environment, Agriculture and Socio Economic Issues, she also specializes in qualitative and quantitative research analysis on a spectrum of health, gender, livelihood and environment related issues. Yamini's research interest areas are agriculture and environment. She has worked with Indira Gandhi Institute of Development Research (IGIDR), Mumbai as a Research Assistant for more than 3 years with several projects such as Maharashtra Environment and Urbanization Report. She was also a member of the organising Committee for the International Conference and Seminars, and has several International publications to her credit.

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Gatha S More holds a Bachelors degree in Management Studies (BMS) with specialization in Marketing. She currently works for gms as a research consultant. She has done a major project for the University of Mumbai titled Medical Tourism in India. She would like to pursue a Masters in management in the near future.

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Surya Shanker Ganguly is a research consultant with gms. With a BSC in Geography, under Calcutta University Surya's wide range of interest includes environmental issues. He further hopes to pursue a Masters in management in the near future.

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Andrew Pidden	Clean Resources Asia
Audra Jones	UN Foundation
Audrey Selian	Rianta Capital
Barry Appleton	Appleton Foundation
Brian Pilkington	Pilkington Foundation
Bryan Martel	Environmental Capital Group
Carolina Manhusen Schwab	Carlota Ltd
Charlotte Perra	Energy Foundation
Chet Tchozewski	Global Green Grass Fund
Chris de Goey	AngelBourse
Christopher	Mouravieff-Apostol
Coco Ferguson	Institute for Philanthropy
Craig Appel	Energy Foundation
Dana Lanza	Environmental Grantmakers Association
Danyal Sattar	Esmee Fairbairn Foundation
David Shelmerdine	Myer Foundation
Denise Lee	Nand & Jeet Khemka Foundation
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Name	*Organization*
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Uday Khemka	Nand & Jeet Khemka Foundation
Victoria P Garchitorena	Ayala Foundation
Virgin Unite	Virgin Unite
Wen Bo	China Coordinator Global Greengrants

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Well I think its fine, building jumbo planes.
Or taking a ride on a cosmic train.
Switch on summer from a slot machine.
Yes, get what you want to if you want, 'cause you can get anything.

I know we've come a long way,
We're changing day to day,
But tell me, where do the children play?

Well you roll on roads over fresh green grass.
For your lorry loads pumping petrol gas.
And you make them long, and you make them tough.
But they just go on and on, and it seems that you can't get off.

Oh, I know we've come a long way,
We're changing day to day,
But tell me, where do the children play?

Well you've cracked the sky, scrapers fill the air.
But will you keep on building higher
'til there's no more room up there?
Will you make us laugh, will you make us cry?
Will you tell us when to live, will you tell us when to die?

I know we've come a long way,
we're changing day to day,
But tell me, where do the children play?

Cat Stevens 'where do the children play' from the album Tea for the Tillerman, 1970

A tropical forest as big as
a football field is destroyed every second!
A lot of the wood is used to make paper.
If trees are cut down at this rate,
we will have almost no forest cover
left by the year 2020.

You can help preserve these
ecologically precious forests by
using wood free paper
similar to the kind you are
now holding in your hands.

This handbook is made from
eco friendly recycled paper.
It is unique and it gives the
sense of pride that we are
helping in our small way
towards conserving nature.

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Reforestation Wood | Recycling Material | Biodegradable Material | Chlorine Free

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