

SECURING THE FORESTS, LAND AND SOILS FOR ALL

COHERENCE IN POLICIES AND ACTIONS FOR HEALTHY ECOSYSTEMS

The Annual Conference of the Indian Association for the Club of Rome

New Delhi, 23-24 November 2016



Development Alternatives

Message

This booklet has been prepared and published by Development Alternatives for the Club of Rome's 2016 Annual Conference on "Securing the Forests, Land and Soils for All", to be held in New Delhi, 23-24 November 2016. I am deeply grateful to my coworkers in DA for their help in preparing this publication, and to the Secretary and Staff of the Indian National Association for the Club of Rome for their very valuable inputs, both to the substance and text, and to the graphics, charts and diagrams that so well illustrate the issues covered.

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Co-President, Club of Rome (2005-2012)



INDIAN
NATIONAL
ASSOCIATION

Policy Coherence for the Nation's Resources

In 2014, the Indian National Association for the Club of Rome initiated a 5-year series of Annual conferences to examine and analyse the issues of policy coherence in how India manages its key resources. This series was envisaged to cover the following issues:

1. 2014 - "Securing Food for All"
2. 2015 - "Securing Water for All"
3. 2016 - "Securing the Forests, Land and Soils for All"
4. 2017 - "Securing Energy"
5. 2018 - "Sustainable Livelihoods"

Established in 2011, the Indian National Association for the Club of Rome is a non-profit organisation, which aims "to act as a global catalyst for change through the identification and analysis of the crucial problems facing India and the communication of such problems to the most important public and private decision makers as well as general public." The broad goal of the national chapter, CoR-India, is to help design an agenda for governments in India, the business sector as well as all its citizens' organisations that could enable everybody in the country to live a full life in harmony with their surroundings by the centenary of the nation, 2047.

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Contents

Summary.....	2
Forests, Land and Soils – The Critical Resources for Food and Livelihood Security	4
Policy Coherence for Securing Our Forests, Land, and Soil Resources.....	9
Actions for Securing Our Forests, Land, and Soil Resources.....	11
Yesterday’s Debate: Protection and Preservation	14
The Debate Needed Today: Conservation and Social Justice	15
The Three Strands of Sustainable Development.....	16
Economic (“Profit”)	16
Social Equity (“People”)	16
Environmental Health (“Planet”).....	17
Impact of Forest Restoration on Ecosystems Security	18
Issue 1: Infrastructure and its Impacts on Forests, Land and Soils	
Optimising the Trade-offs between Efficiency of the Economy and Productivity of Nature.....	20
Issue 2: Forests, Land and Soils for Sustainable Ecosystems and Resilient Communities	
Reducing the Vulnerability of Women, Children and Tribes.....	22
Issue 3: Forest Health and its Restoration.....	24
Issue 4: Land and Soil Health and their Restoration	
Conserving the Earth for Our Food Security.....	26
Issue 5: Water to Connect Land, Soil and Forests’ Resources - Nature’s Circulatory System	28
Issue 6: Legal, Policy and Financial Framework Analysis	
Ecosystems-Environment-Forests, Land and Soils.....	30



Summary

Life on Earth depends on many resources and a vast number of interactions and flows among them. Critical among these are Oxygen, Carbon and Nitrogen from the atmosphere, light and heat from the Sun, food from terrestrial and ocean biomes, not to mention myriads of complex physical, chemical and biological cycles and geological processes.

At a more macro, but also more specific level, *the terrestrial ecosystems that arguably most affect the lives of human beings are forests, land and soils* – interconnected by the never-ending movement of water running through all of them.



These are the subjects of the 2016 Annual Conference of the Indian National Association of the Club of Rome. The last few decades have witnessed a drastic decline in the overall health of all four resources. Water, having been covered in some detail as the central theme of the 2015 Annual Conference, this paper focuses more on the issues of the remaining three: forests, land and soils.

The health of our forests, the productivity of our land and the generative capacity of our soils have suffered massive degradation and loss. Rapid growth, both of population and of economic activity are placing demands on nature and our natural resources that are now significantly beyond their regenerative capacity and the gap between demand for resources and their availability is now reaching dangerous levels. Unless we urgently change course and adopt more sustainable development pathways, the long gestation periods for many resources to recover their productivity, particularly the ones being considered here -- forests, land and soils -- the growth of this gap could become irreversible, at least on time-scales that are meaningful in terms of human lifetimes.

India with its vast variety of flora and fauna, is one of the world's 12 most mega-biodiverse countries. It holds 7% of the world's biodiversity and supports 16 major forest types, varying from alpine pastures in the Himalayas to temperate, sub-tropical and tropical forests, to mangroves of the coastal regions.



Forests cover 67.7 million hectares, or 21.8 % of the land area. Its land area extends from the highest mountains in the world to the low-lands of its vast sea shores; from some of the driest deserts to some of the wettest wetlands; from the least productive soils to the most fertile anywhere. But over the past century, our economic, social and political choices are rapidly levelling this enormously rich diversity down to the lowest level of pervasive deficiency.

The future of India and the health, wellbeing and prosperity of our descendants depends critically on altering the direction and the very nature of today's development trajectory. The costs to today's economy of the diminishing quality of our forests, lands and soils – no less than the tragic costs to human health by the pollution of our air and water – is already plaguing the growth of the nation's economy. We urgently need to incorporate the benefits of healthy environments and the overhead costs of a depleting resource base into the calculations of our economic progress.

The central purpose of the 2016 Annual Conference is to identify critical issues standing in the way of reversing today's trends towards the ecological (and therefore economic) destruction of our nation's most valuable assets (after its people) – its forests, land and soils – and to imagine the changes needed and inform those who make decisions – in government, business, civil society and other sectors of society – how these changes could create a better future for all.

To achieve this purpose, it is essential to focus on the specific barriers to change that arise from the big ticket forces that shape the decisions that fundamentally affect our future: our choice of technology, our economic instruments, our policies and our value systems. In each of these domains, there is considerable room for improvement. Our resource-guzzling, waste-spewing technologies are a major force of destruction of our environmental resource base. The assumptions and basis of current economic structures are geared directly to increase inequity, environmental destruction and social and community breakdown. Our policies and legal frameworks, despite being well-intentioned and framed with beneficial aims, sometimes end up by creating even greater unintended costs than benefits.

In this Annual Conference of CoR-India, we wish to explore the technological, economic and policy choices we can make that converge with the goals of sustainability. In particular, we will explore the nature of State institutions, of business and of civil society that are necessary - even if not entirely sufficient - to serve the economical, ecological and societal and above all ethical, *purpose of speedily eliminating ecological insecurity, particularly with respect to India's forests, land and soils.*



Forests, Land and Soils – The Critical Resources for Food and Livelihood Security

Forests are areas dominated by vegetation and act as habitats for a large variety of flora and fauna. They provide numerous, valuable ecological resources, purifying the air we breathe, the water we drink and many of the food, fibre, fuel, feed and other materials that contribute to the economy and enrich society. They also provide essential ecosystem services by helping form soil, check soil erosion, prevent floods and recharge ground water supplies. Furthermore, forests influence the climate by increasing humidity in the air and by moderating winds; they are useful in reducing the impacts of global warming by acting as a major sink for carbon dioxide. All-in-all, forests also play an important role in the biogeochemical cycles that sustain life, e.g., carbon cycle, nitrogen cycle and oxygen cycle.

Nearly 27% of the earth is covered with forests. During Independence, India's forest cover was a reasonably healthy 33 percent. However, it has now fallen to a very inadequate 21 percent. Despite major financial allocations by Central and State government, the restoration of our forests at current rates still has a long way (and time) to go. In addition to replanting and regenerating our forests, we urgently need to remove the causes of deforestation. These include: expansion of agriculture, grazing lands and cash crops; rapid industrialisation, urbanisation and growing consumerism; logging for timber and excessive extraction of forest products; forest fires, alien species and tree diseases (the frequency and magnitude of all of which is increasing because of climate change), and other economic activities.

The cost of this deforestation is big in the immediate present, and huge over the longer term. Reduction in recharge of water bodies, which leads to lower and more variable surface and ground water flows, which in turn lead to loss of quantity and quality of water available, to floods in the rainy season and drought and desertification at other times. Destruction of forests also leads to loss of soils, pollinators, livelihoods. All these cause tremendous losses for the economy. The consequent loss of biodiversity, often including irreversible extinction of species and disappearance of natural habitats causes gigantic additional costs to society. And the loss to humanity of forests and natural areas in terms of aesthetic and spiritual value is inestimable.

The second major, and related, terrestrial resource is land. Land is not just a source of identity for individuals, communities and nations; it is a source of lives and livelihoods, essential for the production



of food, extraction of natural resources and provision of space for human settlements and economic amenities. Land is needed by the economy, by society and by nature for a wide variety of uses. The competition among these three consumers for land is sometimes so severe that they can end up undermining each other's access to it. The burgeoning demand for land by agriculture, urban growth and mining, for example, have multiplicative impacts on each other and even more on the forests, wetlands and protected areas that their expansion destroys. The problems of land management become even more complicated by antiquated laws, traditional ownership patterns, economic issues and even corruption.

The demand for land rises exponentially as the population and the economy grows, and it is not difficult to see the validity of the observations of Plato 2,500 years ago, Malthus 200 years ago and the Club of Rome 50 years ago, that infinite growth on a finite resource base is bound to lead to pain and suffering for a lot of people. Perhaps it is a recognition of this simple fact that over the past decade, wealthy investors from countries like China, the US, India and others have invested so heavily in land for crops, biofuels and mining in large parts of Africa, Latin America and Asia. During this decade, this "land grab" through purchases by overseas investors has reached an area the size of Portugal.

Land use planning at the regional level and participative management at the local level have become critically important instruments for rational administration of land resources. Few resources are the subject of as many laws and regulations as those that govern land issues, yet these seem to be inadequate to ensure that this resource is used in a manner that benefits all fairly and sustainably.

Soil is the third key terrestrial resource. Next to water, it is perhaps the most essential, yet least recognised basis for the flourishing of life on our planet. Soil is an incredibly complex living thing, harbouring billions of tiny or microscopic fauna and flora that create a medium for the germination and growth of plants. In addition to agriculture, top soil is valuable for many other purposes, notably construction materials, grasslands and forests. The importance of protecting it lies not just in its uses but even more in fragility and the length of time it takes to be created.

Soils can quickly get depleted not just by being removed for other uses but also by erosion. About 180 million hectares (about 60 per cent of India's total area) is adversely affected by soil erosion – by water, wind, overgrazing, poor agricultural practices and a myriad of other causes. Soil degradation is also caused by agrochemicals, mono-cropping, acid rain, polluted water from industrial and other sources,

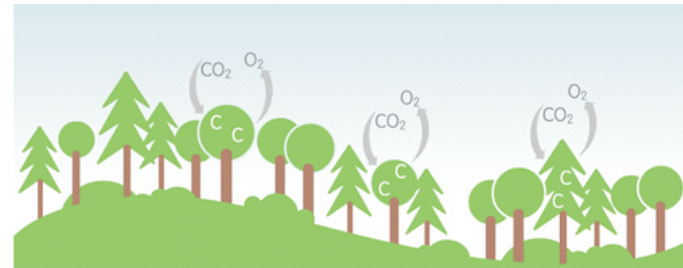


leaching of materials from sanitary landfills and waste dumps. The run-off of tremendous amounts of rainwater on long and steep slopes leads inevitably to soil loss. Forest protection, sustainable agricultural practices, forest restoration and reforestation are the only ways to minimise soil erosion.

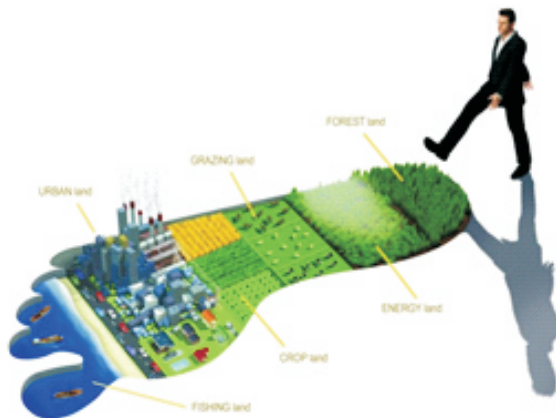
Innovation for Securing Our Forests, Land, and Soil Resources

Human activities consume resources and produce waste. As human population and economies grow, so does the consumption of natural resources and the production of waste. This in turn increases pollution and depletes the resource base and diminishes nature's absorptive and regenerative capacity.

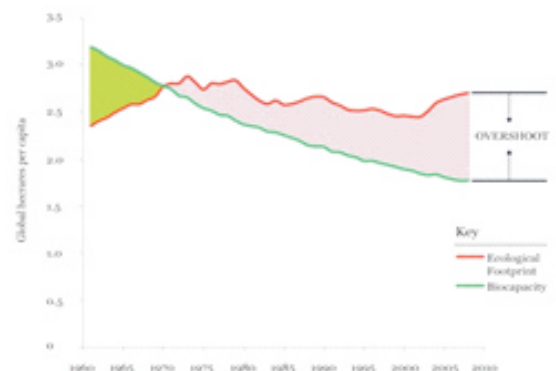
Humanity now needs the bio-capacity of 1.7 Earths to obtain the resources used by the global economy, up from about 0.5 Earths in the 1950s. And India needs some 1.5 Indias to sustain itself, up from the 0.3 or 0.4 Indias it needed at independence. The generous wealth endowed to us by Mother Nature, like a spendthrift's bank balance, is rapidly disappearing, as the gap between withdrawals and deposits keeps growing.



Source: www.forestry.gov.uk



Ecological Footprint (EF) – an objective, science-based metric



Rapidly growing gap between Global EF and Bio-capacity



This situation is not widely understood but is clearly not sustainable; over the coming decades it has to change radically. All nations now urgently need to bring their ecological footprint into balance with their bio-capacity.

India's per capita ecological footprint¹ is relatively modest in comparison with affluent countries which often exceed footprints of 10. However, because of the size of its population, India as a nation has the third largest ecological footprint in the world. Only the US and Chinese are bigger.

While the country's rich few consume large quantities of resources, comparable to their peers in highly industrialised economies, the large majority of Indians are too poor to access even the minimum amounts needed for a decent, healthy life. Yet, we have little room for manoeuvre.

Worse, as the footprint grows and the bio-capacity continues to shrink, the runaway narrowing of options inexorably reduces the space for making rational, optimal decisions for a better future, whether in the social, economic or political domains.

Our forests, land, and soils are the essential supports for the health of our life-sustaining food and water resources (the security of which was discussed, respectively, in the Club of Rome – India's Annual Conferences in 2014 and 2015). ***The conclusions from both discussions clearly homed in on three instrumentalities in which India needs great and immediate improvement: Innovation, particularly in institutions and technology; Investment, particularly in people and nature; and Coherence, particularly in the making of policies and economic structures.***

So the challenge before our meeting is to identify the Innovations, Investments and Convergences that India now has to bring about to create a development pathway that provides all its citizens, rich and poor, with an adequate quality of life without relentlessly destroying its resource base and its future.

Overall, the Big Questions before the Conference, for consideration by each thematic issue, therefore are:

- 1. What are current trends in the state (both quantitative and qualitative) of India's forests, land and soils?***
- 2. Where these trends are negative, what are the changes in institutions and technology choices that can reverse them?***



- 3. *Where would investment in innovation and research; communication and awareness; and community institutions have the greatest pay-offs?***
- 4. *How does public and private investment need to be redirected for managing these resources sustainably for now AND the future?***
- 5. *What are the knowledge gaps or other barriers that prevent rational policy formulation for these resources?***

While Club of Rome Conferences are designed to encourage “out of the box” thinking and sharing of unorthodox ideas, they are structured to facilitate the formulation of concrete and practical lines of action that can be conveyed to appropriate decision-makers with the intellectual weight and experiential strength of a credible body of practitioners and thinkers.

The 2016 Annual Conference of the Indian National Association for the Club of Rome is designed to address the above questions and formulate recommendations to those whose work could benefit from them.



Policy Coherence for Securing Our Forests, Land and Soil Resources

In a democracy such as India, the governance framework comprises of many instruments such as the Constitution, policies, laws, regulations, rules; and institutions such as legislative assemblies, courts, tribunals, public litigation systems, police, etc. In a federal democracy like India's, most of these instruments and institutions are replicated at the State and local level as well. The whole system can be quite complicated. Policy making at both the sectors (ministries at each level of government) and levels of decentralization (federal, state or local) is carried out independently of each other, and there is no guarantee that they would be identical or even convergent. In fact, there is often significant conflict between the different policies in different domains that impact the management of many resources (natural, physical or societal). Sometimes, one policy may well counteract another, leading to sub optimal, unintended or even counterproductive outcomes.

After the United Nations Conference on Human Environment in Stockholm, the Constitution of India was amended, to include protection of the environment as a constitutional mandate. The Constitution (42nd Amendment) Act of 1976 made it a fundamental duty to protect and improve the natural environment by Clause (g) of Article 51A: "It shall to be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and have compassion for living creatures." A change made in Article 48A of the Constitution of India now states, "The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country"

India is witness to a paradigm shift in forest conservation approach, as well as several twists and turns in the past few decades. The Department of Environment was established in India in 1980 to ensure a healthy environment for the country. This later became the Ministry of Environment and Forests in 1985. Now, it is named the Ministry of Environment, Forest and Climate Change (MoEFCC). It is the nodal agency in the administrative structure of the Central Government for planning, promoting, co-ordinating and overseeing the implementation of India's environmental and forestry policies and programmes.

The Club of Rome-India Annual Conference will garner inputs from a wide range of experts and will identify the means by which national, state and local policies in different arenas can be brought in line with each other in the attainment of the most basic goals needed for sustainable national development. To wit: a secure forest-land-soil-ecosystem for a healthy and productive environment.



Policy converts the demands and expectations of society, legitimising them through the political process and change, into actions and practice that deliver the results wanted by society. Since India is endowed with huge ecological and biological diversity, with widely different characteristics in different regions, the demand and support should enhance the ability of regional authorities to keep India's ecological system in good health. Central government should generally play a goal setting and enabling role. This means that regional bodies must have the capacity and power to make the right decisions to regain and maintain the ecosystem balance of their region.

The need for coherence in the policies of the State and Central government is therefore critical for the sustainable development of its territorial resources. We need multi-stakeholder partnerships at all levels, giving opportunities for innovation and game-changing initiatives, to enable India fulfill the goals of the National Mission for Green India (GIM).

India is rich in policies and laws but poor in implementation of these laws. India is advanced in policy rhetoric but has lagged miserably in service delivery. Consequently, the challenges facing the managers of our forests, land and soils, and the nation's ecological footprint are becoming overwhelming. We need to learn from our mistakes and omissions and design a future that will regenerate the extent and quality of our forests, land, soils and ecosystems at large. We have too many Acts and not enough action! We need to make laws relevant and mutually reinforcing.

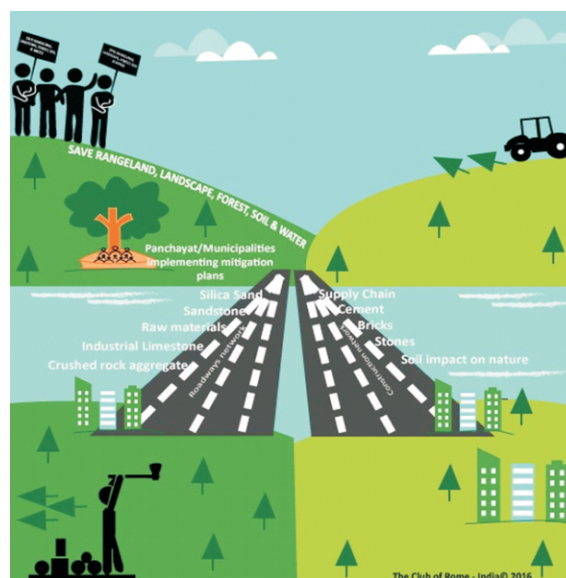
- 1. What are examples of major policy conflicts relating to forests, land and soils within these sectors and in other sectors that impact these resources?***
- 2. What structural changes are needed in governance to ensure that policies in different sectors and domains that affect forests and land are coherent, convergent and mutually reinforcing?***
- 3. What are the knowledge gaps or other barriers that prevent rational policy formulation for these resources?***

As with the issues of innovation described above, this Annual Conference encourages participants to identify the problems facing our terrestrial resource base and design concrete and practical solutions to address them. These will then be conveyed to appropriate decision-makers.

The 2016 Annual Conference of the Indian National Association for the Club of Rome is designed to address the above questions and formulate recommendations to those whose work could benefit from them.



Actions for Securing Our Forests, Land and Soil Resources



Highly creative innovations and carefully designed, converging policies within and across sectors are essential – but not sufficient. The nation needs action based on these that can lead to truly beneficial outcomes, for people, for communities and for the environment. In the context of the larger economy, it should be the responsibility of governments to enable activity that is good for the present and the future, and for business and civil society to carry out that activity. Unfortunately, in India for various historical and cultural reasons these roles have often got badly mixed up. Quite often, actors in one sector of the economy end up doing the work appropriate for other sectors. The first step in rationalising policy implementation is to sort out who is to do what, where and when.

In the case of terrestrial resources like forests, land and soils – and water – the overall objectives having been decided by the government (backed by the elected representatives of the people), the real work on the ground has to be carried out by businesses, communities and households – assisted by the



government and civil society. This work, which covers a vast array of societal concerns, must be based on sound scientific principles, engineering practice and financial efficiency. In the larger interests of an efficient economy and a fair and just society, the actions needed include large numbers of sectoral issues, often in direct opposition to current practice, such as:

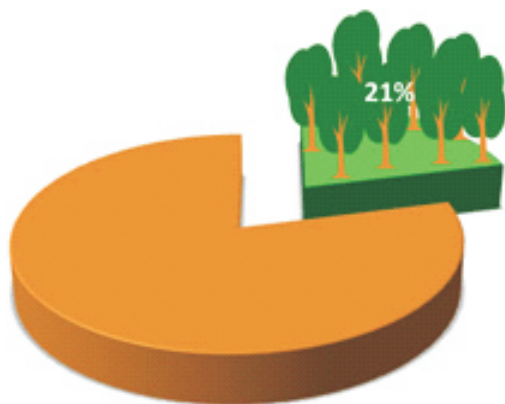
- Expansion of urban settlements and infrastructure only into areas that are not suitable for agriculture, forestry, ecosystem services
- Logging for timber and collection of fuel wood only in plantations created for those purposes
- Grazing only within well-defined limits and only in designated grasslands selected for their resilience
- Systematic protection of forests from the risks of fire, disease and infestation by alien species
- Mining to be allowed only where local populations and ecology can sustain it and with strict conditions for post-mining rehabilitation of lands
- Zoning of industries and other polluting activities away from natural areas (and, indeed, densely populated communities)
- Protection of fragile, high value ecological areas by shifting more intensive utilization to less valuable sites
- Promotion of ecotourism and other ecologically benign livelihoods based on the health and longevity of forests
- Education and awareness of the value of forests to the economy and ecology of local communities

With respect specifically to our forests, land and soils, there are many other improvements we can make in the way we think and how we act:

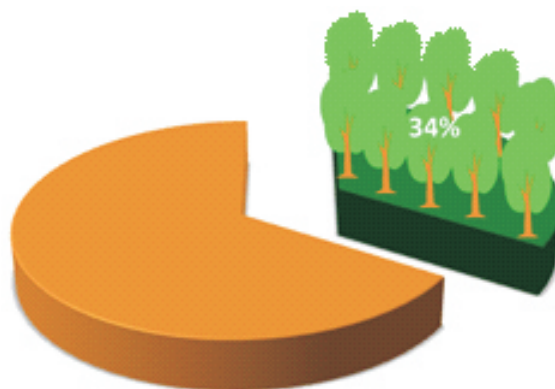
1. **Increase the area and standards of management of protected areas** – studies have shown that this is one of the best investments society can make
2. **Increase the area of forests permanently reserved for timber production** – an obvious way to reduce the pressure on natural forests
3. **Increase the perceived and actual value of forests** – making it too costly to degrade or destroy it



4. **Increase local incomes and improve people's lives** – the most effective and rapid way to motivate smaller families and reduce population growth
5. **Promote sustainable management of forests, land and soils** – least cost way to maintain their health and contribute to the economy
6. **Encourage substitutes for timber, biofuels, paper** – reducing the need to cut trees
7. **Restore forests and plant new ones** – bringing vacant, unused and waste lands, e.g., roadsides, rail tracks, farm boundaries and urban forests
8. **Increase investment in research, education and extension** – maximising the returns to investment in creating and using knowledge.



Present Forest Coverage in India - 2016



Forest Coverage during Independence - 1947



Yesterday's Debate: Protection and Preservation

Until not very long ago, and in some quarters, even today, the measurement of societal progress is measured solely in terms of economic parameters – the main ones being GDP and GDP per capita. With such a limited metric, evaluation of the past and design of the future can only be of a very limited nature. Political, social or ecosystems, being “systems”, can only be meaningfully seen as integrated entities rather than looking at their various parts in isolation and using only one as the surrogate indicator for all aspects.

By the 1970s, there were already some concerns about environmental degradation in the form of pollution, toxic substances, waste management and some basic resource issues. Subsequently, and in rather rapid succession, a host of new environmental issues have become the material of media headlines and global summit conferences: climate change, biodiversity loss, wildlife, long-lived pollutants, pervasive plastics wastes . . .

Over the same period, there was a separate set of global concerns, voiced by separate groups of people, about the issues of poverty, marginalisation, inequality and social alienation . . .

The debates gradually moved towards consequences of globalisation, control of pollution and CO₂ emissions, etc. but rarely moved to discussions of the root cause on how the problems could be solved in a practical but fair world. That can only be done usefully with the holistic tools becoming available today.





The Debate Needed Today: Conservation and Social Justice

Humans have made unprecedented changes to ecosystems in recent decades for their “requirements” of food, fresh water, fiber, feed and fuel. These changes have improved the lives of billions, but at the same time have weakened nature’s ability to deliver other key services such as purification of water and protection of ‘ecosystem-forest-land-soil’ from disasters. Gains have been achieved but at growing costs in the form of degradation of ecosystem services. Attention should go towards setting-up a conceptual framework within which the contribution of ecosystems to human well-being can be evaluated where a change can be brought towards sustainable development.

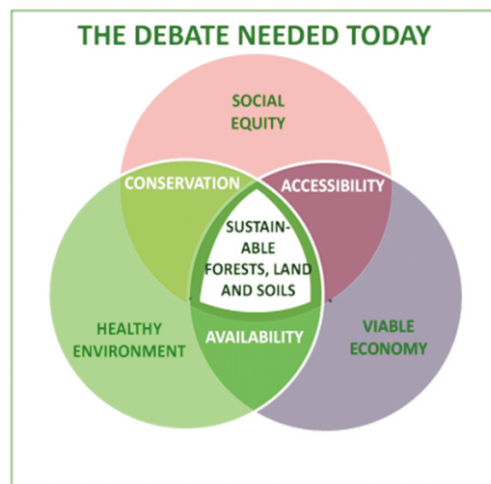
The 20th century saw a fourfold increase in population, and a fourteen-fold increase in gross world product. A few people earned more wealth than anybody could have dreamed, and by the end of the century people found themselves suffocating in their waste products and pollution.

A better, more desirable future lies in reconciling the three strands of sustainable development:

- Equitable Society
- Environment
- Economy

It is no longer meaningful to talk in the language dichotomies –poor vs rich, development vs environment, small vs big, public vs private . . . or left vs right. The solutions of today’s problems lie in finding the judicious mix of both sides of the dichotomy – a kind of merging of the yin and yang to find meta-level landing places reconciling to the interests of all fairly and justly.

We now need tools for analysis and policy making that go far beyond the ideologies of yesterday in bringing together people representing the world’s diversity to define new approaches that will create a world that is truly sustainable, economically, socially and environmentally.



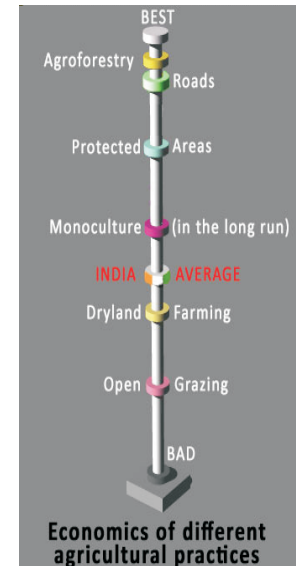


The Three Strands of Sustainable Development

Economic (“Profit”)

For the past two centuries, the dominant thinking has been in the language and idiom of economics, a “science” with a peculiarly one-dimensional view. Activities that made money were “good” and activities that did not were “bad”. Industry that polluted and guzzled resources but made money was good; activities that regenerated the environmental resource base for the health of people but did not make money were bad. In this manner, a one dimensional image shows that actions such as paving over the countryside with roads would score high for the economy but restoration of forests would not.

The schematic here shows in a very rough and not-to-scale manner how different interventions might score if only the economic outcomes are evaluated.



Social Equity (“People”)

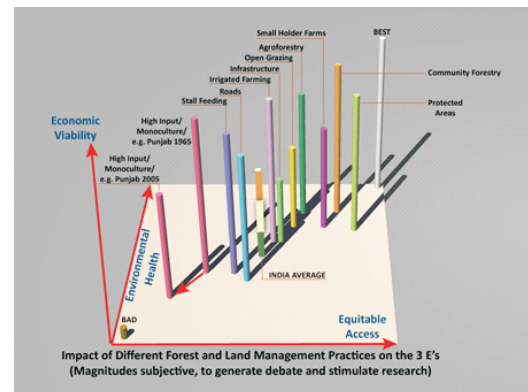
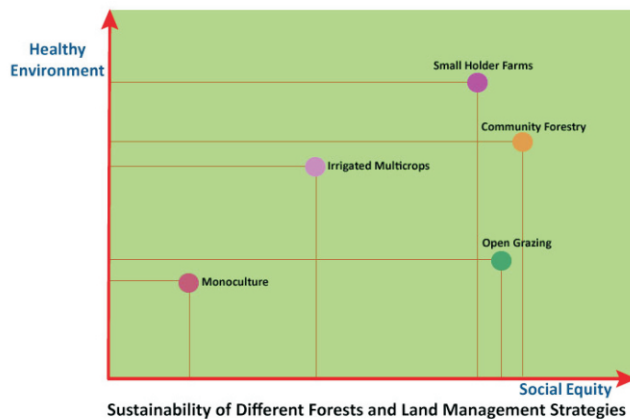
Under the Constitution, citizens of India have equal status with respect to sharing the benefits from use of natural resources, social goods and services such as those related to ecosystems-forests-land-soil. The basic principles of distributive justice imply that any economic activity should at least do no harm, and normally should be conducted so as to improve the lives of people, particularly those living at the margins of the economy. Development planning should first ensure that natural resources such as forest-land-soil be conserved and used sustainably for safe and adequate use by future generations, without jeopardising the lives of people working on them or living near them.

Although the science of sustainability is still young and somewhat rudimentary, it is sufficiently clear on the basic preconditions of measuring the degree of equity a society has achieved, going beyond simplistic measures such as the Gini coefficient, to the need to include in these indicators the position of women in society; health, education and longevity of different groups of the population, and social mobility.



Environmental Health (“Planet”)

Overexploitation and degradation of natural resources, particularly ones that have long gestation periods for regeneration such as forests, land and soils, can close many options for future generations who would need these resources in a productive state, just as the present generation does. Future innovators may provide solutions that in part make up for the loss of these resources but most of them are essential for the most basic needs such as forests for regulating water, land and soils for growing traditional food crops.



The 2D and 3D schematics shown here attempt, again without any pretence at showing exact magnitudes, the combination, in the first case of environmental health and social equity; and in the second case by bringing together all three strands of sustainability: economic, social and environmental. The purpose of these diagrams is not to represent actual magnitudes – that requires more research – but to show the kind of analysis that will be required to generate a public debate on what trade-offs are needed and how they should be made between the three parameters.



Impact of Forest Restoration on Ecosystems Security

The world's ecosystems have undergone severe degradation with negative impacts on biological diversity and peoples' livelihoods. Forest restoration can be termed a long-term process of assisting the recovery of ecological functionality and enhancing the well-being of humans across a deforested or degraded forest landscape¹. Intentional activity initiates or accelerates an ecological pathway-or trajectory through time - towards a reference state.

Forest restoration means that an ecosystem must be returned to its resilient and self-sustaining state, with a balanced structure, maintaining a rich spectrum of species, integrated into the larger landscape, and always supportive of sustainable livelihoods. Historically, it has been observed that many healthy ecosystems are products of human endeavours and commonly require the participation of resource dependent communities. In this way, forest restoration supports conservation and sustainable development efforts².



Source: IUCN and WRI

A degraded forest must be restored to regain sufficient biotic and abiotic resources to sustain its structure, processes and functions. It will then demonstrate resilience to normal ranges of environmental stress, and will interact with contiguous ecosystems in terms of biotic and abiotic flows and social/ economic interactions. Restoration takes time before all the benefits are evident.

The attributes listed below provide a basis for assessing restoration progress:

- It allows adequate time for self-generating processes to resume.
- It focuses on treating the causes rather than the symptoms of degradation.

¹IUCN, WRI. A guide to the Restoration Opportunities Assessment Methodology (ROAM), Gland, Switzerland: IUCN Publication, 2014, p.15

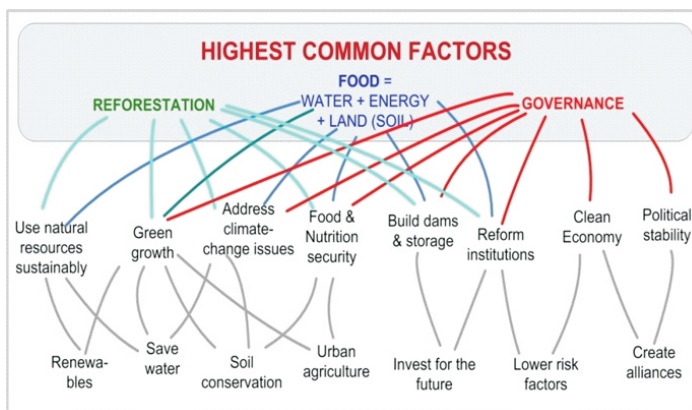
²George D. Gann & David Lamb, "Ecological Restoration – a Means of Conserving Biodiversity and Sustaining Livelihoods", <http://www.ser.org>



- It allows linkages within the larger landscape.
- It engages with all relevant components of society and its disciplines.
- It enables displaced and vulnerable communities to engage in the planning, implementation and monitoring of restoration processes.
- It ensures all stakeholders to be fully aware and provide possible alternatives, opportunities and benefits

There are many compelling reasons why forest restoration is required. The urgent³ need for better food and water security and more secure livelihoods among forest communities, and the growing demand for forest products and Bio-energy, etc., all underline the need to massively scale-up the restoration efforts. Meeting these needs while increasing carbon stocks, improving adaptive capacity and addressing the decline in biodiversity cannot be achieved solely by efforts to mitigate deforestation.

Although tackling deforestation is critically important -- particularly for reducing greenhouse gas emissions-- efforts need to be supplemented by ambitious restoration initiatives that can help take the pressure off existing forest land, provide alternative sources of forest products, improve soil fertility and reduce erosion (through agroforestry and evergreen agriculture) and generally contribute to carbon-intensive land stewardship.



Forest landscape restoration, therefore, complements well other approaches to improving food security and climate change mitigation and adaptation, including climate-smart agriculture and REDD+ (Reducing Emissions from Deforestation and Forest Degradation).

These derivations are shown in the figure below, which highlights the highest common factors—food, reforestation and governance - as “silver bullets”, for solving all our security-related problems.

³IUCN, WRI. A guide to the Restoration Opportunities Assessment Methodology (ROAM), Gland, Switzerland: IUCN Publication, 2014, p.18-19



Issue 1: Infrastructure and its Impacts on Forests, Land and Soils

Optimising the Trade-offs between Efficiency of the Economy and Productivity of Nature

For Economies that industrialised in the 20th Century, infrastructure became synonymous with progress, indeed with “civilisation”. The city, the road, the port and airport; the communication and transport networks; the high-rise buildings and underground tunnels; the power stations and dams, power grids and irrigation systems – all these and more grew in size and scale, through the “great acceleration” of the last century, by several orders of magnitude.

In the 21st Century, while infrastructure development in the industrialised countries is reaching a point of saturation, elsewhere – mainly in the Global South, this acceleration has further accelerated. In their effort to catch up, the “emerging economies”, not least China, India and various others in Africa, Asia and Latin America, are now committed to the single - minded pursuit of infrastructure building. In the three year period 2011 to 2013, China is said to have used more cement than the United States used during the entire 20th century⁴. Her airlines, which were virtually non-existent 50 years ago, now carry nearly half a billion passengers per year⁵.

India’s speed of construction and growth of air travel may not have reached anywhere near these stratospheric levels but that is not due to lack of desire or intention. Our policy makers are explicit in



⁴ Bill Gates (2014) - <https://www.gatesnotes.com/About-Bill-Gates/Concrete-in-China>

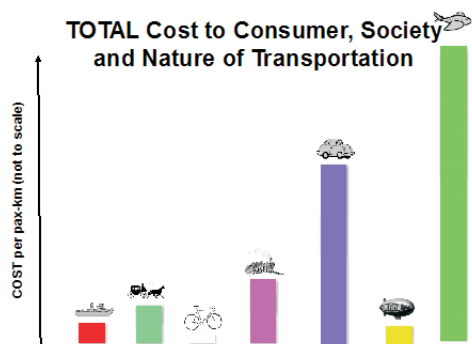
⁵ World Bank (2015) - <http://data.worldbank.org/indicator/IS.AIR.PSGR>



their admiration of current development models and the present government intends to commit some \$1.5 trillion of public funds within the next five years to infrastructure investments. But few among our decision makers have considered what that approach to development, resulting in a doubling of the land under taken up by urbanisation and infrastructure, can do in the longer run to a country's social fabric, economic prospects or environmental quality – not to mention the natural resource base on which reaching all their goals depend.

The nation's primary goal, to improve the lives and wellbeing of all its citizens is not in question; the nation's strategies on how to achieve this goal are. People's access to better livelihoods and jobs; adequate food, water and energy; superior health, education and entertainment; and to personal fulfilment generally are not the issues that are up for grabs: how these will be attained and distributed are the questions that now need well-debated answers.

India, like any late-comer to the economic development arena is fortunate in being able to benefit from the prior experience of others, having access to innovations and ideas that are new and much more resource efficient, and a generally clean slate for making choices that are not constrained by the "lock-in" effects of prior decisions. If it decides to copy the choices made by others in the past, it will end up by paying even heavier costs, since the availability of resources will be even tighter in the future. If it decides to adapt those choices to its own situation, it may escape some of the pitfalls faced by the early adopters. But if it decides to leap-frog into a transformative future, by designing its cities, transport systems, power, water and utility infrastructure to be different, suited to its own future needs – local, decentralised, human-centred and human-scaled – it could quickly improve the lives of its citizens today without reducing the options of future generations.





Issue 2: Forests, Land and Soils for Sustainable Ecosystems and Resilient Communities

Reducing the Vulnerability of Women, Children and Tribes

It is not just the women, children and tribal people of our rural areas, some 600 or 700 million of them – as many as the populations of the US and EU combined – who are dependent on and also deeply influence the health and productivity of our forests, land and soils. EVERYONE, from political leaders to farm labourers, from captains of industry to the workers in their factories, bankers and lawyers, scientists and professors, millionaires and volunteers – everyone depends on these environmental resources for the purity of the water we drink, the cleanliness of the air we breathe, the pollination of the crops that provide our food, and the fibres, fuels and materials that house and clothe us and keep us warm in the winter and cool in the summer. And, all of us are causing havoc to the capacity of ecosystem resources to continue supporting us.

But it is certainly the women, children and tribal citizens who are in most direct contact with and therefore the most vulnerable to any deterioration in these resources. Their food, water, energy and livelihood security is integrally tied up with their access to the products of these resources, even more intimately than the general population. Unfortunately, with populations and economies growing well beyond the capacity of nature to support them, we now face major problems of desertification, water scarcity, depletion of soil nutrients, land degradation from over-grazing, deforestation, urbanisation, road-building, aquifer depletion, and other environmental stresses, increasingly compounded with the effects of climate change, often caused by inadequate – or even counter-productive -- policies, institutions and practices. Women and children – and local communities, indigenous or otherwise -- may be the most vulnerable to any deterioration but they also have immense potential to be stewards of these resources now, and in the future.

Traditional culture and social structures in India undoubtedly led to lifestyles and behaviour patterns that were largely in harmony with nature and therefore could be sustained for millennia. However, the changes in economic systems, technological possibilities and societal arrangements, particularly the commitment to human rights and social justice and the rapidly changing aspirations of communities and individuals that have taken place over the past century, can no longer tolerate some of those



traditions in their pure, original form. They have to be adapted to modern needs by blending the best of the old with the best of the new. Some of the old ones, which are totally inappropriate today, particularly those relating to caste or class and various aspects of gender relations, will have to be discarded altogether. Fortunately, the imperatives of ecological productivity and those of social equity are mutually supportive, so improving one generally helps improve the other.



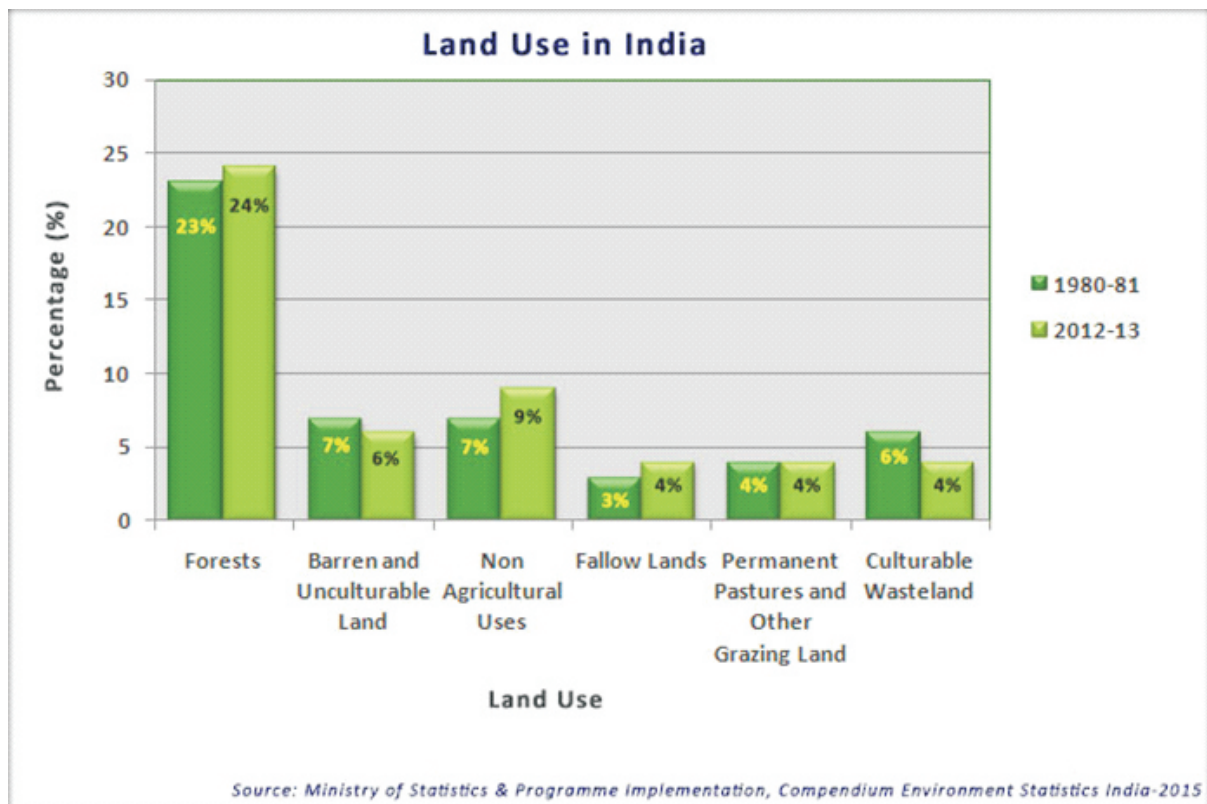
The women and children, the poor and marginalised people of our nation are entitled, as a fundamental Constitutional right, to have healthy, dignified, meaningful and fulfilling lives. This is actually, a moral and ethical imperative that is the responsibility of every citizen to ensure. Beyond this, is the more practical issue of how the citizens of India can best contribute to nation-building. Today, the loss to the economy, culture and social progress of India arising from the loss of its potential human “resources” because of gender, caste, poverty and other factors of exclusion is incalculable. The much vaunted “demographic dividend” is being squandered on a scale that is truly as tragic societally as the individual human tragedy of unfulfilled potential in the first place.

Issues of displacement by “development” projects, loss of land through erosion, threats from land-grabbers, and a host of other risks outside the control of local people increase their vulnerability, further marginalising them. At the same time, it is the women and tribals who generally have the strongest sense of ownership over the local resources, who are willing to go to the lengths often needed to protect them from external forces whose only interest maybe to extract what can be had cheaply and walk away. The policies and supports they need (particularly from the government and civil society) are to strengthen their ability, as communities and to protect the resources on which their lives and livelihoods depend. In this effort, creating better awareness and knowledge among women and girls, particularly as to their rights and entitlements, is quite possibly the action of greatest value to society.



Issue 3: Forest Health and its Restoration

Forests are tree-dominated communities of plants, animals, and micro-organisms that interact with each other and abiotic components such as soil, water, and the climate. The interactions are complex, and each component of the forest has an effect on the others. Trees affect plants and animals that reside in the forest, protect soil from erosion, reduce runoff and improve water quality and clean and cool the air. Likewise, the tree species found in a forest are determined and influenced by the forest's abiotic and biotic components. A healthy forest is a vital, living system that possesses the ability to sustain the unique species composition and processes that exist within it.

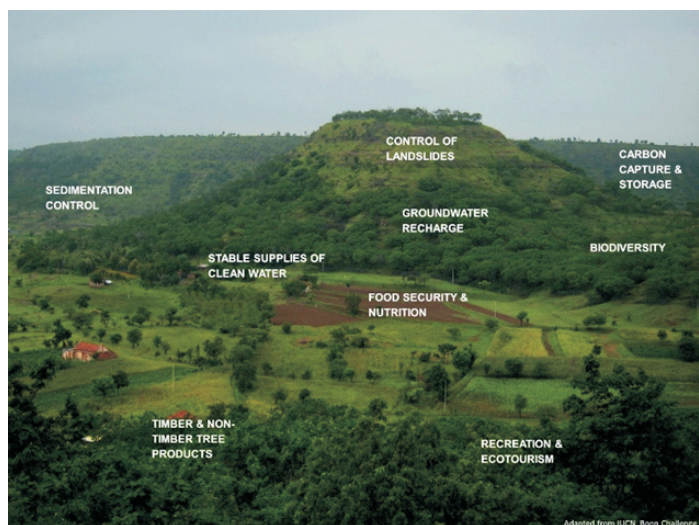




Over the years, the health of India's forests has steadily declined because of the loss of dense and very dense forest areas, forest land diversion, forest fragmentation and over-extraction of forest products. This deterioration in forest health hugely impacts the country's ecological as well as economic security, while also exacerbating the vulnerability of forest dependent rural, mostly poor communities.

Landscape-scale, holistic approaches are imperative for supporting India's developmental ambitions. These approaches include protection of existing well-functioning forests, rehabilitating degraded forests as well as integrating trees with farming and other land uses to support food security, strengthen biodiversity conservation, secure water quality, as well as mitigate climate change and its impact. Successful restoration of forests at landscape scales also support the achievement of India's commitments to the United Nations processes on biodiversity and climate change.

There are fewer priorities more urgent for the future of India's economic or ecological health than regenerating the nation's forest resources. Over the past decades, despite numerous national policies and programmes aimed at improving the forest cover of the country, the situation continues to be alarming today. We now need a better root-cause understanding of the barriers to reviving our forests, particularly of the indirect factors – often stemming from well-intentioned policies aimed at other societal objectives – that prevent enhanced forest-related outcomes.

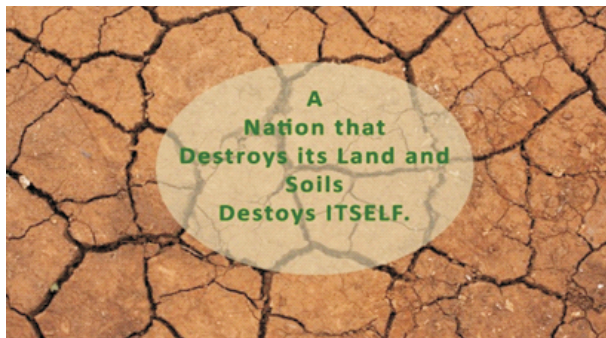


Perhaps equally important, it would be a great impetus to the cause of healthier forests to identify and support policy objectives with other societal purposes and “co-benefits”, such as carbon sequestration for climate change, conservation of biodiversity, augmentation of fresh water resources, etc. These and forest improvement objectives can greatly reinforce each other. Equally important are the institutional structures, many of them more than a century old, that need drastic, fundamental reconfiguration to meet today's fast changing needs, not just in economic terms but also for national and global environmental needs.



Issue 4: Land and Soil Health and their Restoration

Conserving the Earth for Our Food Security



There is around 15 billion hectares of land worldwide. Agriculture uses more than 4.5 billion hectares, or 30 per cent, of the world's land area, and cropland currently covers around 1.5 billion hectares (10 per cent)⁶ of the global land area. Over the last 5 decades, the area used for agriculture has been expanding, primarily at the expense of forests.

Under business as usual conditions, the growing demand for food and non-food biomass could lead, by 2050, to a gross expansion of cropland worldwide in the range of 320 to 850 million hectares more⁷. Expansion of such magnitude would necessarily mean encroaching further into forests, grazing lands and natural areas, at the expense of the basic life-supporting services that ecosystems provide, such as maintaining soil productivity, regulating water resources, sustaining biogeochemical cycles or conserving biodiversity.

India's land area is about 330 million ha, of which almost 50% is cultivable land, and of that, about 50% has been partially degraded through faulty cropping practices. Around 2 per cent of this land area is covered by cities and infrastructures (built-up land), and this area is growing. Built-up land is expected to cover 4 to 5 per cent of the global land area in 2050, most of it by expanding into agricultural land.

Since the massive fluctuations in food prices a decade ago, investors have gone on a spree to purchase large amounts of land overseas. Over this short period, these investors, from China, India and several

⁶FAOSTAT Land Use module". Food and Agriculture Organization. Retrieved 8 July 2016

⁷UNEP – International Resource Panel, "Assessing Global Land Use" (2016)



other countries have bought land in Africa, Latin America and other regions that is considerably greater than the entire land area of Portugal or the state of Bihar, in east India. The magnitude of these purchases presumably reflects the expectation of these investors that domestically available land will be insufficient to meet the future demand of food.

At par with water, soil is probably the most critical natural resource for supporting life in general and humans in particular. Top soil is an enormously complex, active, living substance which takes nature millennia to create. A cubic centimetre of it contains literally millions of living organisms in it. It is not only the base of virtually all crop production, but also has other, competing uses in the economy, such as making bricks and other construction materials, and for being paved over by human settlements, roads and other infrastructure.



“It can take up to half a millennium to build an inch of living soil and only seconds to destroy it”

Physical, biological and chemical processes can degrade land and, particularly, its soil, for example by reducing its organic matter content, biomass carbon, diversity of soil fauna and flora and its nutrients. The implications of land degradation have upon agriculture productivity and it is a serious problem in India too. According to Indian Parliament proceedings, the nation is losing about one millimeter of topsoil each year with a total loss of 5,334 million tons annually due to soil erosion⁸.

Land and soil degradation is a serious problem in India, which needs to be tackled because shrinking of land resource base will lead to a substantial decline in food grain production which in turn would hamper the economic growth rate. In India, about 50 million hectares of land area is affected by wind erosion most of which belongs to Rajasthan and Gujarat; sometimes over-grazing is considered to be the main cause.

Approximately 140 million hectares land area of the country is affected by water and soil erosion as a result of which the top fertile layer of the soil is lost annually at the rate of 6,000 million tons per year containing more than Rs. 1, 000 crores worth of nutrients. The amount of micro nutrients like nitrogen, phosphorus, and potassium lost during this process is about 5.53 million tons⁹.

⁸Minister of State, Agriculture Ministry (in 2010)

⁹Singh A (2014): Land Degradation in India



Issue 5: Water to Connect Land, Soil and Forests Resources

- Nature's Circulatory System

It all starts with a raindrop. Most of us are aware about the hydrological cycle - raindrops to earth, runoff to the streams, streams to rivers, rivers to the ocean, evaporation back into the clouds and raindrops again. The relation between the forests and the rivers is one of total symbiosis. As it is well known, forested catchments are highly efficient suppliers of water, helping meet the domestic, agricultural, industrial and ecological needs in both upstream and downstream areas.



The diverse natural forests regulate rainfall, provide homes for a wide diversity of flora and fauna, and of course, they also help our planet to store carbon. But human activity in and around the forests continues to threaten their survival. Forests, Land, Water and Food Security, are all connected to each other. Food security depends integrally on effective ecosystem services to sustain agriculture, and these are largely mediated by the flows of water. Unfortunately, in recent decades, plantation forests have replaced much of the natural forest area that once covered the world, but they are much less effective at regulating rain, preventing soil erosion and protecting diversity. Forests provide valuable ecosystem functions in maintaining constant supplies of good quality water.

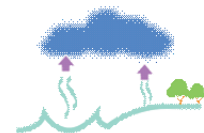
1. Water use by forests

Factors influencing water use by forests include climate, forest and soil type, among others. In general, forests use more water than shorter types of vegetation because of higher evaporation; they also have lower surface runoff, groundwater recharge and water yield. Forest management practices can have a marked impact on forest water use by influencing the mix of tree species and ages, the forest structure and the size of the area harvested and left open.



2. Dry-season flows

Forests reduce dry-season flows as much as or more than they reduce annual water yields. It is theoretically possible that in degraded agricultural catchments the extra infiltration associated with afforested land might outweigh the extra evaporation loss from forests, resulting in increased rather than reduced dry-season flows – but this has rarely been seen.





3. Flood flows

Forests can mitigate small and local floods but do not appear to influence either extreme floods or those at the large catchment scale. One possible exception is reduction of downstream flooding by flood plain forest, where hydraulic roughness (the combination of all elements that may cause flow resistance, such as forest litter, dead wood, twigs and tree trunks) may slow down and desynchronise flood flows.



4. Water quality

Natural forests and well-managed plantations can protect drinking-water supplies. Managed forests usually have lower inputs of nutrients, pesticides and other chemicals than more intensive land uses such as agriculture. Forests planted in agricultural and urban areas can reduce pollutants, especially when located on runoff pathways or in riparian zones. However, trees exposed to high levels of air pollution capture SO_2 and NO_x and can increase water acidification.



5. Erosion

Forests protect soils and reduce erosion rates and sediment delivery to rivers. Forestry operations such as cultivation, drainage, road construction and timber harvesting may increase sediment losses, but best management practices can control this risk. Planting forest on erosion-prone soils and runoff pathways can reduce and intercept sediment.



6. Climate change

Global climate models predict marked changes in seasonal snowfall, rainfall and evaporation in many parts of the world. In the context of these changes the influence of forests on water quantity and quality may be negative or positive. Where large-scale forest planting is contemplated for climate change mitigation, it is essential to ensure that it will not accentuate water shortages. Shade provided by riparian forests may help reduce thermal stress to aquatic life as climate warming intensifies.



7. Energy forests

Fast-growing forest crops have potential for high water demand, which can lead to reduced water yields. The local trade-off between energy generation opportunities and water impacts may be a key issue in regions where climate change threatens water resources¹⁰.



¹⁰According to FAO



Issue 6: Legal, Policy and Financial Framework Analysis

Ecosystems-Environment-Forests, Land and Soils

Every nation has a sovereign right to use and enjoy its own territory in its own way. However, since the United Nations Environment Conference at Stockholm in 1972, numerous conventions, treaties and international agreements have put various bounds on this right, primarily with the intention of limiting nations' rights to harm nature and the planet's life support systems. Indeed, it is now more often the case that international agreements are based on the concept of the responsibility of nations to preserve our planet earth in trust for future generations, and to use its natural resources wisely, avoid harm or damage, and live in harmony with nature.

Given the complexity, ubiquity and fragility of nature, and the long-term implications on how our actions impact it, appropriate institutions of cooperation, laws and policies become necessary.

India is endowed with very rich ecological biodiversity, and a long history and deep traditions of maintaining and nurturing it. All segments of society have been and must continue in the future to be responsible for the health of our natural resources. In a federal system such as that of India, the responsibilities for doing this fall on many levels of government, and these need to be clearly differentiated.

Governments have the job of setting policies, establishing institutions and promoting action that enables the present generation to pass on to future generations the natural endowment in at least as healthy a shape it inherits. In fact, seeing the present state of environmental degradation, it should be substantially improved. Under our Constitution, the respective roles of the Governments at the central, state and local levels are pretty clearly defined. With the 73rd and 74th Amendments, districts, municipalities and village-level communities have acquired some of the most important responsibilities for regenerating and maintaining their forest, land and soil resources.

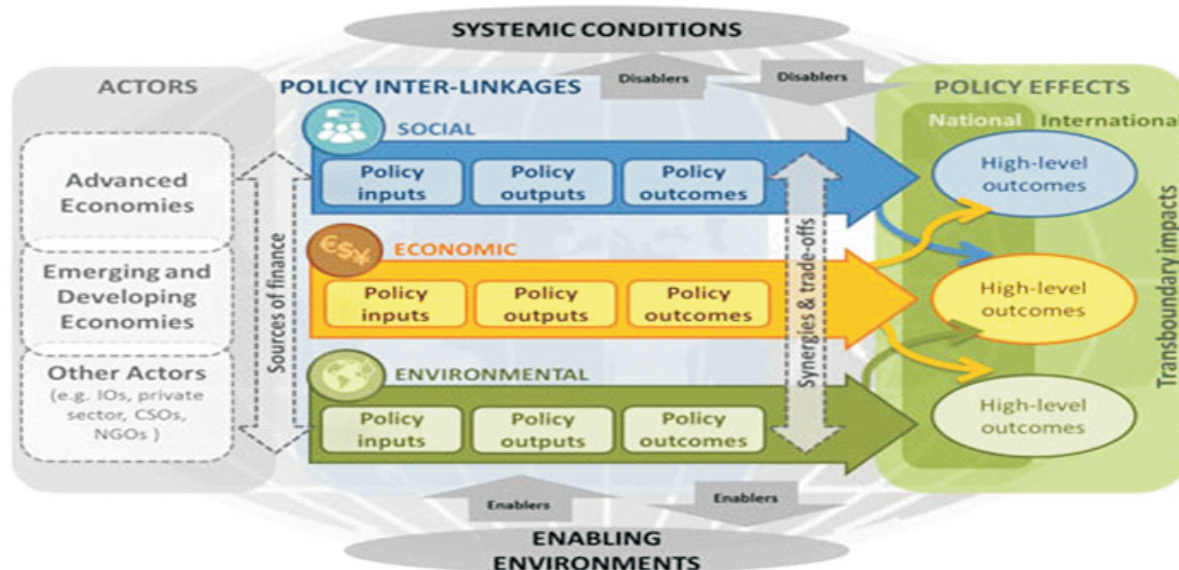
For this, they need major support systems: access to knowledge, technology, capital – all of which in turn require close partnerships between them and the larger sectors of government, private sector and civil society.



The need for coherence in the policies of the state and Central government is critical, in order to embark on India's ecological and forests development agenda. We need a multi-stakeholder partnership, giving opportunities for innovation and game changing initiatives, so that India will be able to achieve the National Mission for Green India (GIM) and take appropriate action.

India is rich in policy designing; however, it has been perceived that there is a difference in rhetoric and reality in policy implementation. The country has witnessed a huge service delivery failure. Consequently, the challenges related to forests and ecological footprints are overwhelming. We need a retrospective policy analysis, which in turn will lead to prospective policy analysis pertaining to forest, environment and ecosystem protection at large. Too many Acts, and feeble actions! Is there a need to make new laws that would be more realistic or flexible or may be more rigid, or otherwise make service delivery systems more rigorous and prompt, increase financial acceptability and accountability etc? This needs to be discussed in the present context.

Analytical Framework for Policy Coherence



Source: OECD PCD Unit, inspired by the work of UNECE/OECD/Eurostat Task Force on measuring sustainable development



The country's forests play a significant role in its social and economic development, and it is a significant contributor to the daily livelihoods of the local rural, indigenous and immigrant populations. However, the challenges that we are to meet - includes our infrastructure need and the relentless pressures facing the ecosystems.

Forests affect a diverse range of stakeholders: Forest resource producers, Forest resource users, Forest resource processors, Societies in general and private and public institutions. Using a harmonious approach while valuing differences can enable these disparate elements to come together for a larger cause.

We need to identify how the above stakeholders can be engaged while taking into account the social distribution of ecosystem services, wellbeing benefits and undertaking issues of environmental and social equity. Communication, awareness and knowledge sharing are key to enhancing appreciation of common issues. The dimensions of the administrative, financial and institutional linkages between the Centre and States, and the asymmetries in the sector, have to be understood to enable the issue to focus on them.

Effective leadership and political willpower affects the governance of forests. The best example is South Korea, where, after losing nearly all its forests during the civil war of 1950-1953, the forest cover grew and reached 64% of the country's total geographical areas. South Koreans not only restored forests, but also increased stocks - the density of trees or wood biomass per hectare - and increased valuable ecosystem services. The estimated economic value of these services were US\$90 billion by 2013¹¹.

¹¹Kathleen Buckingham, and Carig Hanson (2015) World Resources Institute, The Restoration Diagnostic, Case Example: South Korea



INDIAN
NATIONAL
ASSOCIATION

Established in 1968, The Indian National Association for the Club of Rome is a non-profit organisation, which aims “to act as a global catalyst for change through the identification and analysis of the crucial problems facing India and the communication of such problems to the most important public and private decision makers as well as to the general public.” The broad goal of the national chapter, CoR-India, is to help design an agenda for governments in India, the business sector as well as all its citizens’ organisations that could enable everybody in this country to live a full life in harmony with their surroundings by the centenary of the nation, 2047.

(www.clubofrome.in)

Contact: info@clubofrome.in



Development Alternatives (DA), a not-for-profit action research and development organisation, is the primary knowledge partner of CoR - India. DA innovates and disseminates sustainable solutions aimed at reducing poverty and regenerating natural ecosystems and their services. Established in 1982, its eco-solutions deliver basic needs products through the small, local enterprises that generate green jobs and sustainable incomes. Based on its innovative environment-friendly technologies and market principles, these enterprises help build local economies and communities while maintaining a minimum ecological footprint.

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