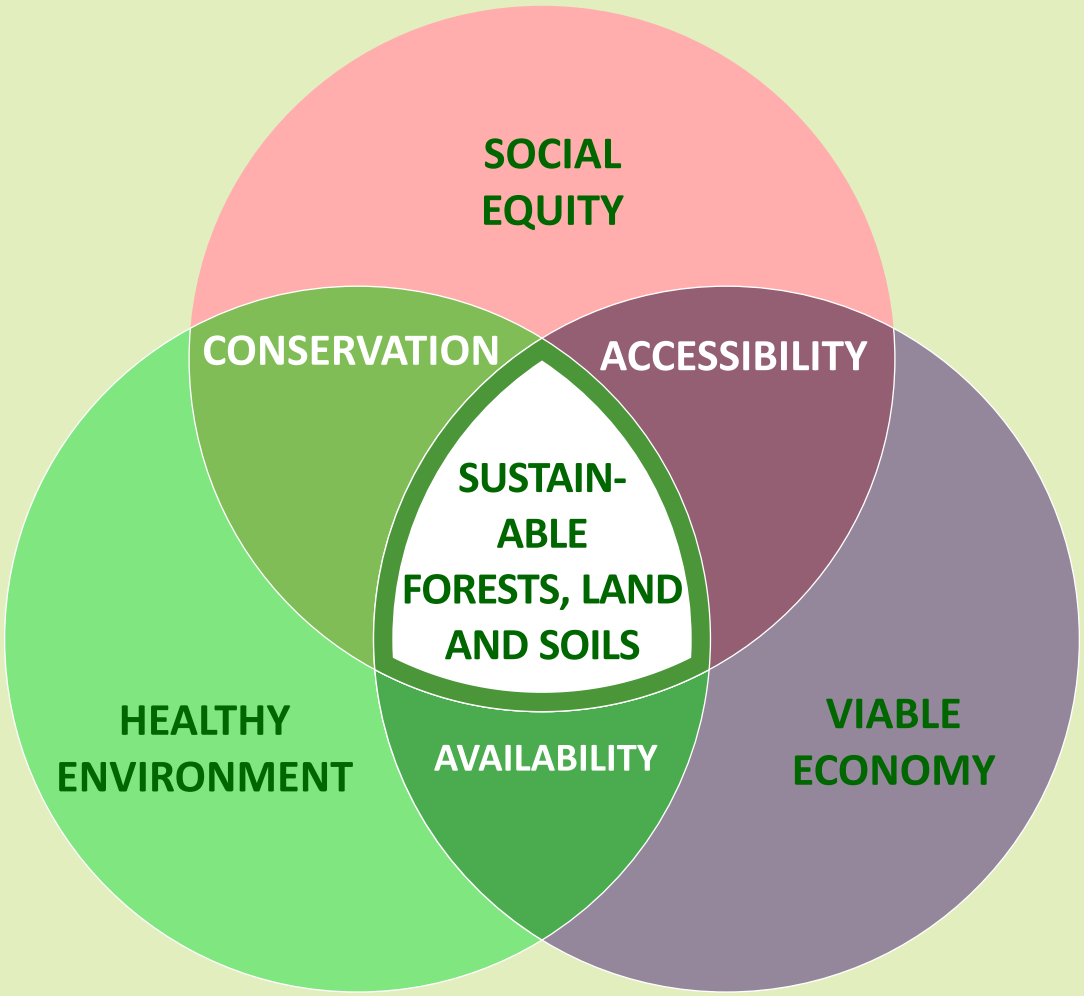
2016
CONFERENCE
REPORT

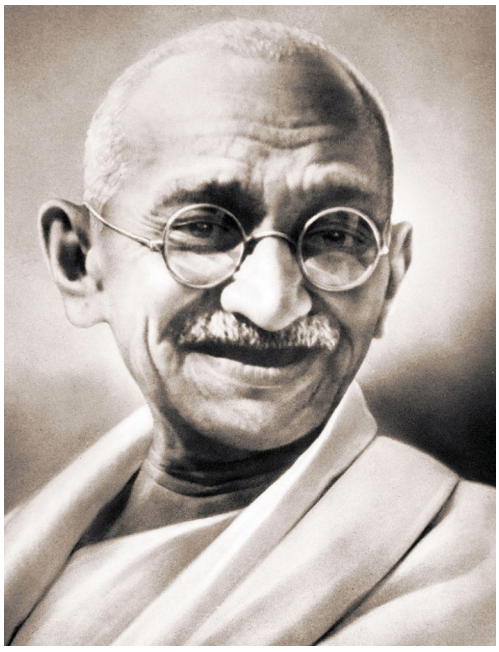
THE CLUB OF ROME | INDIAN NATIONAL ASSOCIATION

SECURING THE FORESTS, LAND AND SOILS FOR ALL

Coherence in Policies and Actions for Healthy Ecosystems



A Report to The Club of Rome
Indian National Association



"To forget how to dig
the earth and to tend
the soil is to forget ourselves."

Mahatma Gandhi

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The Club of Rome
Indian National Association

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Foreword

The focus of the 5th Annual Conference of The Indian National Association for the Club of Rome was "***Securing the Forests, Land and Soils for All***: *The Critical Need for Coherence in Policies and Actions*". The conference, held at New Delhi from November 23 – 24, 2016, sought to assess and determine coherence in policies pertaining to securing forests and soils for people and nature; vital to the emerging *security concerns, which are rapidly becoming major issues in the new national and global agenda*.

Understanding the interdependence of Food-Water-Land and Energy is essential to plan for both present and future populations within the ethical, ecological, societal and economic criteria. In 2014 and 2015 we, at the Club of Rome, evaluated the critical elements of the new security agenda that include Food and Nutritional Security and Water Security, and then last year we considered the security of land that encompasses forests and soils. This has led to a greater understanding of coherence in such policies, guiding us towards recommendations for change in policy directives.

Existing environment-based policies have remained dormant in real practice and, therefore, it is crucial that we persuade agencies, institutions and the establishment to recognise the significance of fresh and healthy food, water, forests, land and air for all, now and in the future.

The primary need now, is to bring on board enough representatives from the government – that includes both the concerned ministries and the elected representatives - for endorsing and advocating environmental policies. We hope to capture their attention and engage them in the emerging security concerns with the help of recommendations from the conferences.

This year, we were privileged to hear valuable propositions from some of the most outstanding people having policy expertise and practical experience on these crucial themes. We are confident that the purpose of Conference 2016 to explore the various facets of forests, land and soils, particularly in the context of expanding populations and climate change has been reasonably addressed. Our aim now is to facilitate the crafting of strategic policies that will manage land insecurity in India and the world and contribute to a more sustainable pathway for achieving our development priorities.

Dr S. Ramadorai
Chairman
The Club of Rome-India

Mr Ranjit Barthakur
Secretary General
The Club of Rome-India

Message from the Trustee, Club of Rome – India

Dear Colleagues,

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.

The health of our forests, productivity of our land and the generative capacity of our soils has 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. The gap between demand for resources and their availability is 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 within limits, 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.

The future of India and the wellbeing and prosperity of our descendants depend critically on altering the direction and the very nature of today's development trajectory. The costs to the 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 was 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 natural assets (after its people) – its forests, land and soils – to imagine the changes needed and inform those who make decisions – in government, business, civil society and other sectors of society on how these changes can create a better future for all.

Ashok Khosla
Chairman, Development Alternatives
Co- President
The Club of Rome (2005-2012)

Acknowledgements

At the onset we would like to express our gratitude to all leading policy think tanks that ensured the success of Conference 2016 and for their enlightened views for enabling congruence of policies at the national and international level.

We are also thankful to the thematic experts and communication staff from Development Alternatives and the Balipara Foundation for their strong support at the conference. The contribution of the Event Management Company, Media Consultant and Administration and Financial Consultants helped us to deliver systematically and is greatly appreciated. The effort of Indira Mansingh in composing and editing the report is highly appreciated. The Club of Rome Team, which includes staff of the CoR Secretariat, was the backbone of the conference.

We recognise the notable contribution of our sponsors such as Tata Steel, Tata Consultancy Services and Rallis India Limited who not only supported the conference, but also shared the views of the industry to envisage the policy recommendations much better.

We are particularly thankful to the Former Minister of Environment, Forest and Climate Change, who affirmed his vision at the inauguration of the conference, we hope, through recommendations of the conference to enable analysis of existing policies, we may able to contribute in attending his vision.

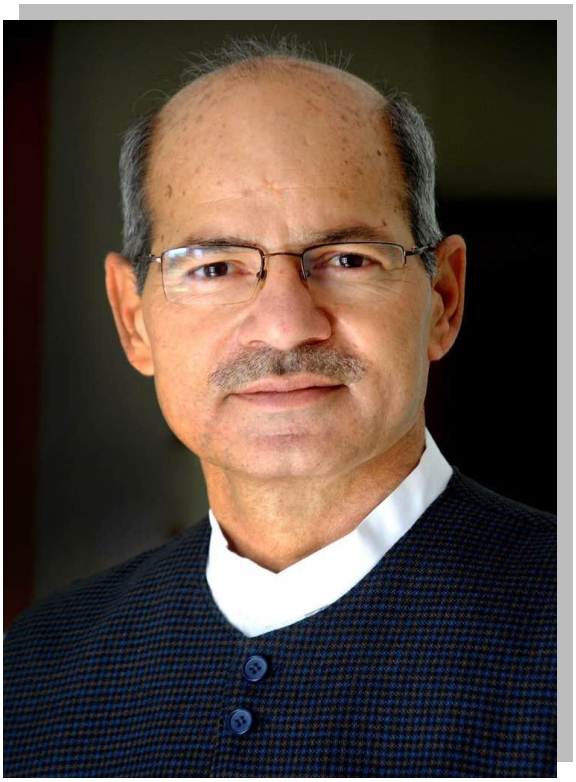
It is our wish that this conference plays a pivotal role in building consensus on policy and action for systematic reforms and positive change for the earth.

Lt Gen Arun Kumar Sahni

Chief Coordinator
The Club of Rome - India

Vishal Massey

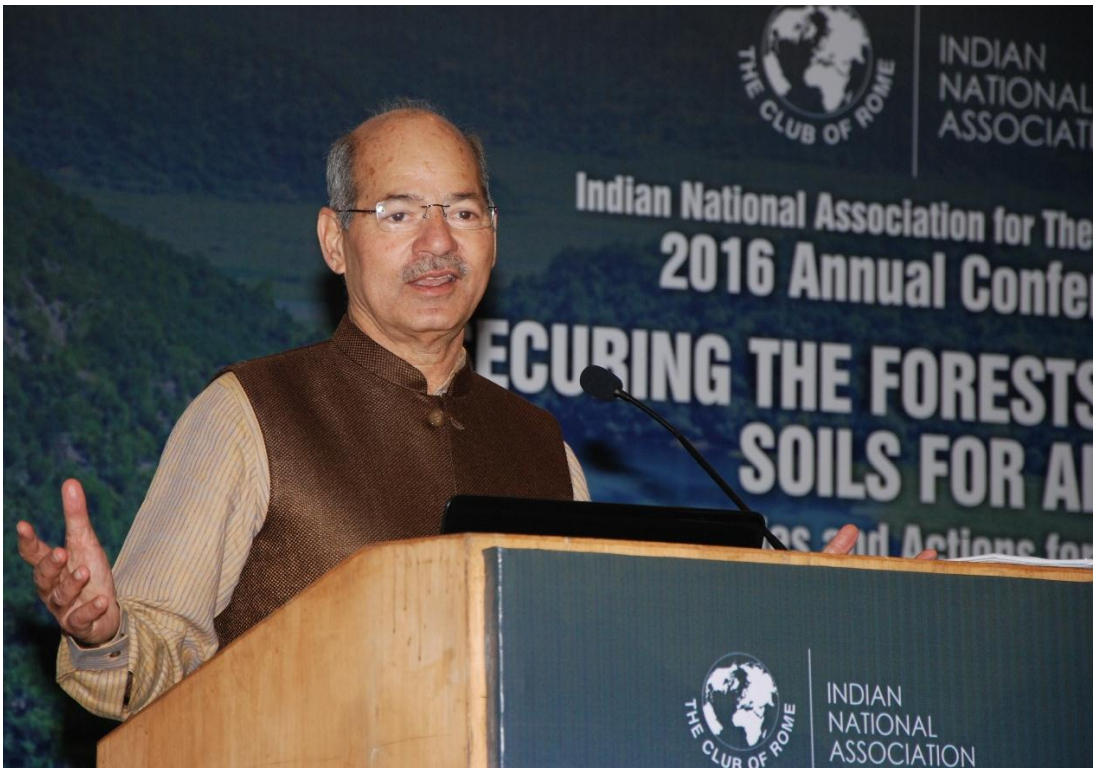
Chief Operating Officer
The Club of Rome - India



This report is dedicated to

Late Shri Anil Madhav Dave, Ex-Minister of Environment Forest and Climate Change, Government of India

who departed this life on 18th May 2017. A remarkable person, who was extraordinary leader devoted to the masses and tremendously passionate towards conserving the environment.



Shri Anil Madhav Dave

Ex-Minister of Environment, Forest and Climate Change

Government of India

Forestry is rooted in our tradition and culture.
The traditional Indian way of living – the Gandhian approach closely resembles the 'Sustainable way of living' – as it produces the least amount of carbon footprint.

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Securing the Forests, Land and Soils for All: The Critical Need for Coherence in Policies and Actions

SECTION A

Executive Summary

Introduction

The focus of the 5th Annual Conference of The Indian National Association for the Club of Rome was "**Securing the Forests, Land and Soils for All**: The critical need for coherence in policies and actions".

The conference, held at New Delhi from November 23–24, 2016 sought to assess and determine coherence in policies pertaining to securing forests, land and soil for the people and nature - vital to the new security agenda.

For the past 40 years the Club of Rome has been dealing with issues of sustainable growth on a global scale - its search for ecological solutions aimed at human wellbeing, for all. The Indian National Association for the Club of Rome (CoR-India), was set up to provide a platform for those who share these concerns and to help identify development strategies that are best suited to the demography, aspirations and resource endowments of India.

The prime concern of CoR-India is the future of our children and generations to come.

- *What kind of country are they going to live in?*
- *What kind of resources will they have access to?*
- *How are they going to feed themselves?*
- *How will they get water to drink?*
- *Will they have decent houses and decent jobs?*

The health of our forests, productivity of our land and the generative capacity of our soils has suffered massive degradation and loss. The rapid increase in population and economic activity has placed demands on nature and our natural resources that are now significantly beyond their regenerative capacity. The gap between the demand for resources and their availability is reaching dangerous levels.

Unless we change course urgently and adopt more sustainable development pathways, the long gestation periods for many resources to recover their productivity, could become irreversible. The future of India, and the wellbeing and prosperity of our descendants depend critically on altering the direction and the principles of today's development trajectory.

The central purpose of the 2016 Annual Conference was to identify critical issues that were preventing the reversing of the ecological and therefore economic destruction of our nation's most valuable natural assets after its people - its forests, land and soils. The objective was to envision the changes needed and the steps to be taken. Those who make

decisions – in government, business, civil society and other sectors of society will be informed on how these changes in policy can create a better future for all.

The conference was designed to address the following issues and provide recommendations that could support new policies and achieve greater congruence in implementing those policies.

- *Current Infrastructure and its Impacts on Forests, Land and Soils; Optimising the trade-offs between efficiency of the economy and the productivity of nature*
- *Forests, Land and Soils for Sustainable Ecosystems and Resilient Communities, reducing the vulnerability of women, children and tribes*
- *Forests health and its restoration*
- *Land and soil health and restoration*
- *Water to connect land, soil and forest resources*
- *Legal, Policy and Financial Frameworks for an ecological approach to Forests, Land and Soils*

Findings and Analysis

Challenges to ecological and equitable development

- A staggering 2/3rd of the Indian population, i.e. 800 million, are **deprived** of even the most basic needs - clean and safe - food, water and air.
- **Land** needed for providing services and for sustaining the population and forests are being encroached on by croplands (millions of hectares required for feeding the people) and for urban and industrial use.
- Increased population requires **additional farmland**, but 32% of the total ground area is already degraded.
- In India, we feed **17% of world population**, with just 2.3% land resources and 4% fresh water. Water scarcity and water stress are adding to the grimness of the scenario.
- The pressure on land and its resources has reached a critical point, as by mid-August of 2016 - **Overshoot Day** - the Earth's yearly quota of resources had already been used up.
- During Independence, India's forest cover was a healthy 33 per cent; it has now fallen to an inadequate 21 per cent.
- **Destruction of forests** leads to loss of soils, pollinators, groundwater and also livelihoods.
- **Soil, food and human health** are closely interlinked. Soil is the source of 99% calories and sustains 1/4th of global biodiversity. Also the primary instrument of carbon sequestration, it holds ten times as much water as held in underground reservoirs.
- Several million tons of soil are avoidably lost every year due to **ill-advised policies for** land, water, energy and agriculture; compounded by natural processes.
- The policies of **subsidies on diesel and fertilisers** are resulting in soil pollution and land degradation, thus impacting agricultural productivity.
- **Disposability** instead of durability has become the nature of consumption today, which has led to a planetary emergency due to an ecological overdraft, where our bio-capacity has been transgressed.

- **Production** is following an extractive growth strategy. Thus, in a linear production process, nothing comes back into the cycle, leading to waste and resource limitations.
- **Development** has acquired a skewed pattern that does not balance social, economic and environmental factors and privileges capital over labour.

- The **Green Revolution** technologies have had some negative consequences due to which our soils have been compromised.
- There has been **inadequate transfer of knowledge of sustainable agricultural practices;** the ratio of 50:10 million agricultural scientists to farmers is a serious mismatch.
- **Forest restoration** must ensure that an ecosystem is returned to its resilient and self-sustaining state. It has to create a balanced and integrated structure, maintain a rich spectrum of species and always be supportive of sustainable livelihoods.

The New Approach to Forests, Soil and Water

1. There can be **no trade-offs between development and ecological sustainability,** as there can be no future livelihoods without ecological sustainability. Land is needed by the economy, by society and by nature for a wide variety of uses and the competition among these three demands is severe. How then do we build our cities, roads, and infrastructure and still conserve nature? Sustainability needs to be made economically viable. Resource use must not be a question of environmental degradation, but more about 'optimisation of resources'. Tools for analysis and policy making can define new approaches and create a world that is sustainable - economically, socially and environmentally.

2**.** The theme of **Return to Nature and native wisdom** was recurrent across all discussions**.** Historically, tribes and forest communities had managed their resources well. However, the constraints faced today arise from policies; though well-intentioned, unfortunately, do not reflect their concerns**.** There is urgency for reverting to India's traditional belief in the earth as a nurturing mother and to search for knowledge from ancient and indigenous sources.

3**. Natural resource conservation** is essential because the resources have diminished dramatically and are non-renewable. There should be a legacy approach and a commitment to future generations, because these resources are the foundation of all human activity. The conservation of natural resources must be integrated with the imperative of equity. People have a fundamental right to natural resources. The seed should be seen as a unit of infrastructure and as belonging to the land and the farmer - the architect. Privilege and access must imbibe the principles of sustainable use of water, soil and habitat. Soil and water management need an integrated Carbon-shed approach for restoring carbon to the soil. It is critical that Agro-forestry is promoted for enhancing produce and wastelands utilised, especially in view of land constraints. Conservation of forests should necessarily involve the agricultural and tribal communities.

4. There is no shortcut to protecting land and forests and soil except to bring in *Swaraj* in its fullest sense and to put power in the hands of the **local people**. Management strategies have to be designed at the grassroots, involving the local and youth leaderships. Measures must be taken to strengthen community based organisations and village level institutions, especially through demonstration and replication. Knowledge building and reinforcing capacities need to be intensified with a greater focus on women, the *Dalits* and *Adivasis.* Local people should be empowered with information to take decisions on their own land use. Concerted efforts are required to ensure that the power to set policies devolves to the *Panchayats*.

5. **Organic farming** for health of the soils was a recurring theme and deserves much more policy attention. Subsidies for organic fertilisers are critical to saving soils as are reduced subsidies for diesel pumps and chemical fertilisers. Designing of new approaches is vital for the restoration of soil health. The adoption of controlled environment agriculture like Vertical Farming is a good example. Goods and services have to reflect the real ecological cost and a choice given to consumers. The number of agriculture extension workers must rise dramatically to bridge the gap between farmers and scientists.

6. **Communication and awareness**: What came through very clearly was the belief that local communities were not being heard, particularly women, the farmers, the tribal and forest dwellers and especially the people of the North East. Action has to be initiated to listen to the communities and learn and put aside the colonial mind-set. Digital mechanisms can play a significant part in communicating upwards with the executive. Formulation of key messages should be used to influence policy-makers to bring about change that is accountable. The corporate sector and the government must jointly invest in knowledge, innovation and communication strategies for environmental protection. Local groups should be empowered with information and entitlements to take decisions for their own land-use. Participatory planning has succeeded as the most inclusive approach - where technical and scientific data, indigenous knowledge from the people and perceptions based on the experience of the community have been merged.

7**. Business and environment**: The times have changed and business representatives have indicated that they have an equal stake in a low carbon, resource efficient and climate smart future. Dynamic partnerships linking environment and business can help reduce environmental risks and ecological scarcities. Conservation projects - national and international - need not to be seen as charity, but as a sustainable business model benefitting people and nature. Financial schemes that reward entrepreneurs who reinvest in nature conservation make good business sense. Interest-free loans and other incentives should be extended for the green economy, and not the brown economy. It will be right to review IPR policies to reduce the overarching preference for MNCs who patent indigenous seed varieties.

8. **Knowledge innovations**: The imperatives of the coexistence of people, nature and profitability demand an escalation in tools and knowledge advances. The pre-condition for integrated planning is the demystification of science and the use of scientific tools like GIS. Opportunities for research and innovation for soil in India have to be

determined and organised. The potential of native biodiversity of crops in India was raised several times and this must be explored. Bio-technologies may provide answers to resource constraints. The carbon-shed approach, if integrated into the national perspective will ensure the health of soil, water conservation and increased productivity in farmlands and trees. Practical methods to manage large quantities of crop residues should be studied to avoid pollution. The role of bio-char in sequestering carbon is a viable option. Research and Development must lead in the quest for new irrigation methods with a water sustainability approach.

9. **Justice and environment**: The fundamental role of justice as the basis for protecting nature and people was underscored; the challenge being whether distributive justice and environmental sustainability were compatible. Decentralisation of forest resources raised significant concerns for ecosystems and for local economies and traditional ecological cultures. Strategy, planning and consultative processes are needed for providing options, not directions. The inclusive approach is crucial.

Attention needs to be given to socio-economic conditions, for example, in understanding how SC and ST land holding patterns are different and how inequalities in water access for agriculture and domestic use impact the quality of soils and land. Legislation and public policy should be in consultation with people; only then can they be implemented satisfactorily. They should take account of people's rights in Schedule 5 areas ensuring tribal ownership of land under the provisions of the Forests Rights Act. *Panchayati Raj* gives rights to the communities for natural resources in their area; this has to be implemented effectively.

Property rights and land-holding patterns call for reforms so that they are seen to be inclusive and on the lines of Gandhi's trusteeship approach that meets the needs of all. The settlement of environment led issues should be through a decentralised process. It was recommended that magisterial courts ought to be sensitised towards environmental justice and a cadre of public defenders and local Bars built up for human and environmental rights.

10. **Policy perspectives**: Recognising the gravity of the state of affairs, there was a united call for developing a Natural Resource Management Coherence Framework. The framework will be designed to logically integrate key elements like resources, systems, stakeholders and the cultures into an explicit, mutually reinforcing strategy. This will help state bodies to work together in a coherent relationship to execute the strategy. An adaptive learning system, based on the challenges and failures of existing government policies needs to be put in place. Self-analysis is required to acknowledge the failure of forestry policies and the virtual subversion of the National Forest Policy. An agenda was suggested for a community movement that would include farmers, scientists, researchers, corporate agencies, governing bodies and other important stakeholders that speak a common language. Multi-stake holders must be engaged in consultations for policy making and policy changes within a systems framework. Policy congruence and convergence is crucial for optimisation of food and natural resources and to overcome policy silos. Education is central to safeguarding nature and young

minds must be sensitised very early on the divide between the ecological footprint and bio-capacity.

11. **Policy and regulation**: An integrated national land policy is an imperative. Agriculture is currently stuck between the central and state lists. Land records need to be modernised and land-leasing legitimised. Land policy should be based on geo climatic and agro climatic conditions. FDI should be promoted in the agriculture sector for technology development, modern farming practices and irrigation infrastructure. Innovative farming practices like cover cropping that are climate friendly need to be encouraged. Building a coherence framework in water policies is required and water regulations changed for safeguarding ground water.

The number of women farmers is fortunately increasing and the law has to be enforced for them to own their land. Skill development should be a priority and machines such as pumps and tractors made woman friendly. Public policy needs to appreciate how education and livelihoods for women leads to fewer children. A Mission Framework with - a Cabinet Committee on Sustainable Agriculture with all concerned Ministers headed by PM, a Mission Secretariat and a think tank to be involved in the mission was a major recommendation. The Sikkim model for regenerating forests, land, soils should be replicated as its success rests on policy convergence in all sectors, through inclusivity of environment, social, economic and educational agendas.

Highlights of the Conference

Introduction

For the past 40 years the Club of Rome has been dealing with the issues of sustainable growth on a global scale - its search for ecological solutions aimed at human wellbeing, for all and forever. The Indian National Association for the Club of Rome – CoR-India, was set up to provide a platform for those who share such concerns and to help identify development strategies that are more suited to the demography, aspirations and resource endowments of India.

The prime concern of CoR-India is the future of our children and generations to come.

- What kind of country are they going to live in?
- What kind of resources will they have access to?
- How are they going to feed themselves?
- How will they get water to drink?
- Will they have decent houses and decent jobs?

These issues do not really hit the headlines, but the Club of Rome tries to get them on the screen of policy makers.

In 2014 and 2015, the Club of Rome-India, evaluated the critical elements of the new security agenda that include Food and Nutritional Security and Water Security, and in 2016 it considered Land Security that encompasses forests and soils.

For the estimated 1.2 billion people living in India, its forests, land and soils are critical resources for Food and Livelihood Security and it is impossible to imagine life without the essential ecosystem services and livelihoods they provide. Purifying the air we breathe – the water we drink and much of the food, fibre and fuel and other materials that contribute to the economy and day to day living. Yet, over the past 70 years, the forest cover has dropped to 21% from 33%; about 60% of India's total land area has been adversely affected by soil erosion and soil degradation and the implications of land degradation on agricultural productivity are serious.

The task before us therefore is the restoration and regeneration of forests, soil capacity and ecosystems - in which case productivity and air and water qualities are ensured for the well-being and livelihoods of peoples. The need for coherence and rationalisation of the policies of the state and central governments thus becomes critical in the context of challenges to forests, environment and ecosystem protection.

Inaugural session: Setting the Context

In his introductory remarks, **Mr Ranjit Barthakur, Secretary General, Club of Rome – India,** called for a candid assessment on whether the government has been influenced on policy congruence by the organisation. He pointed out that much remained to be done to engage a critical mass of government representatives for promoting and advocating environmental policies. Welcoming the participants, Mr Barthakur specified that the major objective of the conference was to reach out to policy-makers to promote good governance, value-driven norms and accountability leading to effective government policies on environmental issues.

Mr S Ramadorai, Chairman, Indian National Association for the Club of Rome, affirmed that the idea of forests remains embedded in our civilisation - both ecological and therapeutic. How then can our forests be restored? While the objective of the conference seemed ambitious, finding the right solutions was, nonetheless, necessary for the survival of our society on planet earth.

The Indian economy is poised to grow, but how do we realise the vision of '*Sabka Saath Sabka Vikaas'*? The discussions must lead to answers that ensure that the women, children and the forest people are not left behind. While advancing the cause of inclusive growth he mentioned that we should also take into consideration the conflicts of productivity and the limits of nature.

Setting the agenda for an India where every citizen can live a healthy and fulfilling life, **Dr Ashok Khosla, Trustee Club of Rome – India**, reminded the conference that a staggering 2/3rd of the Indian population i.e., 800 million, are deprived of even the most 'basic needs' - clean, safe and available food, water and air. He made an appeal for revisiting Mahatma Gandhi's idea of *Antyodaya* which looks at every last person.

Ecosystems, our lifeline need land for providing its services – but the land available for sustaining it is being encroached by croplands as millions of hectares are needed for feeding the population. Further, land resources are used to produce goods, for energy and for bio materials. The stress on land and its resources has reached a critical point he warned, as by Mid-August of 2016, 'Overshoot Day', we had already used up the Earth's yearly quota of resources. Therefore, we must understand the concept of 'resource limitation' to be able to bridge the divide between the ecological footprint and bio-capacity.

The prime objective the Conference 16 is to debate and discuss environment issues and apply that thinking to policy coherence. Policy Coherence, he clarified would bring social, environmental and economic issues together in creating unified solutions within a 'systems framework'. He noted that policies designed to cater to multi-faceted objectives are more likely to be functional.

This conference would, therefore, seek answers for:

1. How healthy are India's forests, land and soils?
2. What institutional land technology changes are needed to improve them?
3. What investments are needed in knowledge generation and sharing, innovation, communication institutions?
4. Where public and private investment should be redirected?
5. What structural changes can make our policies for these and other resources coherent, convergent and mutually reinforcing?

Shri Anil Madhav Dave, the Hon. Minister of Environment, Forest and Climate Change, Government of India and Chief Guest, in his opening remarks, made the proposition that only the Gandhian or Indian way of life can ensure ecological sustainability. Confident that the Indian approach and understanding of nature is inbuilt in our DNA, he raised the need to relook at our relationship with land, soils and forests. He added that we must first empathise with and relate to nature if we want to minimise our carbon footprint.

Shri Dave further signalled that we must stop blaming the forest dwellers for the loss of forests. That culpability lay entirely on the 'mafia, corrupt bureaucrats and corrupt politicians'. Our views on forests, tribal communities and wildlife – all of which have always co-existed interdependently, need to be reviewed. He called for a *Jan Andolan* - a movement of the people - for environmental protection, awareness and regeneration of forests and soils.

Session 2

Plenary 1: Infrastructure and its impacts on Forests, Land and Soils Optimising the Trade-Offs between Efficiency of the Economy and Productivity of Nature

The nation's primary goal is to improve the lives and wellbeing of all its citizens and the question for this session was how to achieve this goal. Recognising that India cannot copy the choices made by developed countries as it will end up paying heavier costs with constricted availability of resources, the session was designed to answer the following:

- *What are the acceptable trade-offs for a country such as India between the demand for more infrastructure and the imperatives of sustaining the productivity of its natural resources?*
- *What are the alternative means to bring the benefits of physical and communication connectivity, water and sanitation, electricity and social services to every community without copying disruptive, costly and inflexible infrastructures?*
- *For those infrastructure investments requiring heavy use of materials that are necessary, what are the possibilities for using wastes from construction and demolition, mining or industry?*
- *What alternatives to conventional rail, road and airlines need to be explored for local or long-distance transport of people, goods and information*
- *How can the 'Ease of Doing Business' index be redefined to reconcile with the imperatives of human rights, social justice and environmental health?*

As chairman of the session, **Mr Shyam Saran, Chairman, Research and Information System for Developing Countries (RIS) and former Foreign Secretary**, set the stage by stating that we were in the middle of the planetary emergency because of the ecological overdraft we have indulged in. Having abandoned India's cultural commitment to sustainable growth, disposability has become the culture of our markets and consumption.

Mr Saran defined the issues that the session should deliberate on - the imperatives of development and necessity of ensured sustainable ecology and was there a clash between these two objectives? And if so, what was the trade-off?

It will not be possible to have livelihoods in the future unless this approach of growth with an 'extractive' strategy does not change. India, he remarked, has lowered its standards of commitment to combat climate change, straying away in the name of 'economic growth'. These are false choices as there can be no trade-offs, he declared between development and ecological sustainability.

On the question of alternative means for providing sustainable services and infrastructure, **Mr John Pontin - OBE, Co-founder and Trustee, the Converging World, United Kingdom** gave the example of BRINDA, a low carbon energy project running in Tamil Nadu. Endorsing a point made by Mr Saran that everyone needs to understand that the ROI on a growing tree is far greater than a cut tree, he proposed the optimisation of trade-offs between efficiency of the economy and productivity of nature through reforestation and restoration projects for carbon sequestration. There is 'ease of doing business', he stressed in this 'business model', holistic in its sustainability approach while changing the behaviour of local communities. It is not visualised as the traditional 'charity for conservation' approach. Loan operations for the environment that give back economic returns are more successful in comparison to the donation-based approach.

There could be no trade off as human beings could not achieve a rich life if they separate themselves from the essence of life – Nature, was the contention of **Ms Rintu Thomas, Filmmaker and National Award** Winner for her environment film, *Timbaktu.* The impact on the productivity of nature and soils was raised by her and she made an impassioned plea for organic farming. This arose from her exposure, during film making, to the chemical pesticides regime followed by Indian farmers and the loss of indigenous species.

Mr Saran validated this approach, saying the spotlight must shift back to 'farmers', making farming a viable way of life again. Lessons from the diminishing returns of the Green Revolution point to traditional ways of living including animal husbandry and agri-horti forestry.

Dr Ashok Khosla categorically declared that there can be no trade-offs, but we need to consider how to build our cities, roads, and infrastructure and still conserve nature. 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 end undermining each other's access to it. Forest restoration, he explained, 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.

Resource use must not be a question of environmental degradation, but more about 'optimisation of resources'. He called for tools for analysis and policy making that will define new approaches and create a world that is truly sustainable, economically, socially and environmentally.

In his concluding remarks, Mr Saran said that it is a false assumption that sustainability is not economically viable. It was critical that public opinion be mobilised to recognise

environmental actions. Forests are the lifeline of a civilisation and maintaining them is not simply a luxury but an imperative.

Session 3

Plenary 2: Forests, Land and Soils for Sustainable Ecosystems and Resilient Communities, Reducing the Vulnerability of Women, Children and Tribes

Chair – Dr Nandini Sundar, Professor, Department of Sociology, Delhi School of Economics, University of Delhi. In her opening statement Dr Sundar spoke of the need to recognise diversity, given the multiple conflicts problems facing the country. **I**ntroducing the theme of the session, she put forward questions the panellists could address.

- ✓ *How well are existing policies and practices on forests, land-use and soils impacting the lives of local people and vice versa?*
- ✓ *What are the impacts of resource extractive industries on local forests, land and soils and on the lives and livelihoods of the local communities?*
- ✓ *What opportunities are there for research and innovation to create livelihood options for marginalised people to help regenerate the forests, land and soils?*
- ✓ *Which feasible options exist to satisfy the food, fuel and other basic needs of local households without further depleting the land-based resources?*
- ✓ *What are the major barriers and hurdles to enabling the local communities to act as guardians of their local biotic resources?*

In response to the key question on existing policies and practices regarding impacting the lives of local people Dr Sundar stated that she understood that historically, tribes and forest communities had managed their resources well, but today's constraints came from well-intentioned policies that, unfortunately, do not reflect their views and concerns.

She observed that it may not be possible to achieve regeneration of forests unless there is security in these areas. Long term and debilitating conflicts as in the North East reduce creative spaces and suppress possibilities of innovative solutions, challenging the resilience of communities and increasing their vulnerabilities.

Encounters, burning of forests, attacks by Naxalites on *Adivasis* and non-Forest dwellers do not create the right environment for sustainable ecosystems and resilient communities. Many untouched forests in India are in fact militarised forests within states such as Odisha, Bihar, Jharkhand and Chhattisgarh and it is critical to bring peace to these areas and enable people to think freely. India must rework the definition of 'forest cover' and maybe a political 'green party' will make it their concern to reduce the vulnerability of women, children and tribes.

Mr Harpal Singh, Chairman, Save the Children and Founder Chairman Trustee, 'Nanhi Chhaan', suggested that vulnerabilities can be reduced if the nutrition, safety and education of children are ensured. The most important, he believed is the education of girl children. Quoting a famous saying he said "you educate a boy, you educate an individual, but if you educate a girl you educate a generation".

Addressing the vulnerability of the cotton farming community in India, **Mr Rajeev Baruah from the Better Cotton Initiative**, gave a grim picture of the high environmental costs of cotton farming in India. This included bad water management practices such as deep water drilling increasing salinity; incorrect use and overuse of pesticides leading to soil pollution and, contamination of freshwater and insect species extinction. The fault lies largely, he observed, in inadequate transfer of sustainable agricultural practices and the skewed ratio of 50:10 million agricultural scientists to farmers.

If organic agriculture – that is feeding the 'soil', and not the 'plant' is practised and farm manure given preference over pesticides he was confident that the crop will be protected, give better yield, soil nutrients will be secured and the habitat protected. Mr Baruah gave the case study of Better Cotton Initiatives where end to end solutions are being provided to farmers and their families for existing land resources. As a result, local cotton variety has been promoted and flourishing in a large area of Central India. Amongst feasible options for basic needs of local households without further depleting the land-based resources, he recommended that cotton scientists use breakthrough technology to improve seed quality that uses less water and is resistant to diseases and pests. Increased irrigation facilities can ensure decent work and better quality cotton.

If conflict development is to be minimised, local ideas should be taken into consideration while deciding policies that impact tribal areas. This was the perspective of former **Indian Army Commander and Chief Coordinator–Club of Rome, India, Lt Gen Arun Kumar Sahni,** on reducing the vulnerability of tribes. India, he said, has a land frontier of over 15000 km. The connectivity and infrastructure in these areas being very poor, there is a lack of coherence in planning and implementing the development activities for security purposes and for people along these areas. He added that the major cause of ecological degradation and loss of biodiversity was absence of proper surveys being carried out before constructing roads. Tunnelling, he believed should be used extensively to minimise the damage to vegetation.

The haphazard approach of such policy initiatives is likely to have a long term impact on the ecosystem. For example, the border state of Arunachal Pradesh with less population density is loaded with hydro power projects, disrupting the lives of the local people and leading to environment degradation, pointed out General Sahni.

Another issue he raised was that large tracts rich with bio-diversity are being destroyed for military camps. Degraded areas must be used for new security camps instead of damaging fresh forest areas.

The question on research and innovation to create livelihood options to help regenerate forests, land and soils was partially answered by speakers who suggested that technological research and methodologies should be a part of project survey and planning for providing alternative livelihood sources to marginalised communities.

In response to the question on major barriers and hurdles to enabling the local communities to act as guardians of their local biotic resources, the speakers agreed that they should be the guardians, but appropriate livelihoods for women must form part of the enabling system.

Session 4

Plenary 3: Forest Health and its Restoration

Dr Rohini Chaturvedi, Strategy Head, Forest and Landscape Restoration, World Resources Institute – India who was in the Chair introduced the session by pointing out the priorities arising from the critical need for restoring forest health and why we need to focus on the following questions:

1. *What are current trends in the state (both quantitative and qualitative) of India's forests?*
2. *How can we inspire, enable and implement political as well as financial commitments to protecting and restoring forest health?*
3. *What innovations in institutional frameworks and technology can support healthy forests at scale?*
4. *Where would investment in innovation and research; communication and awareness; and community institutions have the greatest pay-offs?*
5. *What are the knowledge gaps or other barriers that constrain efforts to regain forest health?*

Dr Chaturvedi determined that there is a real need for adaptive learning based on the challenges and failures of existing government policies. She called for an agenda for a community movement that would include farmers, scientists, researchers, the corporate sector, governing agencies and other important stakeholders that speak the common language in terms of their vision.

Dr Arun R Joshi, Ex Head, National Livelihood Centre, Gramin Vikas Trust, India made an interesting presentation and advocated a carbon-shed approach similar to the watershed approach. This would have mutual reinforcement potential with co-benefits for improving the health of forests. Carbon sequestration he specified is possible, if we encourage farmers to adopt and climate-smart agriculture like agro forestry and the silvo-pastoral system which is livestock-based and encourages the planting and growth of trees. There should be more emphasis on engaging the agriculture community with tree growing activities. This will help the farmers get economic gain in the short run and become a tree growing community.

The carbon shed approach, needs to be integrated into the national perspective so that the health of the soil, water conservation and increased productivity in farmlands and trees can be addressed holistically.

Dr Ajay Kumar Saxena, Programme Manager (Forestry), Centre for Science and Environment, Delhi, responded to the question of quantitative trends and pointed out that the multiple ecosystems in forests are going to be challenged by the 2015 guidelines issued by the government on participation of the private sector in degraded forests. Under the guidelines, approximately half of the Indian forests are proposed to be given to industries for commercial use in the coming years. This policy will have a devastating impact on the ecosystems services and livelihood needs of the people including 20 million farmers who are practicing farm forestry in India. The guidelines are against the national forest policy, which stipulates the maintenance of forests for environmental stability, meeting requirements of

rural and tribal populations for forest products and increasing forest productivity for national needs.

As regards the question on political as well as financial commitments to protecting and restoring forest health, this can be enabled he pointed out. Although the Government of India has come up with many schemes, they could not achieve much due to implementation lacunae and service delivery failure. Schemes and funds like Joint Forest Management, Social Forestry and CAMPA have not been able to meet the people's demands. Compensation for forest losses in industrial activity is causing large scale fragmentation of the remaining forest area. The potential of Agroforestry and forests managed by Joint Forest Management is high. India must improve and increase the productivity of degraded forestlands. If the abundant wastelands of India are regenerated, the country he claimed can become a surplus and exporting country.

In his intervention **Mr Rajiv Singhal, Vice President, Tata Steels, Jamshedpur** underscored the necessity of accepting that much more needs to be done in terms of ecological restoration. He said, "We cannot have engagement in mining landscape without having engagement with forests and population deprived by so called development in these areas."

Mr Singhal acknowledged that mining companies need to do more in forests and have miles to go before they became a role model. Questioning the quantitative trends in forests he challenged the exactness of data on the coverage of forests in India. To improve forests, he suggested that meticulous work has to be done by government authorities by engaging more and more academic and research institutions for reliable data and put it out in the public domain. This will enable industry to take viable and more sustainable decisions. Technology needs to be leveraged far more to improve afforestation in the country, as satellites can give us better and reliable data on forests.

Secondly, independent notifications and policies emerging from separate ministries dealing with forests, environment, land, mining and the tribal ministry reflect the lack of policy convergence. It is critical to take all the stakeholders along including policy makers, industry, NGOs, media and think-tanks. Such issues cannot be addressed by only looking at one agency's point of view for solutions for all.

Mr Singhal recommended that after a developmental project is executed at a site, a compensation mechanism that will help restore the ecological resources that were utilised or lost during the process must be put into place.

Dr Chaturvedi concluded that it is not about a trade-off between environment and development, but about doing the development right taking the landscape as a whole.

Mr Edward Miller, Director, Asia Pacific Landscapes and Livelihoods, Rainforest Alliance, UK mentioned the value of a Certification System that promotes 'Climate Smart Agriculture' and 'Responsible Forest Management' on goods and services. He said that opportunities for sustainability abound and market research reveals that ecologically sensitive brands are outperforming conventional brands by 120%. As consumers are responding positively towards products and goods that are ecologically sensitive, his premise was that a sustainable approach can be turned into a core business strategy.

In reference to the questions on where investment in innovation and research, communication and awareness and community institutions have the greatest pay-offs and which knowledge gaps constrain efforts to regain forest health, the speakers signalled that more stress needs to be given to involvement of educational and research institutions and engaging the local community. A new partnership model where farmers, FDC's and industry work together in association with research institutions was recommended.

Day 2 – Nov 24, 2016

Session 5

Plenary 4: Land and Soil's Health and Restoration

Soils are the key to sustain life on the Earth as they "constitute the foundation for agricultural development, essential ecosystem functions and food security"[1].

After a briefing of the first day of the conference by Mr Jitesh Khosla, former Chief Secretary, Assam, **Mr Perses Bilimoria, Director, Envisionation Ltd, United Kingdom** then took the chair and introduced the plenary with respect to the health and restoration of the highly threatened land and soil resources. The important questions that were to be urgently required to be addressed in this session were:

- *How solid are the existing policies and practices in maintaining the health and productivity of our land and soils? What are the improvements needed?*
- *What are the impacts of economic activities that are intensifying the threats to our soils and what measures are needed to contain these?*
- *What opportunities are there for research and innovation to understand the situation of soils in India and to remediate them where needed?*
- *What are the major barriers and hurdles to enabling the local communities to act as guardians of their local biotic resources?*

Noting the wide gap between the scientific community and the masses, Mr Bilimoria emphasised that communication of science would go a long way in securing the future of land and soil. He suggested that the environment and climate change be linked to business as in calculating the cost of removing co2 from the atmosphere. He mentioned the two approaches to remove carbon through forest and ocean sinks. Since both are already stressed 'Bio-char' offered a viable alternative bio-remedy for the removal of excess carbon.

Produced from the decomposition of biomass in low oxygen it can be used for storing carbon from soil and eliminate it from the atmosphere. Further, the use of such bio char in agricultural lands could reduce carbon sequestration costs. According to Mr Bilimoria, most farmers are accustomed to using bio-char for agricultural practices, but promoting it on a larger scale would make a substantial difference.

Mr Shyam Khadka, FAO Representative, India highlighted the urgency for preservation of soil as it is a non-renewable natural resource. Soils are under pressure from increases in population, higher demand for food and competing land uses. Land degradation is a critical issue today.

[1] The United Nations General Assembly resolution 68/232 adopted on 20 December 2013.

He drew attention to the policies in India that are affecting soil quality negatively - the skewed distribution of the water policy, a subsidised energy policy leading to excess irrigation and salinity, overuse of fertilisers because of the subsidy in schemes and an agriculture policy that is productivity driven and not sustainability oriented.

The key question, according to Mr Khadka is how to make agriculture a viable and sustainable enterprise? Some of his recommendations included land aggregation and irrigation sector reforms, effective delivery of agricultural inputs, agriculture marketing reforms and liberalisation and empowerment of smallholder farmers.

He made a major recommendation for a Mission Framework with the following structure:

1. *A Cabinet Committee on Sustainable Agriculture with all concerned Ministers headed by PM*
2. *A Mission secretariat*
3. *A think tank to be involved in the mission*

Policy imperatives of Sustainable Agriculture were the theme of **Mr Ashis Mondal, Director of Action for Social Advancement (ASA), India**. The government, he observed plays a great role in negotiating on policies as it is the largest agriculture extension institution and the largest buying agency in the market; therefore government's policies can either have a positive or negative impact on agriculture.
He reported that 12% rural households are women headed households where the farm size is smaller than average. We need to recognise women as farmers in policies and programmes. Moreover more than 83% of the total farmers in India fall under the bracket of small-marginal farmers with less than 1.21 Ha of land. Farmers' companies need to be promoted to run the water business in India. Hence, we need innovative institutional mechanisms and legislation for irrigation management transfer.

Dr Vibha Dhawan, Distinguished Fellow and Senior Director, (New Initiatives and Programmes), TERI, raised some pertinent questions on land and soil health and restoration. Is soil the responsibility of only the farmer? Is he the custodian of the soil? There is an assumption that the farmer is not taking care of soil properly, but has he been suitably empowered for sustainable agriculture?

Dr Dhawan pointed out that agriculture is contributing to climate change in many ways that generate greenhouse emissions. These include emissions from livestock, excessive use of fertiliser, over tilling, monocultures and other "high efficiency" agricultural practices. In addition, these have other negative impacts including degradation of soil, contamination of aquifers and socio-economic disparities.

Excessive use of pesticides is aggravating the problem. While government subsidies are necessary for a country like India, lessons should be drawn from the Malaysian example of paddy farmers[2] where they were allowed subsidy on fertilisers equivalent only to the demand of certified seeds. It is essential that Indian farmers are updated on the latest technologies and made aware of the hazards of excessive use of fertilisers and pesticides. App-based services for the use of different applicators at farm fields are initiatives which

[2]Nurul Nadia Ramli, Mad Nasir Shamsudin, Zainalabidin Mohamed, and Alias Radam (2012) : The Impact of Fertilizer Subsidy on Malaysia Paddy/Rice Industry Using a System Dynamics Approach, International Journal of Social Science and Humanity, Vol. 2, No. 3, May 2012

should be encouraged in the IT sector in association with government and agriculture extension services.

The Case Study of Afghanistan is another one where they are investing in high quality planting material - root stocks @ of more than three dollars per plant. For protecting soil in India, it may be practical that the country also invests in basic planting material.

The challenge Dr Dhawan posed for ICAR and agriculture researchers was to develop a variety of wheat, which can mature early or a late sowing variety to mitigate the problem of burning of rice straw. This would prevent pollution and give the soil time to recover nutrients between two crops.

Dr Himanshu Pathak, Director, ICAR, National Rice Research Institute, Cuttack, Odisha, spoke on the need for innovation and coherence for managing land and soil resources. India has achieved tremendous growth in food production that has enabled policy makers to enable rights for the needy and poor. The National Food Security Act, 2013, has converted existing food security programmes into legal entitlements. However, problems like malnutrition and soil degradation remain, as do challenges in agriculture. The major challenge is to feed the world's second largest population with fewer resources. India has to produce grains to feed around 17% of the global population with 4% of the world's freshwater and only 2.3% of the land.

There is increasing stress on land, he pointed out. In 1960 – one hectare land fed two people in a year, but by 2025 it will have to feed up to five. Urbanisation has not only consumed fertile land near water, but pressured farmers and agrarian societies to shift agriculture to infertile land. India had around 142 million hectares of agricultural land, but in the last 15-20 years, a significant 6 to 8 million hectares of good quality agricultural land has been taken out of agriculture use.

Agriculture largely depends on unpredictable monsoon conditions, an important determinant of agriculture and he reminded the audience that India is already a water stressed country with severe depletion in aquifers. Technologies are ineffective, if the climate is not suitable. Unfortunately, food habits have also been changing. We are no longer habituated to millets, but have turned to rice and meats, which require more water.

Soils are being impacted by the high use of nitrogen fertilisers that are used inefficiently. The result is that soil and water pollution and soil nutrients deficiency is increasing in India. Disuse of organic manure, tillage and burning of crop residues add to the nutrient problem. Agriculture, Dr Pathak concluded, is no longer carbon neutral and India contributes around 18% to total greenhouse gas emissions, which includes animal husbandry and crop production.

Dr Pathak endorsed the three steps recommended by Prof. M.S. Swaminathan:

1. *Converting the 'green revolution' into an 'ever-green revolution'*
2. *Mainstreaming the principles of ecology in technology development and dissemination and*
3. *Developing a sustainable and equitable food security system*

How solid are the existing policies and practices in maintaining the health and productivity of our land and soils and how can they be improved was one of the questions answered by the speakers. Mr Khadka observed that sometimes farmers exploit resources heavily due to the policy of subsidies. This should be minimised by restricting diesel use and pesticides to only feed the plants and not the soil. Mr Mondal gave a gender perspective of agriculture – the Indian agriculture system and laws favour patriarchal societies but the Hindu succession Act 2005 has made provision for inheritance of agriculture property by women. It is essential to recognise them as 12% of farmers are women now. He focussed on various reforms for the irrigation sector and private sector lending.

Dr Vibha Dhawan gave a good example of policies related to technology interventions and conservation. Dr Pathak from ICAR raised the issue of an integrated land policy. It is important to look at land as a single commodity and not in segregated forms such as farmland and forest land. Dr Pathak recommended a soil testing mechanism, and improved nitrogen management for soils health whereas Mr Perses Bilimoria emphasised Bio-Char as measures to improve the quality of soil.

In response to the question on opportunities for research and innovation and to remediate soils in India where needed, all panel members and participants were in favour of engaging the private sector more with ICAR, so that the gap from lab to land can be decreased. ICAR research and government extension machinery need to increase their access.

Asked about the major barriers and hurdles to enabling local communities to act as guardians of their local biotic resources, panellists were in favour of agriculture related technologies being promoted indigenously so that technological acceptance, adaptation and transfer would be much easier and local communities can act as a guardian of their local resources.

Session 6

Plenary 5: Water to Connect Land, Soil and Forest Resources

Mr George C Varughese, President, Development Alternatives opened the session with important questions that must be addressed urgently with respect to the contribution of our water systems to land, soil and forest resources:

- *How solid are the existing policies and practices in maintaining the health and productivity of water flows? What are the improvements needed?*
- *What are the major barriers and hurdles to enabling the local communities to act as guardians of their local water resources?*
- *What is the current knowledge base on the minimum water flows, particularly in our rivers and streams, which is needed to maintain basic ecological services and what research is required to be conducted?*

Addressing the above questions, he raised the fundamental issue of the conference, which was: how do we build coherence in frameworks for land, water, soils and forests management? Are we doing agriculture without knowing enough about our 'soils'? Clearly there are huge gaps in our knowledge about the soil, its composition and distribution. Water has an integral connection with land, forest and soil and a coherent link up between them is of utmost importance to conserve these precious gifts of nature.

The most significant technique for building coherence would be participatory planning and strategising, backed by solid data for strong decision making and agriculture policy coherence.

The first milestone in the stage based approach of participatory planning, he clarified, is the sensitisation of society and involving the different groups and individuals. The process then goes on to obtaining indigenous knowledge from the community and stakeholders for blending with technology. This organised approach leads to all the parties getting together for one last consultation, which would lead to the final compilation of a plan for action.

Mr Varughese emphasised that Geographic Information Systems (GIS) is indisputably an effective tool for integration and negotiation and for capturing, storing, checking, displaying data and demystifying it for land use consultations. Its ease of use allows it to become a conversation tool between a woman and a policy.

In his concluding remarks, he stressed the role of water. A resource of nature like water can act as a core element to establish a connection between land, soil and forests as other resources are dependent on water at some or the other level.

Mr Sushil Gupta, Program Design Consultant, World Bank Aided 'National Ground Water Management Improvement Program, India' dwelt on the need for a watershed approach. He pointed out that the traditional farmer understood this and always had the knowledge of his area and a correct understanding of groundwater available.

The scenario by 2050 reveals that the world will require food for nine billion people with the same land and water. India is having 17.5% of the global population, but only 4% of the total freshwater resources and so it is bound to have water stress in the near future. Agriculture already accounts for more than two-thirds of the world's freshwater use and is one of the major factors contributing to deforestation. And water, especially GW utilisation for expanded agriculture to feed its population will increase manifold. .

A holistic approach is essential for the efficient management of land, water, and forest resources necessary to meet an area's food security needs and promoting inclusive green growth as one interactive system. Policies are needed for efficiency in all resources including water. India therefore, needs to develop substantial watershed resources with effective watershed management for planning its future. Mr Gupta suggested that the focus must be on Research and Development for irrigation methods with a water sustainability approach.

The National Groundwater Movement Improvement Programme should be processed properly. This programme involves assigning 80% funds to the grass root farmers. He stated that there is need to replicate this scheme at a mass level. Judicious and efficient use of water that includes conjunctive use of fresh and saline water for irrigating salt tolerant crops and for water supplies, offers good possibilities. So does the use of treated

wastewater for non-potable applications - as in construction, industrial processes and irrigation.

Mr Sanjay Singh, Water Conservationist, Tarun Bharat Sangh, India focussed his intervention on **Bundelkhand: Challenges and Prospects.** The area covers seven districts of Uttar Pradesh and six of Madhya Pradesh. Bundelkhand is a microcosm of all that ails the environment today and remains challenged on scarcity of water, which in turn has led to severe environmental degradation of land, soil and forest resources. The region comes under a rain shadow area which causes recurrent droughts leading to drastically decreased water tables. Extreme suffering and poverty has led to an abandonment of traditional water bodies and water structures available in this region. Historically rich in natural resources, most have been destroyed in absence of proper management and maintenance.

The strategies adopted for the regeneration of the resources, Mr Singh mentioned, include formation and strengthening of community based organisations and village level institutions; knowledge building and strengthening capacities of communities; demonstration and replication with community involvement, with more focus on women, *Dalits* and *Adivasis*; convergence and engagement with local institutions.

Several government programmes and schemes have been exploited like Integrated Water Resource Management; Safe Drinking Water, Sanitation and Hygiene; Livelihood Promotion and Women Empowerment & Gender Development. The model adopted for Bundelkhand engages the entire community where respect for traditional knowledge and local wisdom is combined with modern science and technology to manage the existing water bodies efficiently. With a focus on water sustainability, the participatory planning and execution promotes equity by ensuring equal distribution of water.

He detailed several water conservation and harvesting initiatives that include water technologies, micro irrigation systems, design of water bodies for capturing run-off and sustainable agriculture practices. Drought Mitigation technology forms an important aspect of the initiatives including long-term solutions and community based coping mechanisms such as promotion of grain, seed bank and fodder banks. Renovation and maintenance of wells, tanks and ponds and creation of wetlands are some of the drought proofing measures.

Special Address

In a special address, **Mr P D Rai, Member of Parliament, Sikkim** made an inspirational presentation on the remarkable success story of Sikkim - the greenest state of India. It also has the lowest pollution and lowest noise pollution in the country. How did this come about? Public policy, Mr Rai claimed was thought through in alignment with the policy on sustainability and Sikkim's public policy works on climate adaptation and mitigation through local action.

Community involvement is a major component in the conservation strategies in place in the state of Sikkim. Sikkim's public policy has been hugely effective because of the whole hearted acceptance of the stringent policies by its people who acknowledge the need for strong legislation to protect their natural resources. he people were engaged in the process through advocacy on saving the environment and forests. The idea of sustainability was initiated through baby steps - everyone to start doing something 'green', even if it was for just 10 minutes a day – like planting a tree. Though, a simple idea, it changed Sikkim. These ideas should be scaled up, and may fulfil the expectation of the mass movement envisioned by the Union Minister of Environment, Forest and Climate Change.

The next major step in the conservation strategy was 'changing the way that food is grown'. The path through which Sikkim became India's first fully certified organic state in 2016 began in 2003, with sceptics amongst authorities who were not sure if this strategy was workable. The concern was for the fall in agriculture production, particularly because of the withdrawal of subsidies for agriculture - although many studies from around the world show that organic farms can produce as much, and in some cases much more, than conventional farms.

The farmers were systematically supported in technical matters. Today, all the farm lands have been certified in the state. ICAR has set up a Centre for Organic Research[3] and intensive research and training is going on. The Government of India is financially supporting the institutionalisation of the model. Sikkim being the driver, its Chief Minister is heading a committee of all member states of North-East to promote the organic model. Organic farming, done with the help of scientific guidance will bring back productivity levels to those comparable to traditional farming strategies.

Sikkim's public policy has been hugely effective because of the whole-hearted acceptance of the stringent policies by its people who acknowledge the need for strong legislation to protect their natural resources – laws to be subsumed within a Sustainability Act. Sikkim has been declared the cleanest state as well as cleanest hill station in India. Several environmental legislations have been periodically passed in the state, significant among them being the Industrial Policy that incentivises eco-friendly businesses, the Non-Biodegradable Garbage (Control) Act, Forests (Compounding and Offences) Rules, the State Forest, Environment and Land Use Policy, the Ecotourism Policy and Natural Water Tax Rules.

Environmental public policies of the state include spring rejuvenation, climate resilient livelihoods and ban on firecrackers, plastic bags, bottles and Styrofoam products. There has

[3]India's first fully organic state Sikkim to now have institute on Organic Farming
http://indiatoday.intoday.in/education/story/sikkim-organic-farming/1/593108.html

to be coherence in policy action and ecosystems for achieving this. Eco-system conservation has been carried out as an everyday experience. The state has focused on Eco Tourism - not just tourism - in every way, ensuring convergence with all the departments.

It is also important to ensure the message from this sustainable movement goes across mountains - to make people proud of their mountains. And so, the Integrated Mountain Initiative (IMI) has been started for finding solutions to bring about systemic change to redefine the architecture of sustainable development across the 12 mountain states in the Indian Himalayas and Northeast India.

Dr Ashok Khosla, Trustee, Club of Rome – India, Co-Chair, and Chairman, Development Authorities lauded the Sikkim Green Mission and remarked that life means more than just the Gross Domestic Product (GDP). The combination of great leaders with political will and demand from local community for sustainable practices can lead to better eco system services.

Plenary 6: Legal, Policy and Financial Frameworks for Productive Forests, Land and Soils

Dr Bharat H Desai, Professor of International Law and Chairman of the Centre for International Legal Studies, Jawaharlal Nehru University, New Delhi spoke on International Policies: Reflections on National Policies**.** The important questions for the session were:

- *How solid are the existing policies and practices in maintaining the health and productivity of our land and soils? What are the improvements needed?*
- *What fresh legislation is urgently required to address asymmetries in the governance and federal functioning of these sectors?*
- *What are the impacts of economic activities, such as construction materials, that are intensifying the threats to our soils and what measures are needed to contain these?*
- *What opportunities are there for research and innovation to understand the situation of soils in India and to remediate them where needed?*
- *What are the major barriers and hurdles to enabling the local communities to act as guardians of their local biotic resources?*

International Policies, Law-making procedures and Institutions for regulatory behaviour on environmental limits may not work unless there is positive change in the behaviour, attitude and consumption patterns of human beings was Dr Desai's contention. Legal instruments and regulatory frameworks may reduce the misuse of the earth, but political determination has to be reflected at the grass roots. Going back to the thought unveiled by the Club of Rome in 1972 - "The Limits to Growth", he declared that we are still facing the same predicament even after 45 years. Science can change the way we are living and get extraordinary happiness, but governance and laws are needed to enable this. Climate change debates, deliberations, and negotiations have been long-drawn and have become confusing. Many multilateral agreements have come up, but very few people know them.

Mr Desai acknowledged the difficulties in resolving these issues. Who will set the agenda to design the processes? And do a large number of communities have the capacity to participate and contribute in the processes? Take the example of India's need for high-grade

steel. The question is, do we allow ship breaking for 2 to 3 million tons of steel at the cost of human and environmental cost? If necessary, the choice should be in selecting the option that will result in lesser degradation of the environment, as development is inevitable.

Legal instruments and regulatory frameworks may reduce the misuse of the earth, but political determination has to be reflected at the grass roots. The National Environment Policy of 2006 has huge potential and the Ministry of Environment, Forest and Climate Change must ensure its implementation. Was there a need to bring the judiciary into this process, which sometimes hesitates to interface, was his concluding poser to the conference?

Dr Mohan Gopal, Director of the Rajiv Gandhi Institute of Contemporary Studies (RGICS) and Ex Vice Chancellor of the National Law School of India, Bangalore gave an illuminating presentation on getting the judicial system to work better for the protection of forests, land and soils.

The questions that he addressed looked not only at coherence in the larger sense, but also at the role of legal and judicial system. The premise, Dr Gopal placed was that there are too many laws, and the implementation capacity of the environmental protection policies that are intended to secure the forest and the soils are undermined, whether they are global policies or national policies.

One of the challenges facing the system is that it does not have performance standards. The biggest hurdle, he admitted was that the laws have been copy pasted from 1935 rather than reinvented in the constitution. Indian courts were established in colonial times with the intention of suppressing local communities and allowing people and resources to be exploited. The law and judicial system were instruments of oppression and instruments of exploitation during those days. The colonial courts were logical continuations of the feudal courts of kings, Maharajas and caste elites.

After independence, democratic India has been trying to transform law into an instrument of social transformation and social justice. Article 38 of the Indian Constitution sets the mission of the republic as creating a new democratic order, to secure a social order for the welfare of the people.

The Environmental Laws in India between years 1973-87, were the pioneers for today's environmental protection movement, when **Krishna Iyer and Bhagwati** were in the Supreme Court. Krishna Iyer in the Ratlam municipality judgment[4] said that he wants to "shift the centre of gravity of the judicial of the justice system" from the 'colonial role' to 'role of protecting communities and people's rights'. This was followed by the M C Mehta case and Justice Kuldeep Singh, when the Supreme Court became a pioneer for protection of environmental rights, not only in India but the worldwide.

Dr Gopal pointed out, that this topic should really be "Securing Forests, Land and Soils of All" nor "Securing Forests, Land and Soils for All", because it does not tell us to whom do the forests, land and soils belong and who has the right to control them. The answer given in the 73rd and the 74th Amendment by the Rajiv Gandhi government and the revolutionary

[4] https://indiankanoon.org/doc/440471/ [4] Case against Coca-Cola Kerala State: India, http://www.righttowater.info/rights-in-practice/legal-approach-case-studies/case-against-coca-cola-kerala-state-india/
[5] www.coservation india.org/case.../silent-valley-a-peoples-movement-that-saved-a-for...

Panchayat Extension of Schedule Areas Act (PESA) that gives rights to people and the *Gram Panchayats* for control over their forests, land and soils.

India trained its magistrates in environmental law at the local level in 20,000 magisterial courts across this country. Unfortunately, the government brought in the Green Tribunals Act and transferred the entire jurisdiction for protection of the environment away from the judiciary to the executive branch under the judicial tribunal. And those tribunals are available only in 3 or 4 places in the country. Today local people don't have access to environmental justice and we need to reverse this.

There is no shortcut to protecting land and forests and soil, he declared, except to bring about *Swaraj* in its fullest sense and to put power in the hands of the local people like in Plachimad[4] and the Silent Valley[5] to let them safeguard and protect their own rights. These need concerted efforts to ensure the power to set policies and to guarantee their coherence devolves down to the *Panchayats*. Implement not only the 73rd and 74th amendments, but PESA in its spirit.

Dr Gopal sought the jurisdiction of every magistrate to protect the environment and highlighted the need to work on sensitising and training them. He emphasised the necessity of ensuring that environmental protection goes back to forums that are accessible to people and that they have the independence to achieve that. Then only will it be possible to achieve coherence in the very large and complex global and national policy that is waiting for effective implementation. And the answer lies in the empowerment of the lowers strata in the society, and not just in technical amendments to policies, he concluded.

CLOSING EVENT

CLOSING REMARKS

In his closing remarks **Mr S Ramadorai, Chairman, Indian National Association for the Club of Rome, India** expressed his satisfaction at the richness of though and recommendations emerging from the conference. He called for the power of science to be utilised in building the health of nature. While commending the identification of our ancestors with nature, he observed that life had come a full circle with today's respect for the environment.

Introducing the fascinating concept of Biology as the archetypal 21st Century Science, he elaborated on the advances in this area. Scientists now understand essential life processes at the molecular level of specific DNA segments. Science has not only given us a precise understanding of the secrets of life, but also the ability to edit the genetic code itself. On a macro scale, scientists also appreciate biological processes and interactions at a landscape or ecosystem level.

Recently, scientists have discovered the significance of a vast symbiotic network of roots and fungi under the ground that stretch across entire forests. In fact, they even refer to it as the Wood Wide Web. Soil, it seems, is teeming not just with life, but is a busy medium of communication not just between roots underground but also between above-the-ground predators and underground microbes and fungi. As the methods and tools of science become both more subtle and powerful, our understanding of the forests and natures becomes much more nuanced, he observed.

Biology is now a technology; a tool that can save Nature. This remarkable transformation of biology from a descriptive science of the naturalists to a precise tool gives us an enormous ability to live more harmoniously with and within nature.

Mr Ramadorai warned that we will soon face the problem of feeding 10 billion people on this planet; perhaps even a more urgent problem for India. Although, we have overcome the terrible famines of the early and mid-twentieth century, our nation is still malnourished. But he was confident that bio technologies and continuous learning can provide the answers.

Excess starchy grains and sugar are produced thanks to the Green Revolution and agricultural subsidies. Technologies now exist to convert surplus starch and sugar to protein through a well-proven industrial process in India scale and India price. Doing so would have multiple benefits:

> *Ensure our food security; reduce our disease burden; improve the productivity of our people and most importantly reduce the pressure on the environment*.

He mentioned another important step to lighten our footprint on the planet, which is the adoption of controlled environment agriculture - Vertical Farming. Productivity in controlled environments is as high as 300 times as that of an open field. Similarly, inland aquaculture in controlled environments enables us to reduce the drastic culling of fish in natural waters. As fish need protein too, there are now companies making fish-feed using natural gas-to-protein technology! Thus we can and must consciously reduce our harmful footprint.

We need a nature audit of all our economic activities, pointed out Mr Ramadorai and should consciously eliminate wasteful utilisation of natural resources. New technologies are required for recycling water along with better techniques for extraction of fossil water. This would hopefully permit honest signalling of prices in the marketplace, especially of non-renewable resources.

In conclusion, he stated that the power of new science and precision technologies to nourish Nature in a sustainable manner can now be harnessed, without further destruction of forests, land and soil. The health of our planet can be enhanced not by exploitive destruction, but by appliance of traditional knowledge systems and modern learning to regenerate, reconstruct, and revitalise nature. This can be done through better science, improved technology, and continuous learning.

Mr Ranjit Barthakur, Secretary General, Club of Rome – India, Advisor, Tata Consultancy Services (TCS), and Trustee Balipara Foundation concluded the conference by highlighting that the power of change in the distributive framework of value based policy must include everyone.
He questioned if there was clarity in understanding what policy congruence is. A societal approach from bottom up to include everybody must be imbibed; that is real congruence. Secondly, policy needs to take into consideration the changes in technology and the law needs to catch up with technology. Any forward movement must keep the people - the bottom of the pyramid, engaged and informed because they are the implementers of our

food security and protectors of our forests. A distributive framework of policy, he suggested, is only way of effective implementation because it is a framework for all - a framework of inclusion - and there can be no other way. He spoke of the need for stakeholders such as communities and societies to take this policy congruence forward together.

Mr Barthakur concluded the discussions by thanking all the speakers and the participants for helping identify areas where focus is needed for creating policies and coherence. He pointed to good governance as a value driven process. Global partnerships and localised support are both needed for impact and ensuring the objectives of the conference.

Conclusion

The response towards the Conference was overwhelming. Students, educational institutions, policy making bodies, NGOs, lawyers, business, media professionals and political leaders were part of it. Although there was a larger framework of questions and plenary wise issue based questions, the participants did not confine themselves to those and discussed several more issues. They debated on the issues within a national and international perspective.

There was a common understanding that Indians should decolonise their mind set and pursue Article 38 of the Indian Constitution that sets the mission for the republic to secure a social order for the promotion of welfare of the people. Various legislations, policies and plans were made within this but somehow the colonial mind-sets have inhibited that.

India has adopted various approaches of growth and development which are extractive in nature and lack durability. The masses at large are not giving much emphasis to the durability of production processes and products. There is a need to bring back the spotlight onto the traditional way of living and promote innovations and technological interventions to preserve it.

Forests, climate change, and ecosystem protection issues need to be looked at from the viewpoint of the global village, but in the Indian context and the Gandhian way of living. The Gandhian way of living and Gandhian thoughts must be advocated and promoted worldwide. It is the only sustainable way of living - protect nature.

The emphasis of the conference was on the preservation of 'Conventional Knowledge' with modern technologies. The local communities, farmers and tribes should be consulted while making policies related to forests, land and soils. The centre of gravity related to justice, policies, planning and its implementation must be community oriented. Institutional changes are required to facilitate this by systemic changes in administration, judiciary and policy making bodies.

Instead of top down government, the response should come from the bottom. The provisions settled in 73rd and 74th Indian Constitution Amendment and Panchayat Extension Schedule Act must be promoted. There is a need to reverse the entire system of policy, planning and justice related to environment and forests. But at the same time it has to be ensured that local communities should not be betrayed by elite segments or the production oriented world for their own benefits.

Larger issues of Forests, Land and Soils must reflect on the overall education system, which initiates from primary school level orientation and training and capacity building is needed up to the judiciary and district magistrate levels. At the same time, mass movements by engaging communities and societies as in the Sikkim model, must be emulated.

Many universities, government institutions and organisations are engaged in innovation, research and development and promotion of technologies; however, there is still a separation from the private sector. Although, several business institutions believe that India should be economically prosperous, they also believe that it should not be at the cost of planet earth. This can encourage multi sector involvement in the protection of Forests, Land and Soils.

Though there were many Acts and policies discussed in the conference it has been seen that they are acting in silos at some levels. The policy implementers, education institutions, various line departments, corporate and normal people must be made aware of them.

In this digital era the 'ease of doing business' has been promoted, but somehow there remains a gap between small and marginalised farmers, vulnerable segments of society - women and children, and the core issues of forest, land and soil.

The presentations and discussions at the conference yielded a rich and diverse set of specific suggestions and recommendations, which may be seen in the relevant sections of this report.

Recommendations

The major recommendations that emerged from the conference are:

1. **Return to Nature and native wisdom for sustainability – the Gandhian approach**
2. **Natural resource conservation**
   - Conservation of natural resources to be integrated with the imperative of equity
   - Involve the agricultural community in conservation of forests
   - Promote agro-forestry and utilise wastelands
   - Sequester carbon in soil through a Carbon-shed approach
   - Explore use of waste water for non-potable uses, e.g. construction, industrial purposes and irrigation
   - Conjunctive use of fresh and saline water for irrigating salt tolerant crops and for water supplies

3. **Business and environment**
   - Review IPR policies and reduce the overarching preference for MNCs who patent indigenous seed varieties.
   - Harmonise a regime of financial schemes by giving payoffs as financial instruments and invest the return in nature conservation
   - Provide interest-free loans for green economy, and not brown economy**.**
   - Private sector to play a vital role in the promotion of technology
   - Enhance FDI in the agriculture sector
   - A new partnership model where FDC's, farmers and industry work together in association with research institutions was recommended.
   - Farmers' companies need to be promoted to run the water business in India
   - Improve ease of business for the farm sector

4. **Policy and regulation**
   - Engage multi-stake holders in policy making and policy changes.
   - A Mission Framework with - a Cabinet Committee on Sustainable Agriculture with all concerned Ministers headed by PM ; a Mission Secretariat and a think tank to be involved
   - Adopt the Sikkim model, i.e. policy convergence in all sectors, through inclusivity of environment, social, economic and educational factors
   - Real ecological cost of goods and services to be provided to consumers
   - Work on policy congruence and convergence for optimisation of food and natural resources
   - Protect conflict areas and North-east states from political pressures and conflict situations
   - Local management strategies involving local and youth leadership to be factored into policies

- Train a large number of agriculture extension workers to bridge the gap between farmers and scientists**.**

LAND

- Create an integrated land policy for India
- Land policy to be reclassified based geo climatic conditions.
- Modernise land records and legalise land leasing arrangements
    - Law for women to own land to be enforced.
    - Change land-holding patterns, taking account of people's rights in Schedule 5 areas.
    - Strengthen *Panchayati Raj* implementation and enforce rights of the communities to natural resources in their area.
- Settlement of land issues in tribal areas under the provisions of the Forests Rights Act

SOILS

- Public investments in integrated policy instruments for soil health
- Design new approaches to promote restoration of soil health
- Much more policy attention to be given to organic farming
- Subsidise organic fertilisers
- Reduce subsidies for diesel pumps and chemical fertilisers.
- Subsidise innovative climate friendly farming practices like cover cropping

FORESTS

- Review current accounting techniques for forests, as they are producing incorrect data.
- Rework definition of forest cover

WOMEN FARMERS

- Undertake skill development of women
- Recognise women as farmers in policies and programmes.
- Make machines such as pumps and tractors woman friendly

WATER

- Build a coherence framework in water policies
- Change water regulations, especially to discourage the exploitation of ground water.

5. Communication and Awareness

- Facilitate action to listen to and learn from the local community
- Encourage participatory planning
- Empower local groups to take decisions for their own land-use
- Promote education for environment
- Create mass awareness for a low carbon footprint lifestyle

- The corporate sector and the government to jointly invest in knowledge innovation and communication strategies for environmental protection

6. Knowledge Generation and Innovations

- Science to be demystified and integrated into planning
- Explore native biodiversity of crops in India.
- Explore bio-technologies for food security and to conserve resources
- Develop a coherent framework for natural resource management
- Find practical methods to manage crop residues instead of burning them
- Sequester carbon through bio-char

7. Justice and Environment

- Legislation in consultation with people
- Plan and strategise for giving options, not directions
- Reform property rights by incorporating the Gandhi's trusteeship approach
- Pay attention to socio-economic conditions, for example, in understanding how SC and ST land holding patterns are different
- Set regional policy goals for minimising nutritional inequalities in people as well as soils
- Fundamental Rights should not be subordinated to Directive Principles
- Performance standards needed for judiciary
- Public Defenders and local Bars required for Human Rights and Environmental Rights
- Sensitise magisterial courts towards environmental justice

Technical Recommendations

Managing Land and Soil: New Approaches are needed

1. From carbon-negative (C^-) to carbon-positive (C^+) agriculture with carbon sequestration
2. From polluting to pollution-neutral green agriculture
3. From climate-prone to climate-proof agriculture
4. From low-efficiency to high-efficiency agriculture
5. From state-oriented to globally-competitive human resources in agriculture

This can be done by Managing Land and Soil Resources and the relevant Policy Issues are:

- Developing an integrated land use policy. Land should not be viewed as a separate entity such as forest land and agriculture land. All types should have an integrated policy, so policy wise maximum utilisation is possible
- Crop planning
- Invest in Land and Water Resources Management
- Good quality of planting material needs to be promoted
- Strengthen environmental education and capacity building. Need to educate farmers, students, researchers and even policy makers

- Consider everything on watershed approach: Delhi has water problem, because it has not been considered in a context of basin and the levels are falling. Address the knowledge gaps on what are the water resources and how best can those watersheds be used and managed keeping in mind the needs of Delhi for drinking purposes and others
- Connect with the farmers: Government of India has launched Water Resources Information System (India-WRIS) databases usable only by scientists and educated people. Farmers need to be provided with a unique village ID to access this database and get all the information on water and crops and the capacity to handle these technologies in the easiest way
- Old farmers and stalwarts are good sources to understand from and discuss with regarding the state of our natural resources – learning from the past.

Major recommendations for soil health management call for:

- **Integrated Nutrient Management** (INM) programmes with nutrient-based subsidies
- **System of Rice Intensification** (SRI) to be adopted in other commodities – such as sugarcane and wheat. As with rice, the principles to be followed are: early and healthy plant establishment, reducing competition between plants, increased soil organic matter, active soil aeration and the careful application of water for raising the productivity and profitability of differently-managed crops
- **Soil Health card** scheme to issue soil cards to about 14 crore farmers spread all over India for better management of nutrients and fertilisers. The cards will also provide access to correct information and databases. The card has Soil Testing Kits; Soil Testing Laboratories; Information on balanced use of fertilisers, Organic Farming and Integrated Nutrient Management
- Tailor agricultural practices to **local ecological and socio-economic systems**
- **Increase productivity** from degraded forests, wastelands and Forest Development Corporations (FDCs) by adopting good practices and technologies for farming and agro-forestry. Native species - *Gamhar, Shisham, Kadamb, Red Sanders* etc. to be given preference over Eucalyptus/Teak
- Implement **new partnership models between** FDCs and Farmers, FDCs and the Pvt. Sector, Industry and Farmers etc.
- Reform JFM to **share major benefits** with local communities
- Judiciously utilise **CAFs, 14th FC, REDD+, MGNREGA,** etc. in restoring forests and common/waste lands
- **Incentivise farm forestry** - Classify farm wood as agriculture produce, in order to make it eligible for subsidised loans/MSPs. Restrictive regulations to be relaxed
- Future: from pure conservation to Sustainable Forestry Management and productive forestry - **by and for the people.**

Land aggregation reforms

- **Modernisation of land records** - digitisation based on GIS maps and surveys based on settlements
- **Easy bank loans for farmers** based on land records linked with *Aadhaar* cards
- **Homestead-cum-garden plots** for all rural households

Irrigation Sector reforms

- **Redesign water management systems**
- **Focus on rain-fed areas** to create irrigation infrastructures
- **Intensify the Watershed Programme** - redesign MGNREGS to mobilise resources, restructure National Rain-fed Area Authority (NRAA)
- **Restore and manage traditional tanks**
- **Rationalise pricing of canal irrigation water** for full cost recovery of Operation and Management as well as depreciation
- **Modernise canal networks** and complete unfinished schemes
- **Set up farmers water companies**
- Impose a **surcharge for irrigation infrastructure development**

Effective delivery of Agriculture inputs

- **Enactment of Seed Bill 2004**
- **Strengthening Direct Benefit Transfer** (DBT) for seed subsidies would make state run seed production agencies competitive and effective
- **Overhauling of Seed Certification Systems**, including possibilities of private sector participation
- **Soil Nutrient certification** to encourage sustainability
- **Soil nutrient-based subsidy regime** to progressively encourage soil testing and incentivise efficiencies in fertiliser use
- **Overhauling of Agri-Extension**: adoptable and validated research for farmers; link performance of extension by adoption-based accountability
- **Agri-research institutions** - ICAR, State Agricultural Universities to be covered under accountability framework for results / impacts
- **Private/non-profit/FPO (Farmer's Producers Organisations) participation** in extension
- **Private Sector Landing** (PSL) to target small and marginal farmers (SMF)
- **Setting up Central Agricultural Development Fund for Women Farmers** – in areas of research and training, drudgery reducing farm machines like tractors and tillers that women can manage.

Agriculture Marketing Reforms / liberalisation

- States to be encouraged to **adopt Model Agriculture Produce Marketing Committee** (APMC) Act[5]. 2003
- **States to join National Agriculture Market (NAM) platform** through incentive linked mechanism.
- **National Agriculture Trade legislation** to leverage India as one unified market e.g. - e-NAM for *mandis*
- **Private sector participation** in the Minimum Support Price (MSP) procurement, storage and distribution alongside government organisations
- **Infrastructure gaps for post-harvest storage** can be addressed by private sector, particularly in the supply chain – to attract large scale investment, including FDI, in organised processing and retail

[5] www.indiabudget.nic.in/es2014-15/echapvol1-08.pdf

- **Public Private Partnership** (PPP) mode for construction of warehouses, post-harvest infra, etc.
- **Essential Commodity Act** (ECA) should be invoked under exceptional shortage situations only, and when invoked, genuine businesses must be distinguished from hoarders.

Empowerment of Smallholder Farmers

- Departure from individual based extension; **subsidy to group based approach**
- **Promotion of farmer producer organisations** (FPOs) - over 4000 operatives in India need to be supported by government. They should be given more power for agriculture marketing, insurance and supply chain. It is an emerging model
- Enabling conditions for **financial access by FPOs**
- **Enabling marketing laws for FPOs** to aggregate, sell and develop interface with the industries directly
- Regulatory changes to **enable FPOs to access agriculture inputs**, etc.
- **Creation of an apex institution at the central level** to address the need for a promotional role for FPOs

Improved agricultural practices

- **Zero or reduced tilling**
- **Integrated nutrient and pest management**
- **Promoting compost, mycorrhizae and other bio-fertilisers**
- **Encourage natural micro flora**
- **Intercropping composting -** Livestock options to be promoted - a good source of nutrient for soil too
- **Ever-Green Agriculture** by using research based new plants of various crops. They have a better absorption capacity of sunlight, better root systems and photo-insensitivity, are drought tolerant and have high yield capacity. New and excellent varieties are available and more are being bred every year. For example ICAR has got varieties which can produce more than 10 ton per hectare. Next Generation Super Rice has high yield
- **Water saving technology** and improved nitrogen management
- **ICAR leaf colour chart** which tells a farmer the periodicity and quantity to apply nitrogen fertilisers
- **Promotion of government policy of *Neem* coated urea** that increases the efficiency of nitrogen by 8-10%. On an average, 20% less *Neem*-coated urea is required as compared to ordinary urea. It is helpful in preventing insect attacks
- **Bio Char**: In India, we burn 600 million crop residues every year. The cost implication of collection and transportation of crop residues is very high. If converted into char it will be retained in soil for a longer period and that will enhance soil fertility, reduce pollution and sequester carbon
- **Conservation Agriculture** – variants of this technology include Reduced tillage; Laser land levelling; Water saving technology. (DSR, SRI, Drip); Nutrient saving tech (LCC, USG, NI) and Crop diversification
- **Exploiting biodiversity vigorously** - Rice alone has more than 1, 50,000 varieties

Context Paper for the Conference

Challenges and Opportunities in Managing the Nation's Land Resources

Overview

In 2014, the Indian National Association for the Club of Rome began a five-year series of Annual Conferences, the objective being - to examine and analyse the issues of policy coherence in India and how the nation manages its key resources. It is recognised that economic development is urgently needed for eradicating poverty and creating a fair and just society, but it must follow pathways that recognise planetary boundaries if societies, companies, and people are to hope for a reasonably prosperous, long-term future. With a commitment to promoting systemic, long-term solutions on emerging issues of global and national importance, The Indian National Association for the Club of Rome has been raising the issues throughout the country and in promoting dialogues at the critically important interface between science-policy. It was decided to look at the following issues in depth and systematically:

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

Conference 2016 focuses on "Securing the Forests, Land and Soils for All" and was held on November 23-24 at the India International Centre at which more than 125 participants were present. Leaders, academics, experts, representatives from NGOs, journalists, bureaucrats, politicians, lawyers and students took part. The opening and closing sessions took place with five technical plenaries where more than 25 speakers shared their views.

Background

Humans consume and produce waste and as the population and economies grow so does the consumption of natural resources. This in turn increases pollution and drains the resource base, decreasing 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; this was just about 0.5 Earths during the 1950s. India needs around 1.5 Indias which is about 0.3 or 0.4 Indias as compared to the time of independence. The generous wealth which is granted to us by nature is like a spendthrift's bank balance. It is rapidly disappearing as the gap between withdrawals and deposits keeps growing. This is not widely understood but is clearly not sustainable; over the coming decades it needs to change radically. All nations now urgently need to bring their ecological footprint into balance with their bio-capacity. Though, the per capita India's ecological footprint is modest in comparison with wealthy countries, which often exceed footprints of 10. Because of the

size of its population, India as a nation has the third largest ecological footprint in the world and only USA and China are bigger.

While the rich countries and industrialised economies consume large quantities of resources in, most Indians are too poor to access even the minimum amounts needed for a decent and healthy life. However, we have little room for evasive action. As the footprint grows and the bio-capacity continues to shrink, the runaway narrowing of options reduces the space for making rational and optimal decisions for a more beneficial time to occur, whether in the social, economic or political arenas.

India's forests, land and soils are the essential support for the health of 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 focussed on three instrumentalities in which India needs great and immediate improvement:

- Innovation in institutions and technology;
- Investment in people and nature; and
- Coherence in making policies and economic structures.

So the challenges before the meeting were to identify the Innovations, Investments and Convergence. India has to bring about to create a developmental pathway that supplies all

its citizens, rich and poor with an adequate quality of life without relentlessly destroying its resource base and its future.

The Big Questions of the Conference for consideration by each thematic plenary, therefore were:

1. How healthy are India's forests, land and soils?
2. What institutional and technology changes are needed to improve them?
3. What investments are needed in knowledge, innovation, communication institutions?
4. Where public and private investment should be redirected?
5. What structural changes can make our policies for these and other resources coherent, convergent and mutually reinforcing?

It was our privilege that Shri Anil Madhav Dave, Minister of Environment, Forest and Climate Change, Government of India, delivered the keynote address that set the tone of the conference and Shri Prem Das, Rai Member of Parliament from Sikkim, gave a special address on the Sikkim Green Model.

The technical plenaries were:

- *Plenary Session 1: Infrastructure and its impacts on Forests, Land and Soils Optimising the Trade-Offs between Efficiency of the Economy and Productivity of Nature*
- *Plenary Session 2: Forests, Land and Soils for Sustainable Ecosystems and Resilient Communities, Reducing the Vulnerability of Women, Children and Tribes*
- *Plenary Session 3: Forests Health and its Restoration*
- *Plenary Session 4: Land and Soils' Health and its Restoration*
- *Plenary Session 5- Water to Connect Land, Soil and Forests Resources*
- *Plenary Session 6: Legal, Policy and Financial Frameworks for Productive Forests, Land and Soils*

Plenary Session 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 and 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 century. Her airlines, which were virtually non-existent 50 years ago, now carry nearly half a billion passengers per year.

India's speed of construction and growth of air travel may not have reached anywhere near these stratospheric levels but that is not for lack of desire or intention. Our policy makers are explicit in 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 needs to be well-debated.

The following questions were the agenda of Plenary 1.

- *What trade-offs can India make between Infrastructure and natural resources protection?*
- *Which alternatives can India adopt for inclusive and sustainable transport, connectivity, water and sanitation, electricity and social services to all its citizens?*
- *How can wastes from construction and demolition, mining or industry be used more widely?*
- *What alternative transport means are available for local or long-distance transport of people, goods and information, such as improved communication networks; lighter than aircraft, such as airships, dirigibles, balloons and blimps; and decentralisation which brings foci of demand closer to sources of supply?*
- *How can the 'Ease of Doing Business' index be redefined to reconcile it with the imperatives of human rights, social justice and environmental health?*

Plenary Session 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 but some 600 or 700 million of them – as many as the populations of the US and EU combined – who are dependent on and 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 it is 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 actually is 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 societal 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 that are only of interest maybe to extract what can be cheap and walked away with easily. The policies and supports they need (particularly from government and civil society) are to strengthen their ability, as communities and to protect the resources on which their lives and livelihoods depend upon. In this effort, creating better awareness and knowledge among women and girls, particularly as to their rights and entitlements is quite possibly the most useful action.

In addition to the 6 Big Questions listed in the Overview. The important questions that we must now urgently address regarding the relationships between local people and forest, land and soil resources are:

- *How well are the existing policies and practices regarding forests, land-use and soils impacting the lives of local people and vice versa?*

- *What are the impacts of the resource extractive industries on the local forests, land and soils and on the lives and livelihoods of the local communities?*
- *What opportunities are there for research and innovation to create livelihood options for marginalised people to help regenerate the forests, land and soils?*
- *Which feasible options exist to satisfy the food, fuel and other basic needs of local households without further depleting the land-based resources?*
- *What are the major barriers and hurdles to enabling the local communities to act as guardians of their local biotic resources?*

Plenary 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 which plants and animals 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 impacts. 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.

The priorities arising from the critical need for restoring forest health required focus on the following questions:

- *What are current trends in the state (both quantitative and qualitative) of India's forests?*
- *How can we inspire, enable and implement political as well as financial commitments to protecting and restoring forest health?*
- *What innovations in institutional frameworks and technology can support healthy forests at scale?*
- *What are the other sectors with greatest mutual reinforcement potential and therefore co-benefits with forest restoration?*
- *Where would investment in innovation and research; communication and awareness; and community institutions have the greatest pay-offs?*
- *What are the knowledge gaps or other barriers that constrain efforts to regain forest health*?

Plenary 4: Land and Soils' Health and Restoration

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) 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 more. 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 India 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 took place 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 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. 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.

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 millimetre of topsoil each year with a total loss of 5,334 million tons annually due to soil erosion.

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 micronutrients like nitrogen, phosphorus, and potassium lost during this process is about 5.53 million tons.

With respect to our highly threatened land and soil resources, the important questions that the conference was expected to address were:

- *How solid are the existing policies and practices in maintaining the health and productivity of our land and soils? What are the improvements needed?*
- *What are the impacts of economic activities, such as construction materials, that are intensifying the threats to our soils and what measures are needed to contain these?*
- *What opportunities are there for research and innovation to understand the situation of soils in India and to remediate them where needed?*
- *What are the major barriers and hurdles to enabling the local communities to act as guardians of their local biotic resources?*

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

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 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. With respect to the contribution of our water systems, the important questions that were addressed were:

- *What is current knowledge base on the minimum water flows, particularly in our rivers and streams, needed to maintain basic ecological services and what research is needed?*
- *How solid are the existing policies and practices in maintaining the health and productivity of water flows? What are the improvements needed?*
- *What are the major barriers and hurdles to enabling the local communities to act as guardians of their local water resources?*

Plenary 6: Legal, Policy and Financial Frameworks for Productive 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 hold 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, 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 least as healthy shape as 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 and municipality 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 to make service delivery systems more rigorous and prompt, increase financial acceptability and accountability etc.? This needs to be discussed in the present context.

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 plenary to focus on the same.

With respect to our highly threatened land and soil resources, the important questions that were to be addressed were:

- *How solid are the existing policies and practices in maintaining the health and productivity of our land and soils? What are the improvements needed?*
- *What fresh legislation is urgently required to address asymmetries in the governance and federal functioning of these sectors?*
- *What are the impacts of economic activities, such as construction materials, that are intensifying the threats to our soils and what measures are needed to contain these?*
- *What opportunities are there for research to understand and innovation to deal with the inter-sectoral policy conflicts that impinge on our forest, land and soil resources?*
- *What are the major barriers and hurdles to enabling the local communities to act as guardians of their local biotic resources?*

SECTION B

Setting the tone for the Conference

MR RANJIT BARTHAKUR

In his opening remarks, Mr Barthakur informed the conference that this being the fifth such event of the Club of Rome-India, it was time for a candid assessment on how these conferences were achieving their real goals. No doubt, the themes that have been taken up by the conferences are vital for the nation and planet earth, but the objective of policy congruence must also be evaluated.

Key Points

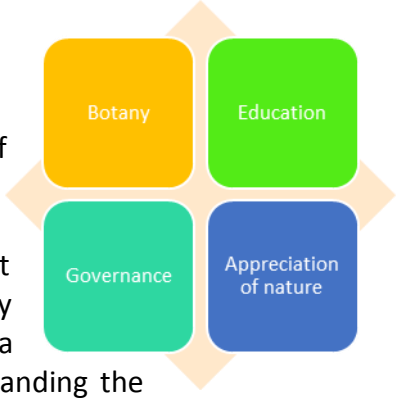
- Engage enough representatives from the government for promoting and advocating environmental policies
- Botany must be included in the educational curriculum from primary level
- Children must closely watch plant life
- Appreciation for the framework of nature to be inculcated
- Appropriate governance

The Club of Rome has taken five important elements, ***food, water, forests – land - soils, energy and waste for discussion and policy coherence.*** CoR-India has been contemplating if it has succeeded in the objective or not. We do not have enough representatives from Government to take part in the conference and it is they who are integral to policy. This is a challenge for us and for others also to engage more and more policy makers in these kinds of conferences.

We need to engage the attention of an adequate number of representatives from the government for promoting and recommending environmental policies. If they have missed being here due to other commitments, it is hoped that they will look seriously at the recommendations of the conference. Existing environment-based policies have remained dormant in real practice and there is a need to convince governing agencies on the importance of fresh and healthy food, water and air for all.

Mr Barthakur focused on four major themes:

Importance of Botany



The understanding of Botany must start from the beginning of education and at all levels of society. Botany and Botanical Diversity must be included as a part of primary and basic education. Children should be made aware of plants and plant life. Their curriculum must include the fundamentals of botany with relevance to their local context and presented in such a way that children enjoy learning about it. Without understanding the

importance of plants, it is hard to understand forests and land and food and water security and their importance.

Appreciation of the framework of nature

Urban India should understand nature, however, it is tough as there are few places where the 'touch and feel' of Nature is possible, because of which a larger section of the population is not connected with the environment.

Governance

All elements of natural resources must be seen in a framework. There have not been any recommendations which require too much legislative changes. Suppose, the recommendation is, that forests and agriculture must go hand in hand, because it was the same during 1950 and many countries were having the same setup. We need to see closely what existed then and what is happening in the world today, to frame effective government policy.

"Good Governance leads to strategising and fulfilling objectives that help in forming a strong policy framework. Governance should be a value-driven process."

Considering the GDP of the western model of growth of industrialisation of some countries - they need to take inspiration from countries like **Netherlands,** which has brought in a massive change in natural policy and urbanisation structure to sustain nature. They have a Nature Policy, which itself is a congruent policy. All line departments come under the same policy, whether related to forests, road, transports or any other development. The structure makes good governance possible, which needs to be examined in the Indian context, to enable us toensure better ways of governance.

The Costa Rica model has led it to become the largest afforested nation when in the 1950s, the nation faced severe deforestation

They brought the mechanisms of ecotourism into that scenario, which helped afforestation as an objective. Therefore, afforestation with a focus on ecotourism may help to increase forests.

Similarly, Singapore has done a commendable job of modern living with scarce water resources by appropriate multiple use practices. It is based on an urban plan, clear objectives and the systems of administration and governance that have been put in place.

Further, the Queen's Foundation support of Kung Nichai in Northern Thailand, at first promoted the botanical garden as a home movement, and it first faced challenges.

Communities were encouraged and now they manage their air, land, water and carbon resources for better lives and economic well-being.

There has to be a congruence of policy with value driven norms, honesty, accountability and full respect of human rights for better governance.

Good governance is a value driven process having:

- *Social value*
- *Rule of law*
- *Right to clean air and a healthy environment*
- *Efficient public sector*
- *Participation – Multi Actors Participation*
- *Equity and sustainability*
- *Legitimacy - Access to knowledge*
- *Accountability*
- *Education*
- *Political empowerment of people and*
- *Sustainability*

How we foster "responsibility", "solidarity" and "tolerance" and debate to achieve good governance is the main motive of the conference. It is most important to understand where we are:

The waves of development have eventually impacted on the use of natural resources, which we are consuming 1.7 times more than we have. The different phases of development show that human growth has impacted nature considerably.

- Mechanical agricultural practice was the 1st seed of industrialisation
- 1800s - Energy and transport was the second wave of the economic development index
- Chemical and fertilisers revolution spreads across all industries - more agriculture for more demand of food. In the 1900's there were only 2.2 million people. That number has been estimated to increase to 7.6 billion by 2020.
- The Technological Revolution (1960) brought TV's, mobiles, computers - democratised information and participation with a metamorphosis towards technology
- Artificial intelligence is the new technology that offers considerable possibilities for a better life

Welcome Address by Chairman

S. RAMADORAI

Dr Subramanian Ramadorai welcomed all the participants, speakers and panellists and elaborated on the topic of the conference, specific purpose and key panel discussions. He mentioned that the topic of the conference seemed ambitious, nonetheless necessary for survival as society on planet earth.

He hoped that, "*The conference will discuss intensively the various issues and themes that have been identified by brilliant minds with deep policy expertise and practical experience.*"

The Indian economy is poised to grow at a world leading rate; it is also an opportunity to consider whether there is implicit duality between the productivity of nature and the efficiency of the economy.

He looked forward to hearing insights from the participants and speakers on how such a duality may be overcome through new knowledge, new science and new practices. Another important concern that he spoke of was, that there has to be inclusive growth for the vision of *Sabka Saath Sabka Vikaas* to be realised.

As forests and land are open resources for extraction or infrastructure development, he queried:

Q1: How do we ensure that our brothers and sisters who historically earned their livelihood from forests are not left behind?

Q2: How do we ensure that the welfare of women and children is an integral aspect of growth that we might presume?

Partial answers of these vexing questions lie in the forest itself, he pointed out, where we can understand how to preserve and if necessary, restore the health of forests. Perhaps the forests might let us if they are continued to be managed by the forest born people.

India has an incredible diversity of life and idea of forests is deeply embedded in our civilisational ethos. The English word "Jungle" has its origin in Sanskrit "*Jungala*", and in classical Ayurvedic text, the *Jungala* is important for the health of humans, animal and plants. The ancient belief that the health of Jungle was necessary for our health was understood by them. It was evident to them that humans, animals, plants, trees, flora and fauna, water, land, soils and medicine were interconnected and interdependent. Forests are both ecological and therapeutic. Such insight into the landscape ecology might perhaps pre date Vedic culture as can be seen from the classical Sangam literature of Tamil Nadu. The example of Sangam literature *"Mulle"* refers to forests and landscapes. It has a clear

description of the landscape along the ecological and therapeutic benefits with attention to flowers, fruits, animals, trees and weather patterns.

Several different types of medicinal honey available from rock bees, for example, might be the sign for healthy forests. Other leading signs of health of various ecosystems are known to our forest dwellers. Our scientists can do well in heeding what is mistaken as mere folklore.

The Club of Rome will focus deeply on three intertwined themes – water, land and soil. The conference needs to be concerned on how the landscape might be regenerated and how to restore the crucial roles played by soil and water.

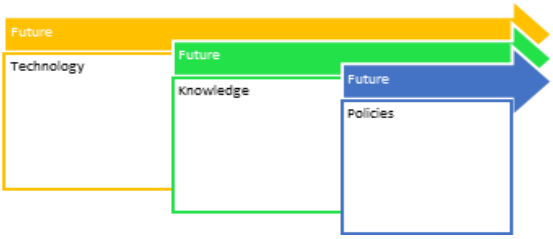
A couple of years ago, The Tata Consultancy Services took a remote sensing study on "Soil Health in a Gangetic Plain". They were shocked to learn there were tracks of sub sodic soils available in most fertile Gangetic Plain. Even more shocking in the satellite pictures were the abundant Ghost Villages, because of the spread of Salinity. We usually use water for its cleansing property. However, the study found that water was loaded with toxic sodification in vast tracks of Sultanpur.

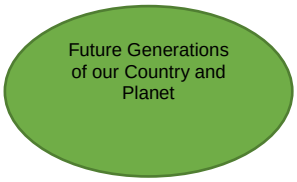
CoR-India looks forward the valuable thoughts of participants on possible approaches to restore land, water and soils for the health of forests. There is a hope for positive actions after inputs from strong panel discussions on Legal, Policy and Financial frameworks for Productive Forests, Land and Soils.

Sharing the overall theme of the Conference

DR ASHOK KHOSLA

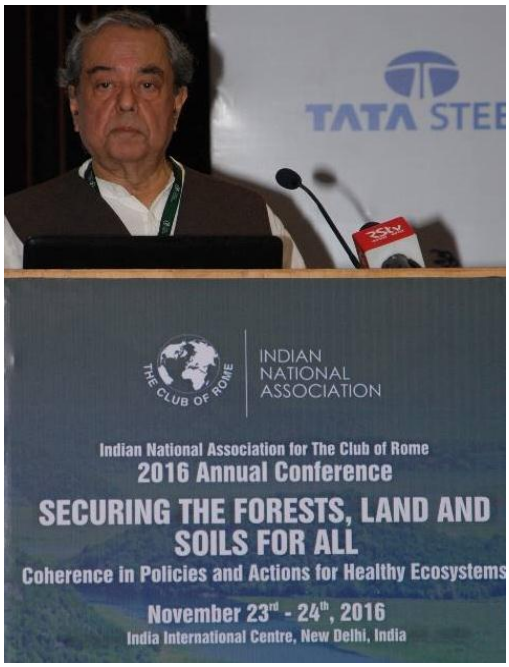
For securing our forests, land and soils attention must be given to technologies, knowledge and policies to secure the future not only for us but also for the future generations.



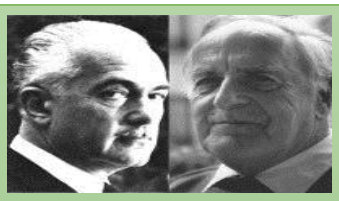


The publication by the Club of Rome titled “Limits to growth” in 1972 made it a major force to reckon with, which was such an explosion of knowledge or it may be said as a nuclear explosion in the mind. For the first time, some eminent people, who had made it in life, heads of some of the biggest corporations in Europe, such as Aurelio Peccei, head of Fiat and Olivetti; and along with him around 30 great eminent people came together. Though they had already expressed certain amount of concerns about where the world is going, though they were not looking at poverty issues as much as we might wish. But they were looking at what the modern form of Industrialisation is leading to, in terms of degradation of environment, breaking up of societies and alienation as the predicament of mankind. They were essentially raising issues that had never been done by anyone before. They were unfamiliar issues and were reacted to very strongly by existing establishment, particularly by economic professionals. It took 30 years for people to realise what was in the document, was actually something of importance.

It was only by the end of century, year 2000 that people around the world started to realise that there was a great deal of foresight in what the Club of Rome has written. Now being a pioneer think tank, it gave it a huge positioning or standing in the world of intellectuals.



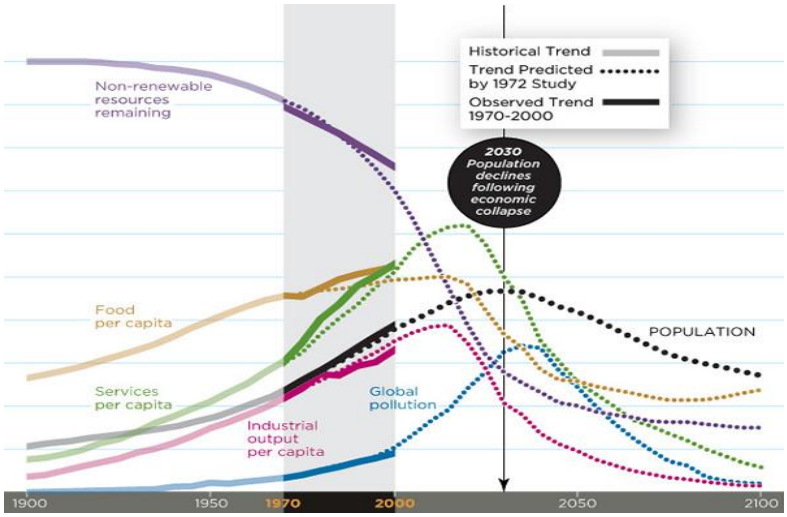
Aurelio Peccei was an Italian scholar and industrialist, best known as the founder and first president of the Club of Rome. During World War II, he was involved in the anti-fascist movement and in the resistance, where he was a member of the "Giustizia e Libertà".



The story of the Club of Rome begins with an unlikely encounter between Aurelio Peccei, a successful Italian industrialist, and Alexander King, an eminent Scottish scientist. While travelling around the world for his work, Peccei had grown concerned about the pace of socio-economic development, environmental degradation and the North/South divide. He expressed these concerns in a keynote speech given to ADELA, a new investment company. Through a series of coincidences, Peccei's speech transcript landed on the desk of Alexander King, who was so

Internationally, "Limits to Growth" had a huge influence on numerous people, many of them young at the time, who later went on to become world leaders, such as Mikhail Gorbachev, Al Gore and President Horst Kohler of Germany. The book highlighted, for the first time, the potential negative consequences of the existing development model – which by the end of the 21st century could lead to such imbalances between population, resources and the environment that the global economy might well collapse.

Though "Limits to Growth" was dormant for 30 years for the general masses, the economy kept on growing with increasing populations and robust Gross Domestic Product (GDP); and therefore, there was feeble attention on the resource limitations. People failed to connect with the problems mentioned by the Club of Rome relating to pollution, crashing populations and limited food supply. Nonetheless, it is not a forecast or a prediction, but a warning that if we do not mend our ways all our beautiful industrialisation, food supply, services etc. will start collapsing after a certain point.



Dr Ashok Khosla had the privilege of being President of the World Association of the Club of Rome for seven years. He perceived how powerful this mechanism was for influencing policies, areas of research, academia and influencing media. The Club of Rome had a built-in strength for being able to reach people with new ideas, questioning the think tanks and how to bring change. To replicate that position and strength in India, Mr S. Ramadorai, Dr Ashok Khosla, Mr Ranjit Barthakur and few others got together and came to the conclusion that it would be useful in creating a platform for debate and focus about the most pressing issues of India.

Within India, a robust estimate of 400 million people are living 'Good Lives' with sufficient facilities and resources; while a staggering 2/3rd of the Indian population i.e., 800 million are deprived of even the most 'basic needs' of clean, safe and available food, water and air. Therefore, the Club of Rome decided to handle the issues serially through its annual conferences: 2014 - Food for all, 2015- Water for All, 2016 - Forests, Land and Soils, 2017 - Energy and Nature and 2018 - Sustainable Livelihoods for all.

The intended format of the CoR-India conference is to generate debate and discussion on environment issues and policy implications to bring about actual change instead of just being a talk-shop.

"Trees are the earth's endless effort to speak to the listening heaven"

Rabindranath Tagore

Dr Ashok Khosla *added "Forests are to regenerate its own living system"*

"A people without children would face a hopeless future; a country without trees is almost as helpless."

Theodore Roosevelt

"Trees according to great thinkers are important but according to scientists it is fundamental, they are essential for the life on the earth. Buy land, they're not making it anymore."

Mark Twain

"To forget how to dig the earth and to tend the soil is to forget ourselves."

Mahatma Gandhi

"A nation that destroys its soil destroys itself"

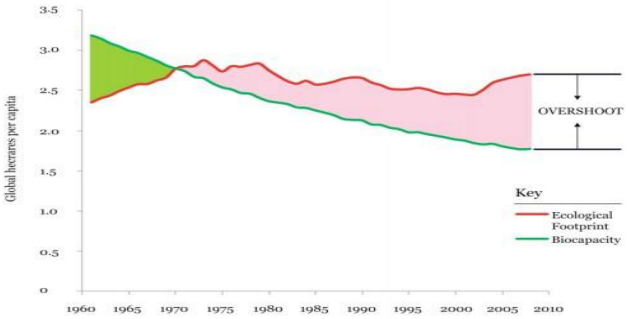
Franklin Roosevelt

Fortunately, India has been the first country to have a National Resource Panel. Usually, the west drives these kinds of initiatives. But the Indian Government is sensitive towards the limit to resources, which are a major constraint to health and well-being of people.
The conference, therefore, is trying to find answers to questions such as:

1. *How healthy are India's forests, land and soils?*
2. *What institutional and technology changes are needed to improve them?*
3. *What investments are needed in knowledge generation and sharing, innovation, communication institutions?*
4. *Where should public and private investment be redirected?*
5. *What structural changes can make our policies for these and other resources coherent, convergent and mutually reinforcing?*

Silos of government systems that Indian Government and many more countries have created are actually the problems, sometimes making it impossible for one ministry to enforce the policies of another ministry. Countervailing impacts and counteractive impacts of these policies often neutralise one another completely. There is a need to figure out a way to help these policies go in right direction without necessarily changing the roles and responsibilities of Ministries. Such as **"Does free energy for small and marginal farmers produce effective results in food security for all, which we would like to gain in future?"** Contradictory policies usually deliver unintended results. The unintended impacts of some policies are bigger than the actual impact.

Human activities consume resources and produce waste. As our population grows and global consumption increases, it is essential that we measure nature's capacity to meet these demands on our planet. The Ecological Footprint has emerged as one of the world's leading measures of human demand on nature. It allows us to calculate human pressure on the planet and come up with facts[6]. There has to be a footprint requirement of hectare land per individual. It is 1.7 times more than our bio-diversity can hold. India is also very near to the world average; India needs some 1.5 times more which was 0.3-0.4 times at Independence. It is simple as Bank account, if we have enough, we can use it, but at some point if the balance gets over, then what do we do. We are fortunate enough that bank account comes every month, but we don't know when the bio capacity will decline and ecological footprint will increase. It is 70% more than the earth produces.

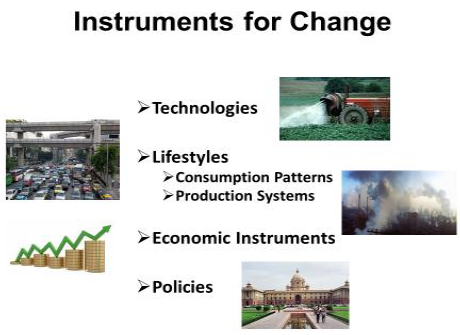


Earth Overshoot Day (EOD) is the day on which humanity's resource consumption for the year exceeds Earth's capacity to regenerate those resources that year. Earth Overshoot Day is calculated by dividing the world bio capacity (the amount of natural resources generated by Earth that year), by the world ecological footprint (humanity's consumption of Earth's natural resources for that year), and multiplying by 365, the number of days in one Gregorian common calendar year:

[6] http://www.footprintnetwork.org

(Word Bio Capacity / World Ecological Footprint) X365 = Earth Overshoot Day

Unfortunately, we have already used up the Earth's yearly quota of resources in Mid-August of 2016. This is scary for all of us. We are way over our resources as a country. The multimillion question is how will we redirect the way we are going. No doubt, technology has a solution to mitigate the situation. Further, our lifestyle needs to be changed as well as our consumption pattern in production systems. Our financial instruments, fiscal policies, incentives, taxes must both encourage and discourage consumption. Certain kinds of behaviour and policies must be in favour and act as an instrument of change.



Alternative technologies can be different and bring positive change, for example, small check dams can be a partial answer to heavy dams on large rivers. We can make perennial rivers taking two or three crops from the adjoining land, which will decrease the time and distance for women to fetch water for their use. This will help create new jobs or small level of industrial and business activities. Increase in employment rates among women, negatively influences population growth – women with jobs give birth to much fewer children in comparison to women without jobs. Reason behind unemployed women bearing more children was because of them considering their children as an 'insurance' strategy for the families in old age.

Development Alternatives did a small study and found that the control group where there were no interventions with the families of their relatives in neighbouring villages, the women had 25 babies during that time. However, in intervention areas, there were significant improvement in livelihood, leadership development and families' well-being and only two babies were added during that period.

Alternative institutions and livelihoods are in need of government intervention at higher levels (maybe defence, foreign policy, economy and currency level controlling) and policy level. But a large part of governance must be promoted locally, where people can engage in decision making as well as present their views on implementation. Governance has to be by communities and for the communities. A large part of people of India lies in the rural area; hence we need village republics to nurture governance at the local level.

Policy Coherence: The Club of Rome is involved in adopting 17 sustainable development goals. The goals relate to everything which comes

under poverty, hunger, suitable consumption and conservation of nature. These goals have been adopted by various nations and some of the government have a commitment to them.

Policies need to be intertwined; each policy must reinforce the other policy. Few may ask should we give up development for the sake of environment, there is no question of giving up; we can have both, or more of both, if we design our choices correctly. Now the purpose of a gathering like the Club of Rome encourages how we can go together.

For making a brick we need 1 kg Coal and 1 kg soil, if we build houses, but then we compete with food production and we compete with carbon emissions.
We may do total damage if we continue to build houses in the same fashion; we need to change not only the technology but also policies which help us to change these technologies.

Vote of Thanks

LT GEN ARUN KUMAR SAHNI, PVSM, UYSM, SM, VSM, FORMER ARMY COMMANDER INDIAN ARMYAND CHIEF COORDINATOR –COR - INDIA

Lt Gen Arun Kumar Sahni thanked all the delegates and dignitaries at the gathering; as also participants from the Indian Army. Though the Army people are not social scientists by training, however, fortunately and unfortunately the Army serves in all those difficult areas where transition is taking place. Therefore, their views are also encouraged in policy initiatives. He was confident that the proceedings would throw up extremely valuable suggestions which could go into the recommendations for the required policy change

SECTION C

Key Note Address by the Chief Guest

SHRI ANIL MADHAV DAVE, Ex-MINISTER OF ENVIRONMENT, FOREST AND CLIMATE CHANGE (MoEFCC), GOVERNMENT OF INDIA

There is little difference in the concept of 'land' and 'soil' and how it is viewed in general. Hence, it is really important to understand deeply the difference of definitions. Nonetheless India does not need to learn from the west about 'forestry', as it is rooted in our tradition and culture and it is inbuilt in our blood. However, there is a fault of teaching process that we developed a western outlook towards forestry.

British framed the Indian Penal Code (IPC) to control the Indians and become rulers on them. During the British rule it was inferred that hitting charges are less and speaking abusive language charges are more. Similarly, if a person travels in a tam-tam, and somebody uses abusive language, it is acceptable to hit that person back. So according to IPC, hitting charges are less and speaking abusive language charges are more. This because "*Gora Sahab danda martah tha aur Kala Aadmi gaali deta tha*." On 15th August 1947, India got its Independence but was not decolonised. *Therefore let us decolonise India 'Aayiye hum Bharat ko Tantra ke drishti se jo Paratantra hain use Swatantra karein' (Let us look at India from the point of view of our autonomy and change it from one guided from outside to one of self-rule).* Since we have the same administration, same policy, same taxation and same thoughts therefore we learnt to view the forests from the British's belief.

The British viewed 'tribal communities' as danger since they owned weapons for safety and self-defence, they were a potential threat to the empire. So they labelled the tribal communities to be 'enemies of the forest'. By doing so, the British Empire was successful in changing mind-sets that tribal community members were outsiders in their own homes in the forest ecosystems that they survived for generations. The mind-set remained in the present with little change, and we still associate remote and small villages and tribes to be enemies to our forests and the environment. While the real culprits/enemies like corrupt politicians, corrupt bureaucrat, forest mafia and their connection continued to damage the forests haphazardly. We need to decolonise the country, and change the world for which society and human should change themselves first. We also need to change our views towards forests, tribal communities and wildlife; they are friends as a community – all of which have always interdependently co-existed.

Poaching is on a rise in India because of high demand of wildlife trafficked products in markets overseas, especially 'China'. Animals are our own, these are not Indian thoughts the tribal's harm the animals, these have been implanted and engraved in our thoughts.

Therefore this is how we have been used to the nature of existence and we like it. We need to treat forests and earth in the same manner as we treat our family members.

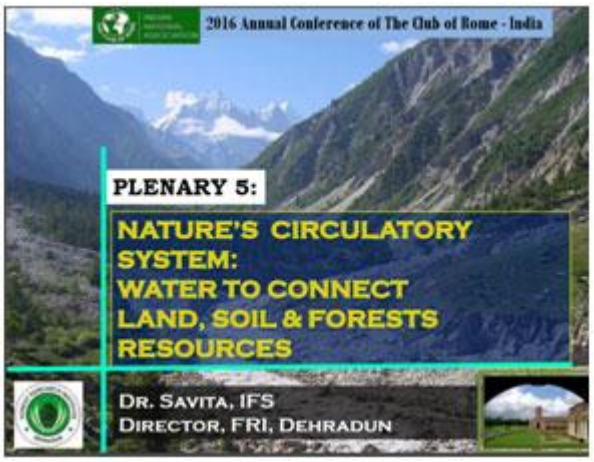
Gandhiji said that non-violence is the way to fight back because if violence takes place the roads may divert, hence these thoughts have shaken the colonial era. There is a need to change the thought as Gandhiji taught. Our outlook reflects our behaviour towards someone. Hence, it is important to change our outlook towards forests. Therefore, MoEFCC focuses to change the viewpoints to see the forests in India.

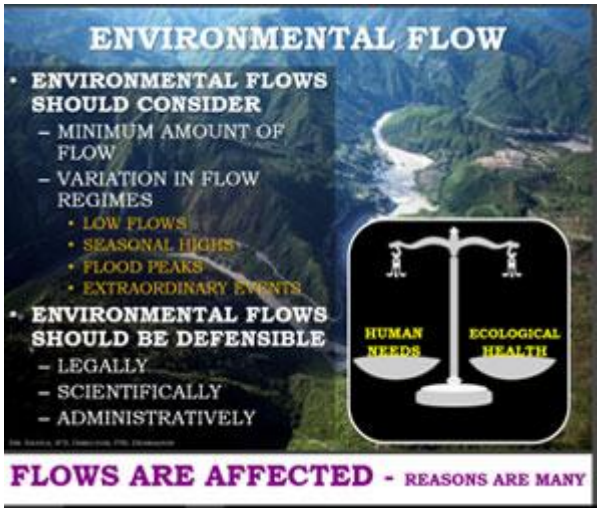
2017 is a year of work for India if the country wants to reach the goals set during the Paris Agreement, then environmental protection and awareness has to take the form of a '*Jan Aandolan'* – Community Movement, where variables like climate change, environment change and carbon trading should be included in the '*Jan Aandolan'*.

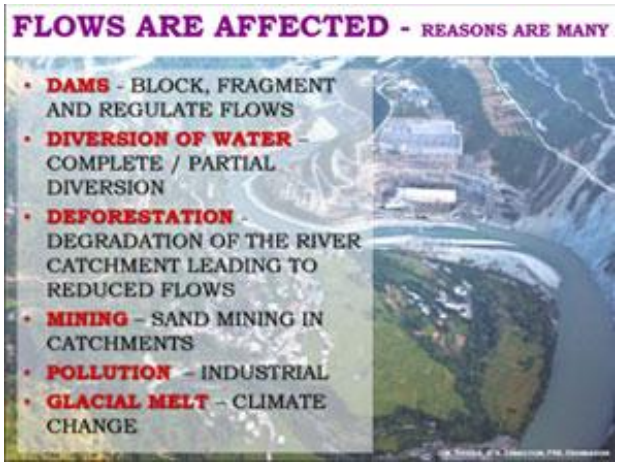
'Traditional Indian way of living' (Gandhian approach) closely resembles the 'Sustainable way of living' – as it produces the least amount of carbon footprint. As a team, we can all work together to make a change. If we all want to live a healthy life in the coming future; forests, solid waste management and liquid waste management are the answers. Minimum carbon footprints thought, interrelationship between land, forests and water, should all be viewed in the right way.

APPENDIX

Sharing of Forest Research Institute



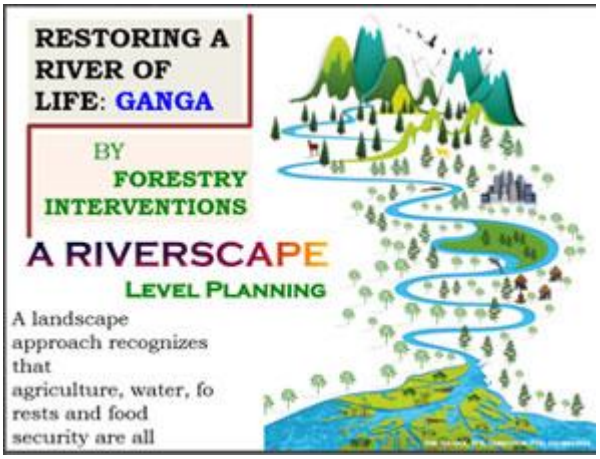


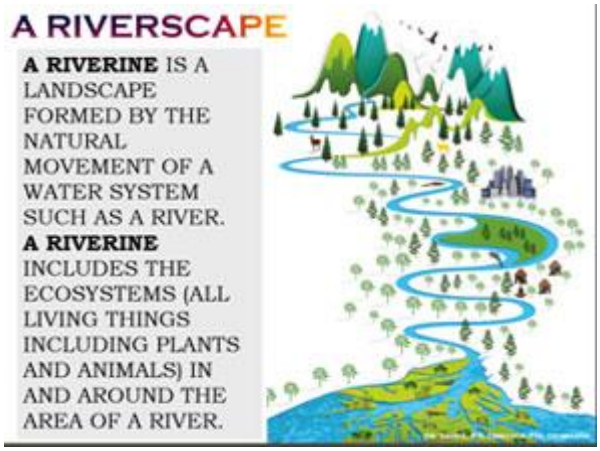



IMPLICATIONS OF FLOW REGULATION
ECOLOGICAL – aquatic biodiversity, ecology and habitats affected, invasion of exotic and introduced species
MORPHOLOGICAL – sand, silt and sediment deposit declining, channel morphology
HYDRAULIC CONNECTIVITY – lateral and horizontal connectivity disrupted
SOCIAL ISSUES – deteriorating water quantity and drinking water scarcity
ECONOMIC – loss from fisheries and farming
SPIRITUAL AND CULTURAL NEEDS - sacred groves, temple fish sanctuaries.


MULTIPLE-USE POTENTIAL OF RIVERS
IRRIGATION
DRINKING
POWER
NAVIGATION
INDUSTRY
FISHERIES


WHY SHOULD A RIVER FLOW FROM SOURCE TO SEA UNINTERRUPTEDS ?
•Is a river just water flowing waste to sea
•Is river an ecosystem in itself or a drain for carrying water
•Does a river have any functions or is just a conduit - evolutionary and ecological functions
➢DELIVERING RICH NUTRIENTS TO THE SEA
➢SUSTAINING FISHERIES AND LIVELIHOODS;
➢PROTECTING WETLANDS WITH THEIR CAPACITY TO FILTER OUT POLLUTANTS;
➢PROVIDING HABITAT FOR A RICH DIVERSITY
➢PROTECTING WATER QUALITY;
➢MAINTAINING SEDIMENT BALANCES

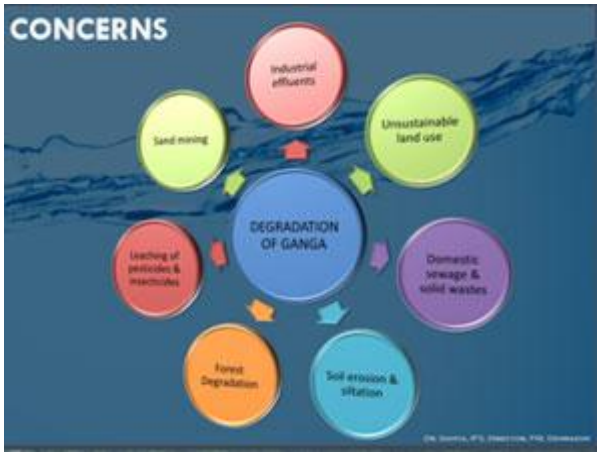

RESTORING A RIVER OF LIFE: GANGA
BY FORESTRY INTERVENTIONS
A RIVERSCAPE
LEVEL PLANNING
A landscape approach recognizes that agriculture, water, fo rests and food security are all

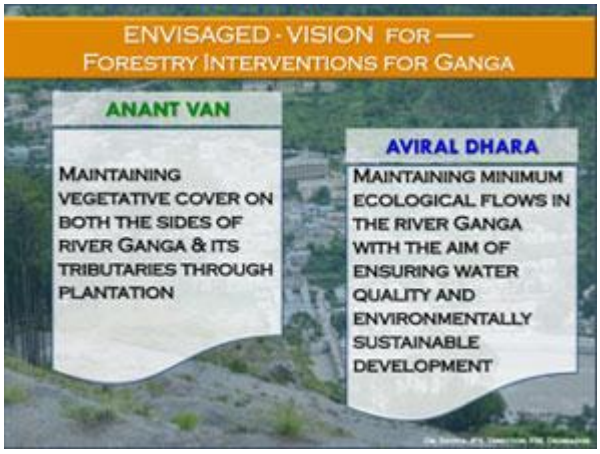

A RIVERSCAPE
A RIVERINE IS A LANDSCAPE FORMED BY THE NATURAL MOVEMENT OF A WATER SYSTEM SUCH AS A RIVER.
A RIVERINE INCLUDES THE ECOSYSTEMS (ALL LIVING THINGS INCLUDING PLANTS AND ANIMALS) IN AND AROUND THE AREA OF A RIVER.

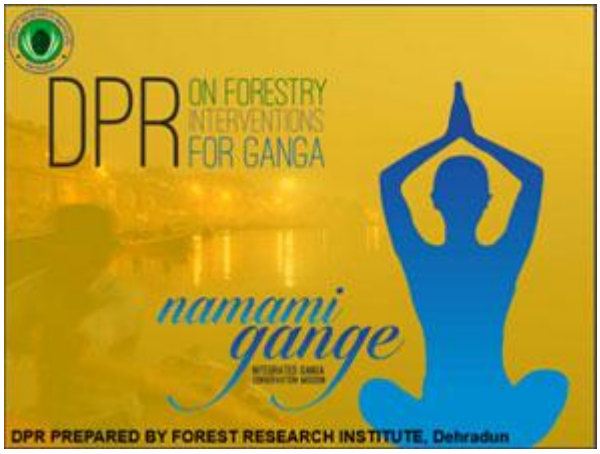

WHY RIVERSCAPE RESTORATION
- BY FORESTRY INTERVENTIONS
Forested catchments supply water to:
• domestic,
• agricultural,
• industrial and
• ecological needs
in both upstream and downstream areas.
A Key Challenge Faced By Land, Forest And Water Managers is to maximize the wide range of multisectoral forest benefits without detriment to water resources and ecosystem function.

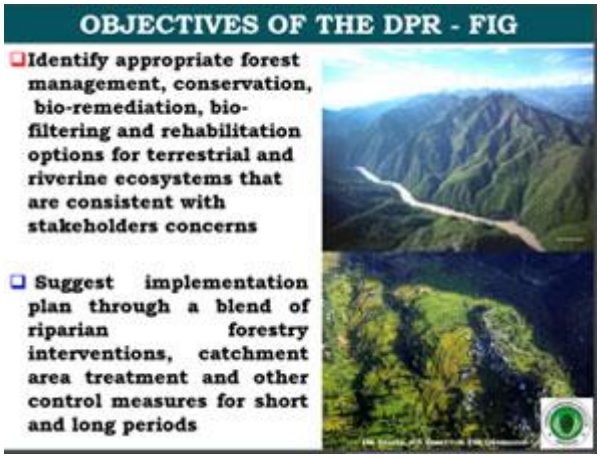

GANGA RELATED ISSUES
A 2525KM SACRED RIVER SYMBOL OF INDIA'S AGE-LONG CULTURE AND CIVILIZATION
FLOWS THROUGH 172 CITIES AND TOWNS
ONE OF THE MOST POPULATED AND LEAST DEVELOPED REGIONS IN THE WORLD


GANGA FACT CHECK
40,000
15,000
140-200
1,800
1.1 mn ltrs
REDUCED FLOW
ABOUT 29 BARRAGES ON THE RIVER DIVERT 60% OF THE FLOW

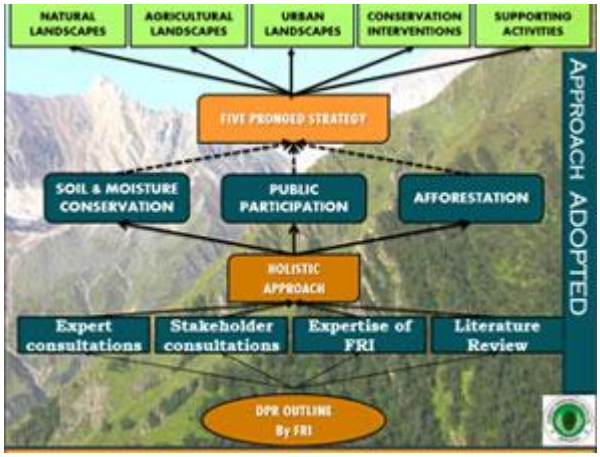

CONCERNS
Industrial effluents
Unsustainable land use
Sand mining
DEGRADATION OF GANGA
Domestic sewage & solid wastes
Leaching of pesticides & insecticides
Forest Degradation
Soil erosion & siltation

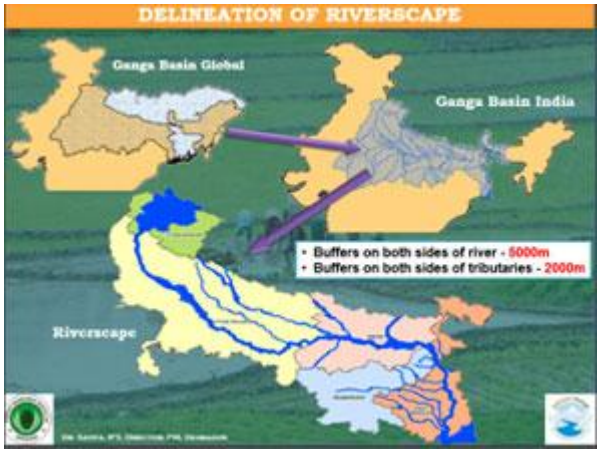

ENVISAGED - VISION FOR — FORESTRY INTERVENTIONS FOR GANGA
ANANT VAN
MAINTAINING VEGETATIVE COVER ON BOTH THE SIDES OF RIVER GANGA & ITS TRIBUTARIES THROUGH PLANTATION
AVIRAL DHARA
MAINTAINING MINIMUM ECOLOGICAL FLOWS IN THE RIVER GANGA WITH THE AIM OF ENSURING WATER QUALITY AND ENVIRONMENTALLY SUSTAINABLE DEVELOPMENT

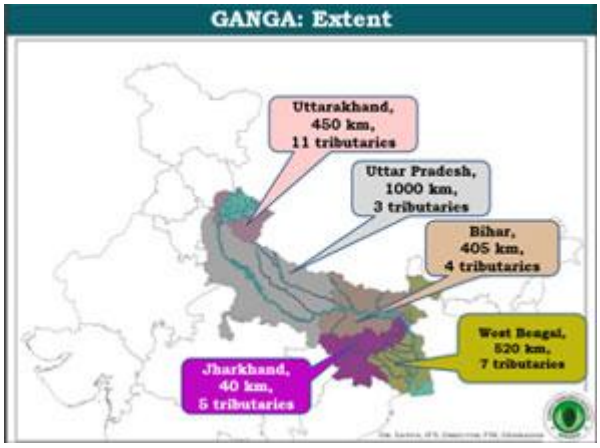

DPR ON FORESTRY INTERVENTIONS FOR GANGA
namami gange
DPR PREPARED BY FOREST RESEARCH INSTITUTE, Dehradun

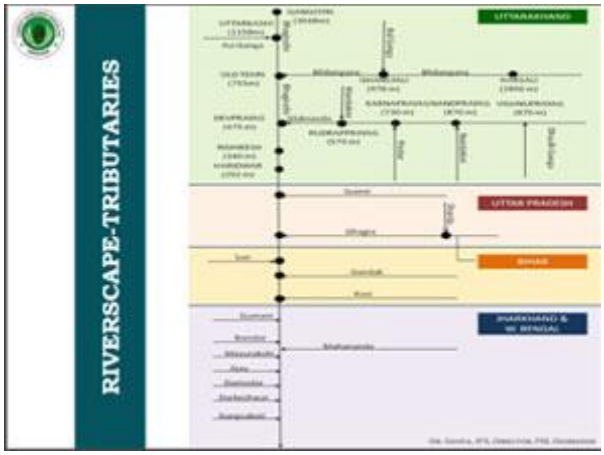

OBJECTIVES OF THE DPR - FIG
Identify appropriate forest management, conservation, bio-remediation, bio-filtering and rehabilitation options for terrestrial and riverine ecosystems that are consistent with stakeholders concerns
Suggest implementation plan through a blend of riparian forestry interventions, catchment area treatment and other control measures for short and long periods


APPROACH ADOPTED
Identification and prioritization of critical areas/villages (land availability)
Identify possibilities for regeneration/improvement of forest catchment areas and its treatment through appropriate native local species for augmenting water flow;
Involve stakeholders like local communities, fishing community, industries, the NGO's, Scientists, Research Institutes for participation
Plan treatment activities through bio-filtering and development of artificial wetlands for treatment of waste water;
Plantation of medicinal plants and other appropriate species in upper reaches of Ganga
Examine the possibility of eco-tourism and other income generation alternatives for the selected areas;


NATURAL LANDSCAPES
AGRICULTURAL LANDSCAPES
URBAN LANDSCAPES
CONSERVATION INTERVENTIONS
SUPPORTING ACTIVITIES
FIVE PRONGED STRATEGY
SOIL & MOISTURE CONSERVATION
PUBLIC PARTICIPATION
AFFORESTATION
HOLISTIC APPROACH
Expert consultations
Stakeholder consultations
Expertise of FRI
Literature Review
DPR OUTLINE By FRI
APPROACH ADOPTED


DELINEATION OF RIVERSCAPE
Ganga Basin Global
Ganga Basin India
Buffers on both sides of river - 5000m
Buffers on both sides of tributaries - 2000m
Riverscape


GANGA: Extent
Uttarakhand, 450 km, 11 tributaries
Uttar Pradesh, 1000 km, 3 tributaries
Bihar, 405 km, 4 tributaries
West Bengal, 520 km, 7 tributaries
Jharkhand, 40 km, 5 tributaries


RIVERSCAPE-TRIBUTARIES
UTTARAKHAND
UTTAR PRADESH
BIHAR
JHARKHAND & W. BENGAL


RIVERSCAPE
Bhagirathi
Alaknanda
Nandakini
Pindar
Ganga
Ramganga
Gomti
Ghaghra
Gandak
Kosi
Sone
Mayurakshi
Damodar
Rangnabati

RIVERSCAPE

PARTICIPATING STATE	BIO-GEOGRAPHIC ZONES	DISTRICTS	FOREST DIVISIONS
Uttarakhand	2B, 7A	9	20
Uttar Pradesh	7A, 4A, 4B, 6A, 6B	43	50
Bihar	7B, 6B,	30	20
Jharkhand	6B, 7B	6	6
West Bengal	6B, 7B, 2C, 8B	10	14
TOTAL		98	110

LULC MAP

GOMUKH TO GANGASAGAR

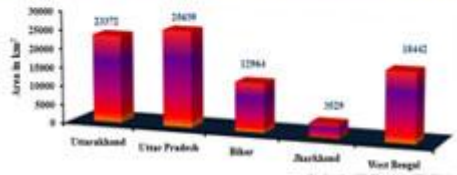
About 110 Forest Divisions in 98 districts along the river in 5 states

Broad Activities envisaged:

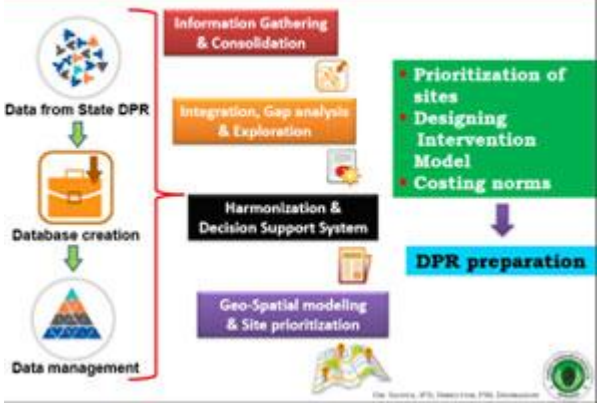
- ✓ Planting
- ✓ Seedlings for farmers, educational institutions, households etc.
- ✓ Stabilization of eroded banks
- ✓ Create aesthetic zones
- ✓ Undertake soil conservation measures
- ✓ Capacity Building of Forest/ Line Deptt. Personnel and civil Society
- ✓ Mass awareness

STATE WISE SPATIAL EXTENT OF THE PROJECT AREA

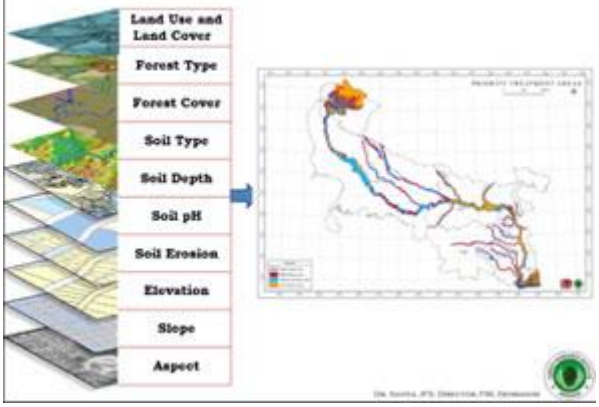
STATE	Riverscape AREA (Sq. Km)	GEO- GRAPHICAL AREA (Sq. Km)	RIVERSCAPE AREA (%) OVER GEOG. AREA
Uttarakhand	23372	53483	43.70%
Uttar Pradesh	25639	240928	10.64%
Bihar	12964	94163	13.77%
Jharkhand	3529	79714	4.43%
West Bengal	18442	88752	20.77%
TOTAL AREA	83946	557040	15.07 %

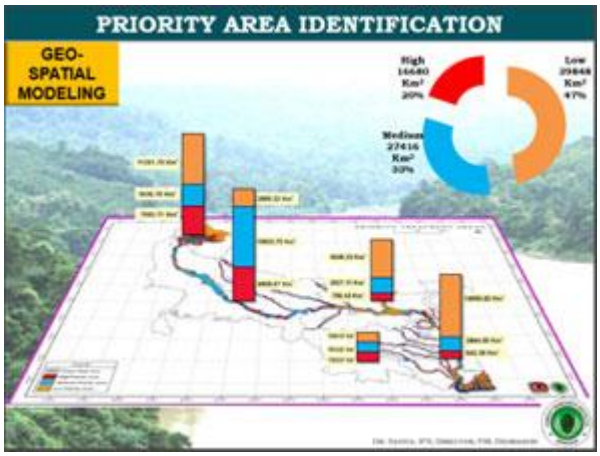


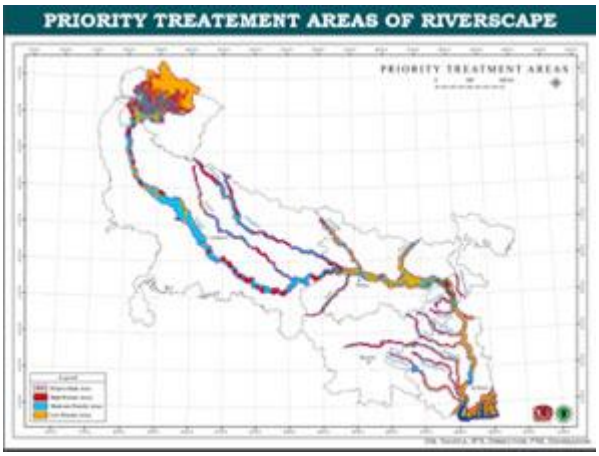
PROCESS ADPOTED OF DATA ORGANIZATION

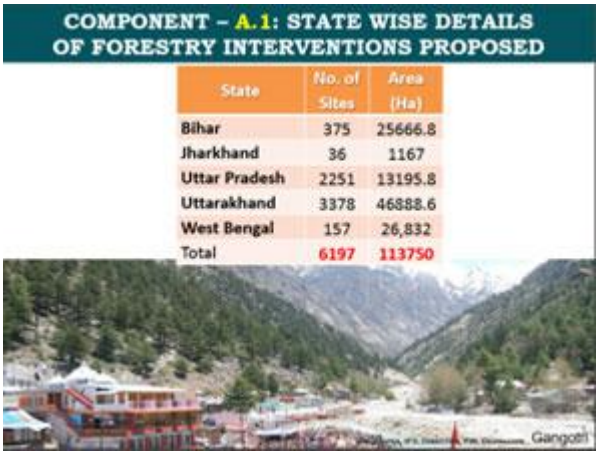


IDENTIFICATION AND MAPPING OF PRIORITY AREAS

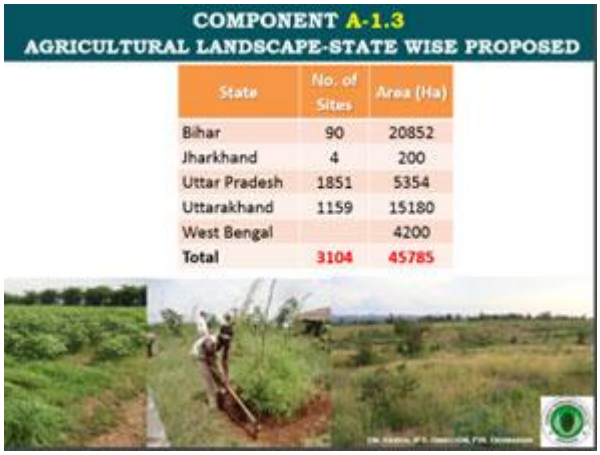




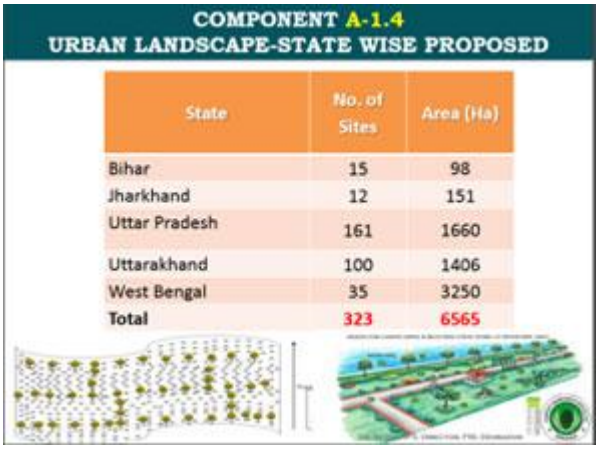




State	No. of Sites	Area (Ha)
Bihar	375	25666.8
Jharkhand	36	1167
Uttar Pradesh	2251	13195.8
Uttarakhand	3378	46888.6
West Bengal	157	26,832
Total	6197	113750



State	No. of Sites	Area (Ha)
Bihar	90	20852
Jharkhand	4	200
Uttar Pradesh	1851	5354
Uttarakhand	1159	15180
West Bengal		4200
Total	3104	45785



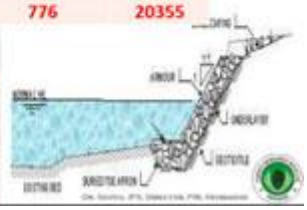
State	No. of Sites	Area (Ha)
Bihar	15	98
Jharkhand	12	151
Uttar Pradesh	161	1660
Uttarakhand	100	1406
West Bengal	35	3250
Total	323	6565

PROPOSED NUMBER OF PLANTS IN DIFFERENT LANDSCAPES AND STATES

STATE	LANDSCAPE
Uttarakhand	Natural
	Agriculture
Uttar Pradesh	Natural
	Agriculture
Bihar	Natural
	Agriculture
Jharkhand	Natural
	Agriculture
West Bengal	Natural

COMPONENT A-2
PROPOSED CONSERVATION INTERVENTIONS- STATE WISE

State	No. of Sites	Area (Ha)
Bihar	4	2000
Jharkhand	21	772
Uttar Pradesh	15	1017
Uttarakhand	636	7967
West Bengal	100	8600
Total	776	20355



COMPONENT-C
UPSCALING & REPLICATION –PHASE-II

NMCG:

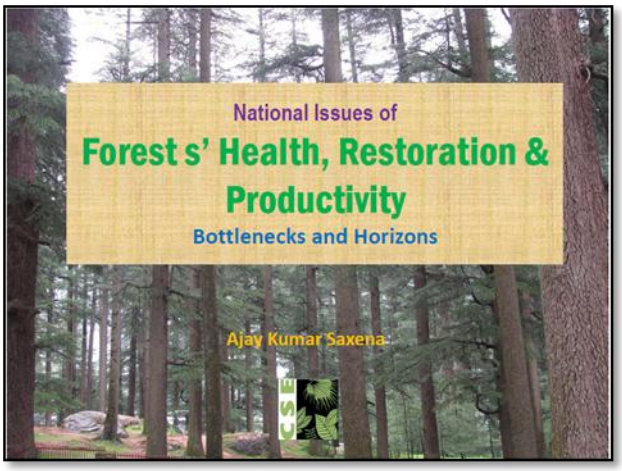
Scaling up and replication of Successful Models of Forestry Interventions and Riverscape Conservation in additional sites/states

Sab mil kar Vriksh Laganyein
Ganga ki dhara ko Aviral Banayein

- **Thanks...**

Other PPTs

Session 3: Ajay Kumar Saxena, CSE



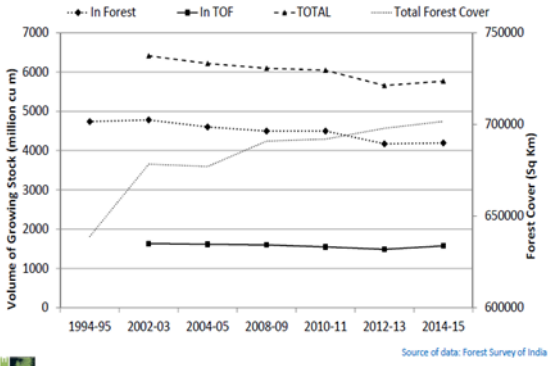
Forests of India: Some Facts

- A huge variety - 16 major types, 221 forest types - Tropical to Alpine
- India has 8% of global biodiversity : ~45,000 plants species & ~90,000 animal species (mostly in forests)
- Forests = 21.34% of geographical area. Tree Cover 2.82% (FSI, 2015)
- Concurrent list - both State and Centre can legislate
- Home to **~300 million people**
- Per capita forest - **0.06 ha (global : 0.6 ha)**
- Of 530 million livestock population in India - **190 million fully depend on forests**

Forests of India: Some Facts

- Most of the timber of the country comes from Trees Outside Forests (TOF): private lands, farms, homesteads etc.
- Forests in GDP – from 2.6% in 1950s to 0.67% in 2007-08 (fall due to **higher growth in other sectors, less productivity** & **under valuation** of forest products & ESs)
- Continue to be managed under archaic Indian Forest Act, 1927 with age old science and practices.
- Since FCA, 1980, **1.29 million hectares** of forests diverted in **49,370 cases** so far. ~5 million ha diverted during 1947- 1980.

Growing Stock Vs Forest Cover



Forest Democracy? Largely a failure so far

- Indian forests largely a bureaucratically managed system with few exceptions like ADCs in NE
- Failed Initiatives e.g. JFM, Social Forestry, EDCs, SFM etc. FRA2006 reluctance (large scale rejection of claims)

Joint Forest Management

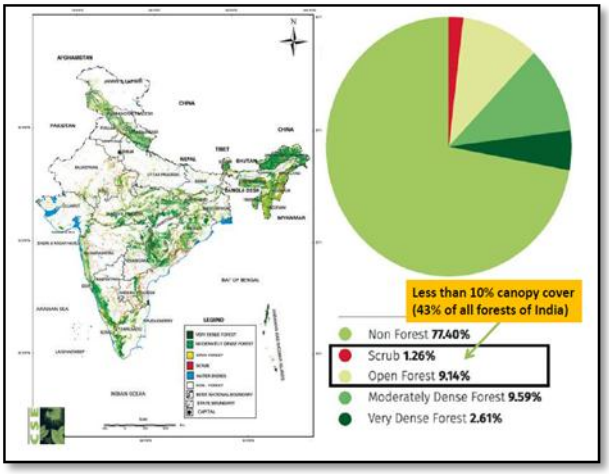
- Operational for **25 years**, adopted by all States
- **112, 896** JFM Committees managing **24.6 mha** of forests
- Many JFMCs dysfunctional
- non-participatory planning & management, skewed benefit-sharing - major causes of failure & degradation

Industrial demand for forests : A Chronology

- **1976:** National Commission on Agriculture supported *industrial plantations on forest lands*. 26 State FDCs were set up.
- **1988:** National Forest Policy is formulated. Asks industry to source wood from farmers. industry demands captive plantations.
- **1991:** Karnataka-Harihar Polyfibers—for captive plantations. PIL (CSE and others). Lease cancelled.
- **1992:** Industry kept pressing the demand. Kamal Nath proposed to give 1.7 million ha for plantations. But the proposal did not go far.
- **1994:** Draft guidelines for afforestation of degraded lands through industries.
- **1996:** Saifuddin Soz, then environment minister, openly opposed industry's proposals to privatize forests.
- **1997:** The PC Working Group on 'prospects of leasing out degraded forestlands to the private entrepreneurs/forest corporations' The group advised involvement of industry in use of wasteland. But industry turned down this offer. It wanted more productive forest land.
- **1998:** Expert Committee on the Review of Afforestation Policies and Rehabilitation of Wastelands. The committee could not resolve the issue.
- **2000:** Andhra Pradesh proposed to sign an MoU with the Reliance. In 2001, the state government was forced to give up this proposal.
- **2011-14:** PC's WG (12th 5 Year Plan) recommends leasing 2.5 million ha of forestland to the paper industry. MoEF&CC rejects idea. Industry keeps pushing the demand.
- **2015: Guidelines for participation of private sector in afforestation of degraded forests.**

The MoEF&CC Guidelines

- MoEF&CC issued **'Guidelines for the participation of the private sector in afforestation of degraded forests'** during late 2015. **To be implemented soon! Pilots first.**
- Reasons: Improving productivity, enhancing forest finance, creating jobs, enhanced **raw material,** C- benefits...etc
- **85–90 %** of given forests to be used by industry as captive plantations and the remaining **10–15 %** to be developed (by industry) for local communities with 'suitable plant mix'.
- Proposes to give **degraded forests** to private agencies, including industries. In 1st phase – forests with canopy density <10% to be given.



The problems

- Big question: As guidelines itself mentions **shortage** of fuelwood and other forest produce to local people, **how can 10-15% provide in future what 100% is not providing today?**
- It will have a devastating impact on livelihoods of **~20 million farmers** involved in farm forestry.
- Against National Forest Policy, 1988 (stipulates the maintenance of forests for environmental stability, meeting **requirements of rural and tribal populations** for forest products, and increasing forest productivity for ***national*** *needs). NFP also* prescribed **sourcing industrial wood from farmers -** against what now being proposed by MoEF&CC.

The problems

- No matter how degraded they may appear, natural forests are significant sources of various ESs and livelihoods to millions of forest-dependent people, and harbour unique biodiversity as well.
- Plantations (low ecological values, no wildlife or NTFP) will never match diverted natural forests on ecological functions and complexity (**Severe ecological consequences - Forest Health**).
- Will pose threats to many endangered species (e.g. Great Indian Bustard, blackbuck) which inhabit the open forests and grasslands.

Farm Forestry : A success

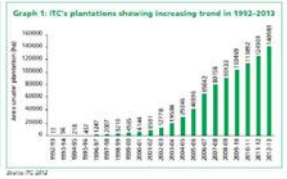
- In the last three decades, a vibrant market for wood from farm forestry has been established.
- Major paper mills (ITC Ltd, JK Papers, BILT etc) are able to meet up to 95% of raw material demands from farm forestry.
- CSE's GRP study has monitored the trend for demand for paper over years - Shows that the proportion of wood from farm forestry in sampled mills had grown to **61 %** in 2013.
- Other estimates : **65 %** of the country's wood demand and half of its fuelwood demand met by farm forestry (World Agroforestry Centre, 2014).
- Therefore, **farm forestry is already supplying majority of raw material** to industry

Farm Forestry : A success

Table 2: Sample mills with most of its raw material from farm forestry in 2011–12

Source of raw material/wood	Paper mills with percentage from various sources						
	BILT - Ballarpur	TNPL	ITC Ltd	Sirpur Paper	Star	West Coast Paper	JK Papers (Rayagada)
Farm forestry	87.13	48.97	99.89	98.97	89.08	87.64	91.24
Govt. forests	11.33	0.00	0.11	0.91	10.92	11.18	8.76
Govt. plantations	1.54	26.45	0.00	0.00	0.00	0.00	0.00
Captive plantations	0.00	0.83	0.00	0.00	0.00	1.18	0.00
Open market	0.00	23.75	0.00	0.12	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: GRP, 2014



Livelihood for farmers or plantation for industry?

- Farmers grow plantations voluntarily on their farms as it is profitable for them with a favourable benefit–cost ratio and internal rates of returns (IRR).
- Prohibitory regulations make people reluctant to grow trees on their private and common lands, especially long-rotation species e.g Teak. MoEF&CC issued guidelines to improve situation, impacts yet to be seen.

Table 3: Economics of growing selected species in agroforestry systems in India

Species	Poplar	Eucalyptus	Kadamba*	Teak
Rotation years	7	10	8	20
Number of trees/hectare	500	1,250	320	475
Expenditure/hectare in INR	82,292	1,13,215	43,776	2,09,715
Benefit (in INR)	2,72,533	2,66,220	68,124	4,19,961
B:C ratio	3.31	2.33	1.6	2.0
IRR per cent	68	32	31	30

*Anthocephalus kadamba
Source: FAO, 2009

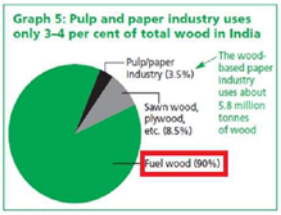
Alternate Lands for growing wood

- A Working Paper of the Planning Commission (2014) says that according to industry's own admission, industry's requirement can easily be met from 2 m ha of degraded land.
- Agroforestry practised on **13.5 m ha** in India (i.e. 8% of India's area under agriculture), potential is far greater.
- **>24 m ha** of forests managed by **JFM**
- FSI, 2015: **9.13 m ha** of TOF (i.e. 2.78 % of its geographical area). If enhanced by regenerating abundant wastelands - we can become a surplus and exporting country
- Farmers own **uncultivated wastelands >35 m ha**
- **FRA, 2006** – rights over **4 mha** recognised (potential = **40 mha**)
- **Tree cooperatives**

LPG or polluting fuelwood?

- Should our womenfolk and girl children continue with the drudgery of collecting and burning polluting biomass or shift them to cleaner energy sources i.e. LPG, electricity, solar, wind energy ?
- Shift will drastically reduce pressure on forests.

Graph 5: Pulp and paper industry uses only 3–4 per cent of total wood in India

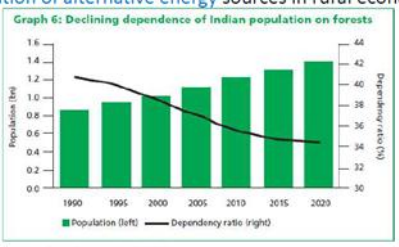


Source: FAO, 2009

Declining dependence on forests

- **FAO: Dependency Ratio of the Indian population on forests shows a declining trend** (Forestry Outlook Study, 2009). But with faster population growth, total demand from forests keeps increasing, albeit at a slower rate than population.
- This opportunity can be used by the Government to increase penetration of alternative energy sources in rural economies.

Graph 6: Declining dependence of Indian population on forests



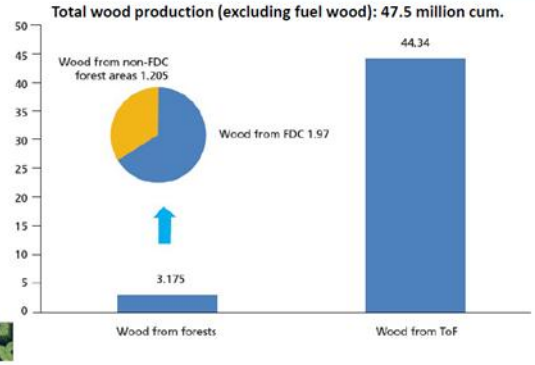
Source: India Forestry Outlook Study by FAO, 2009

Wood & Forest Development Corporations

A CSE Study

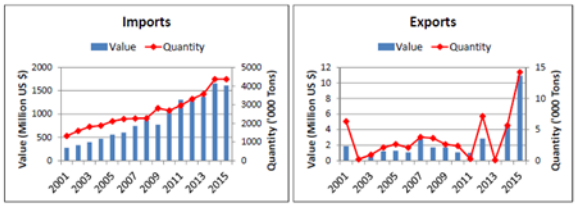
Wood Production In India

Total wood production (excluding fuel wood): 47.5 million cum.



Wood Pulp - Imports & Exports

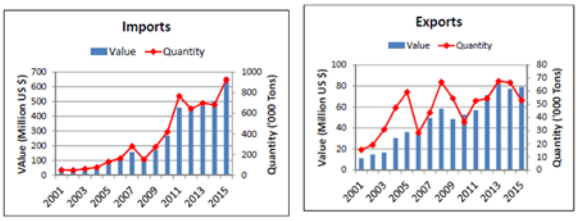
(HS Code: 47)



SOURCE: International Trade Centre/ UN COMTRADE, 2016

Wood - Imports & Exports

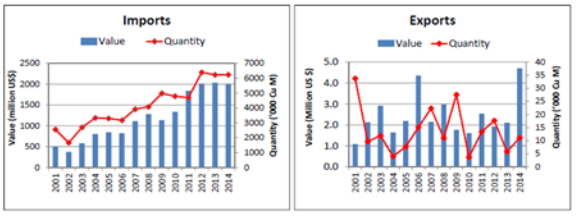
*(Plywood, Sawnwood, Veneer, Particleboard and Fibreboard – **Excluding Wood Logs**)*



SOURCE: International Trade Centre/ UN COMTRADE, 2016

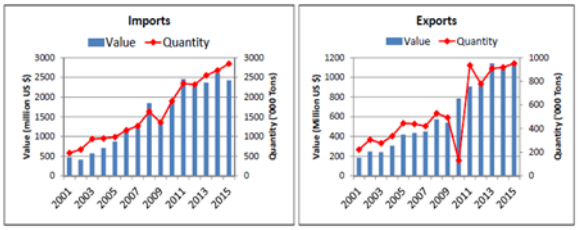
Wood Logs - Imports & Exports

HS Code: 4403



SOURCE: International Trade Centre/ UN COMTRADE, 2016

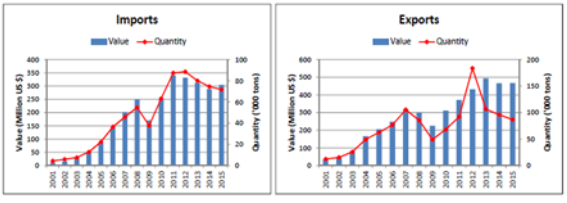
Paper & Paperboard - Imports & Exports



SOURCE: International Trade Centre/ UN COMTRADE, 2016

Wooden Furniture – Imports & Exports

HS Code: 94



SOURCE: International Trade Centre/ UN COMTRADE, 2016

Overall status

- Equivalent wood production: 45.7 million cum
- Equivalent wood consumption: 60-70 million cum
- Equivalent wood imports: 14 million cum/year (US $7 billion or Rs. 47,000 crore)
- Contribution of forests to meet the wood demand: 3.175 million cum or 6% of total wood consumption
- Demand rising at about 8-10 percent per year

Objectives of FDCs as proposed by NCA, 1970

- **Increase per hectare (ha) production and revenue from forests**
- To create much more employment for skilled as well as unskilled hands;
- To give substantial support to the economy of the backward areas and the tribal population which depends for growth on forestry activities;
- To expand or establish a large number of industries based on raw material from the forests;
- To enter the export market in wood and wood products; and
- To have a sustaining impact on the employment in the secondary and tertiary sectors.

Area of Plantations raised by FDCs (till 2015)

Sl. No.	State	Teak	Eucalyptus/ Acacia	Bamboo	Cash crops	Others (misc. species)	Total area (in ha)
1	Andhra Pradesh	0	57,041.17	10,559.4	4012	8,950.86	**80,563.43**
2	Chhattisgarh	1,10,740.61	1,250.15	6,748.75	0	427.82	**1,19,167.3**
3	Gujarat	0	3,595.15	44	0	351	**3,990.15**
4	Karnataka	1,090	39,383.6	875.6	4,143	409.2	**45,901.4**
5	Kerala	1,257.46	4,622.64	834.57	1,948.19	312.26	**8,975.12**
6	Madhya Pradesh	2,09,342	0	23,183	0	3,189	**2,35,714**
7	Maharashtra	1,46,416	0		1,48,703		**2,95,119**
8	Odisha	0	0	0	35,842	17,547	**53,389**
9	Tamil Nadu	0	1,27,710	0		28775	**1,56,485**
10	Tripura	0		0	8,132.82	0	**8,132.82**
11	West Bengal	0	200	0	0	1172	**1,372**
	TOTAL	4,68,846.1	2,33,802.71		3,06,160.46		10,08,809

11 FDCs managing 1.08 m ha plantation

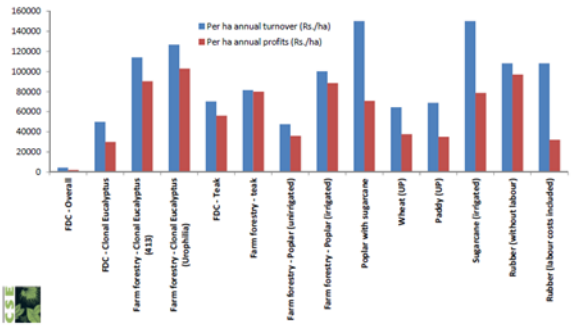
Production and Productivity of FDCs with Tree Plantations

Sl. No.	State	Average annual wood production from FDC lands (in cum)	Area under FDC possession (in ha)	Production from FDC lands (cum/ha/year)
1	Andhra Pradesh	2,34,942	83,700	2.81
2	Chhattisgarh	40,707	1,97,322	0.21
3	Gujarat	8,400	5,714	1.47
4	Karnataka	1,52,228	41,633	3.66
5	Kerala	42,336	10,500	4.03
6	Madhya Pradesh	90,000	4,25,000	0.21
7	Maharashtra	32,600	3,63,000	0.09
8	Tamil Nadu	3,28,951	75,000	4.39
	Total	**9,21,764**	**12,01,869**	**0.77**

Economic productivity of FDCs raising plantations

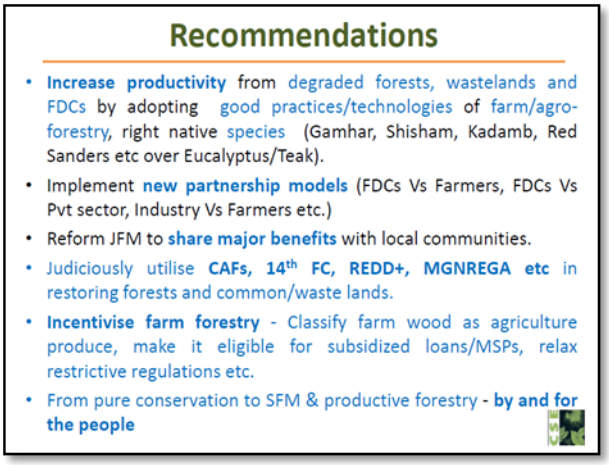
State	Area under possession (ha)	Annual turnover (Rs)	Annual profits (Rs)	Per hectare turnover (Rs)	Per hectare profit (Rs)
Andhra Pradesh	83,700	100 crore	60 crore	11,947.4	7,168.46
Chhattisgarh	1,97,322	50 crore	15 crore	2,533.9	760.17
Gujarat	5,714	38 crore	3 crore	66,503.33	5,250.26
Karnataka	41,633	52 crore	15 crore	12,490.1	3,602.9
Kerala	10,500	20 crore	1.5 crore	19,047.6	1,428.57
Madhya Pradesh	4,25,000	85 crore	50 crore	2,000	1,176.47
Maharashtra	3,63,000	120 crore	60 crore	3,305.8	1,652.89
Tamil Nadu	75,000	80 crore	55 crore	10,666.7	7,333.33
	12,01,869	**545 crore**	**259.5 crore**	**4,534.60**	**2,159.14**

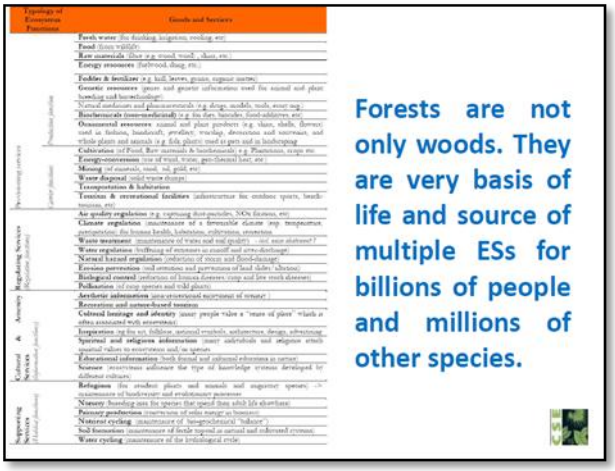
Economic productivity of FDCs Vs other land uses in India



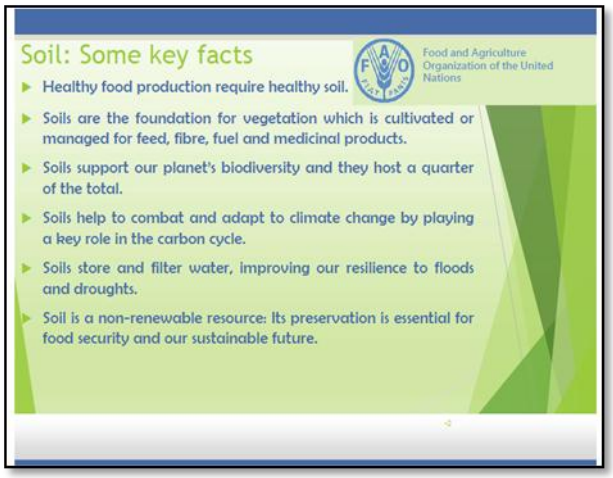
Conclusions

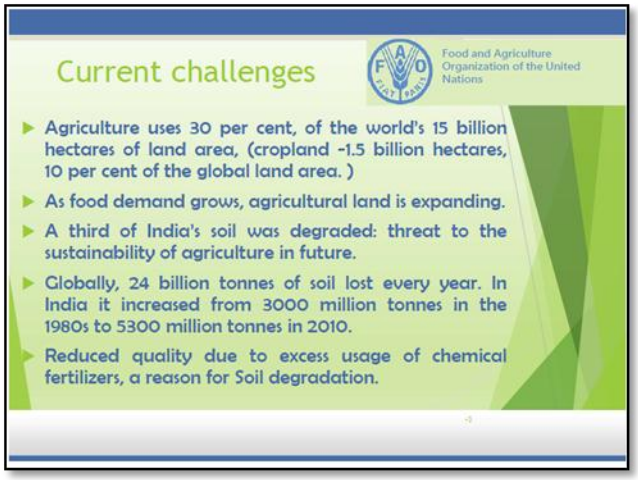
- India needs to increase the **productivity** of degraded forestlands (**Global - 2.1** m^3/ha/year Vs **India - 0.7**)
- Forests undergoing **fast and chronic degradation** – need urgent efforts but **silvicultural and socio-economic considerations** must be kept in view
- Need to **compensate for forest losses** to industrial activities, causing **large-scale fragmentation** of remaining forests of India. **CAMPA has failed** so far.
- **Giving (degraded?) forests to industries will only destroy forest ecosystems and farm-forestry. FDCs not performing well to basic objectives.**

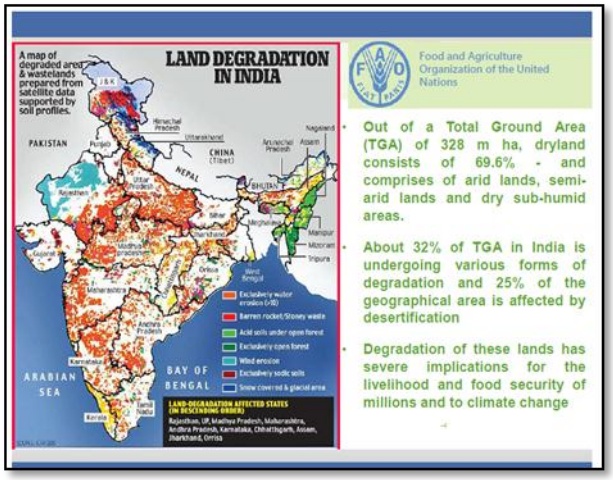


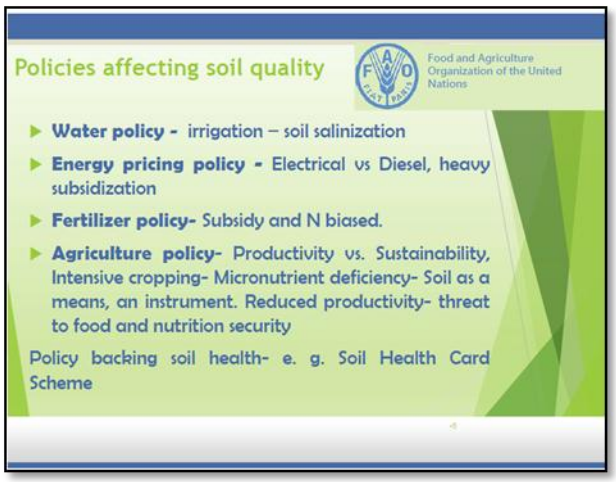


Session 5: Shyam Khadka, FAO Representative in India



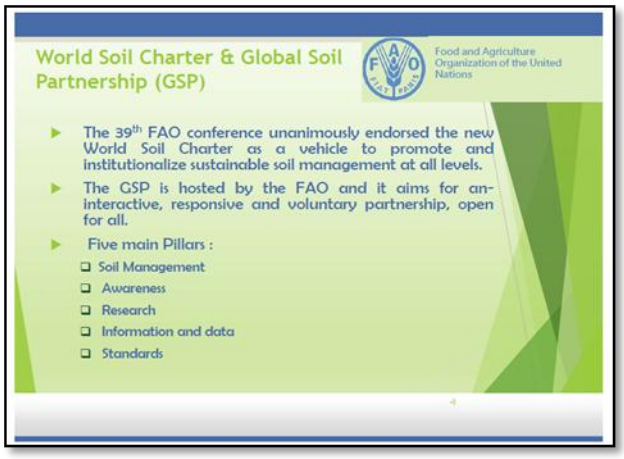





Policies affecting soil quality
Food and Agriculture Organization of the United Nations
Water policy - irrigation – soil salinization
Energy pricing policy - Electrical vs Diesel, heavy subsidization
Fertilizer policy- Subsidy and N biased.
Agriculture policy- Productivity vs. Sustainability, Intensive cropping- Micronutrient deficiency- Soil as a means, an instrument. Reduced productivity- threat to food and nutrition security
Policy backing soil health- e. g. Soil Health Card Scheme


Priorities for Soil health management
Food and Agriculture Organization of the United Nations
Living soil- enhance Soil Biodiversity
Nutrient-based subsidy
INM programmes
SRI in individual commodities – rice, sugarcane, wheat
Organic fertilizers and subsidies
Soil health cards
Public-private partnerships


Pathways for Healthy Soils
Food and Agriculture Organization of the United Nations
Agro-ecological & socio-economic systems specificity
Public investments in integrated policy instruments for soil health
Ownership, monitoring and evaluation responsibilities in communities or local governments
Regional policy goals of minimizing nutritional inequalities-in people and soils


World Soil Charter & Global Soil Partnership (GSP)
Food and Agriculture Organization of the United Nations
The 39th FAO conference unanimously endorsed the new World Soil Charter as a vehicle to promote and institutionalize sustainable soil management at all levels.
The GSP is hosted by the FAO and it aims for an interactive, responsive and voluntary partnership, open for all.
Five main Pillars :
Soil Management
Awareness
Research
Information and data
Standards

Session 5: Ashis Mondal, Director ASA

SECURING THE FORESTS, LAND, AND SOILS FOR ALL –

How Viable & Sustainable Agriculture can contribute to this goal - the policy imperatives

Ashis Mondal, Action for Social Advancement (ASA)
www.asaindia.org

The Club of Rome : Indian National Association Conference,
New Delhi
24 Nov' 2016

Indian agriculture: a few upsides

- 600 million people; 140 million households
- Food grains: 50m MT (1950) to 260m MT
- Highly diversified; net exporter for 20 years
- Largest producer of milk; second largest producer of fruits & veg, sugar; non-cereals make up 75% of agri GDP
- Irrigation coverage from 6% (1950) to 40%
- Stability in the face of adverse NRM factors

Challenges

- Share in GDP declines from 56.5% (1950) to <14%
- Share in overall employment only reduced from 76% (1950) to 52%
- GR strategy not easily replicable in rainfed areas; bulk of smallholders in these regions
- 8%+ GDP growth not possible without 4% growth in agriculture
- 12% rural HH are women headed & their farm size is smaller than average, feminization of agriculture needs policy recognition

Challenges

- > 83% are SMF & issues related to productivity, services, mkt, risk coverage, investment, etc.. are big
- Public investment in agri is near static,
- Although pvt. investment has grown but far less than potential due to policy constraints
- Complex institutional settings and resource management between states and centre ..... missing an overall perspective and coordination

Key question

The challenge is how to make agriculture a viable and sustainable enterprise ?

and If not done then the reality of healthy soil, forest.....green economy will continue to elude us

5 Key Areas of Interventions

- Land aggregation and related measures
- Water - Irrigation sector reforms
- Facilitating effective delivery of Agri Inputs
- Agriculture Marketing Reforms / liberalization
- Empowering Smallholder Farmers

1. Land Aggregation and related measures

- legalizing land leasing arrangement, freeing up the land leasing market
- Modernization of land records - digitization, GIS maps, survey / settlement
- Land issues in tribal areas including implementation of FRA
- Homestead-cum-garden plots for all rural households
- Hindu Succession Act (Amend) 2005 – implement provision of inheritance of agriculture property to women
- Recognizing women as farmers in policies and programmes

2. Irrigation Sector reforms

- focus rain-fed areas to create irrigation infrastructures
- Intensify watershed programme - redesign MGNREGS to mobilize resources, restructuring of NRAA
- Restoration and management of traditional tanks – Bundelkhand, Tamilnadu, etc.
- Rationalize pricing of canal irrigation water for full cost recovery of O&M & depreciation
- modernizing canal networks & completion of unfinished schemes,
- innovative insti. mechanism & legislation for irri. management transfer,
- imposing surcharge for irrigation infrastructure development

3. Effective delivery of Agriculture inputs

- DBT for Fertilizers subsidy (started)
- Soil nutrient-based subsidy regime progressively, would encourage soil testing facilities & incentivize efficiencies in fertilizer use
- DBT for seed subsidy, would also make the state run seed production agencies competitive and effective
- Overhauling of Seed Certification Systems, including possibilities of private sector participation
- Enactment of Seed Bill 2004 (shall address many above listed issues)
- Overhauling of Agri Extension
  - Impact (adoption) based extn., Performance linked
  - Private / non profit / FPO participation in extn.

3. Effective delivery of Agriculture inputs

- Agri research (ICAR, SAUs) to be covered under accountability framework for results / impacts, Performance linked support
- PSL to target SMF - creation of a sub-target for SMF within agri & allied activities
- Setting up Central Agricultural Development Fund for Women Farmers - research, training, drudgery reducing farm machines…

4. Agriculture Marketing Reforms / liberalization

- Mandating States to adopt Model APMC Act. 2003 / join NAM, incentive linked mechanism.
- Formulating a National Agriculture Trade legislation to leverage India as one unified market - NAM is started but very few takers
- Private sector participation in the MSP procurement, storage and distribution alongside Govt. organization
- Infrastructure gaps for storage, post harvest can be addressed by –
  - enable large investment, including FDI, in organized processing and Retail,
  - PPP mode for construction of warehouses, post harvest infra, etc.
- ECA must be invoked under exceptional shortage situations only, and when invoked genuine businesses must be distinguished from hoarders

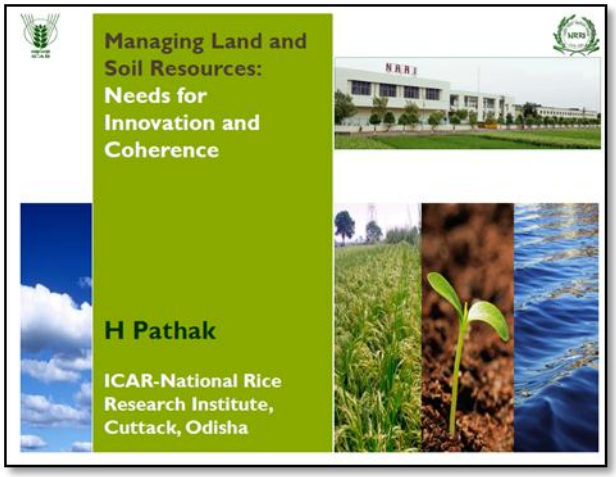
5. Empowerment of Smallholder Farmers

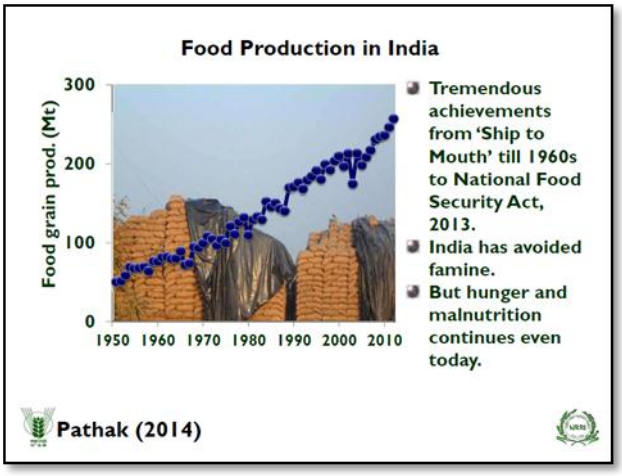
- Departure from individual based extension/subsidy to group based approach
- Promotion of farmer producer organizations (FPOs)
- Enabling conditions for financial access by FPOs
- Enabling marketing laws for FPOs to aggregate, sell, develop interface with the industries directly,
- regulatory changes to enable FPOs to accessing agriculture inputs, etc.
- creation of an apex institution at central level to address the need for promotional role for FPOs

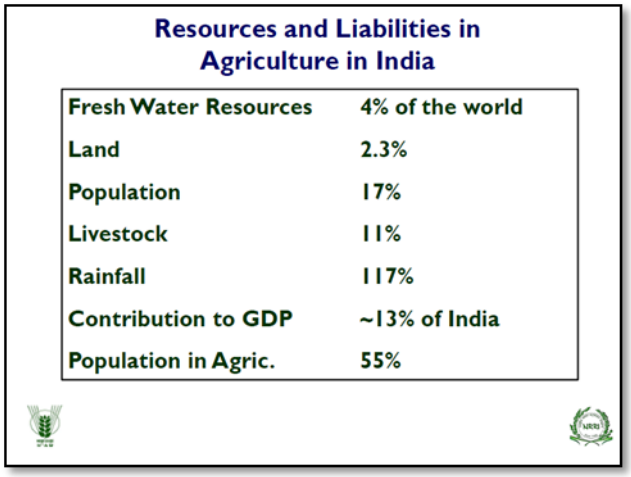
Mission Framework

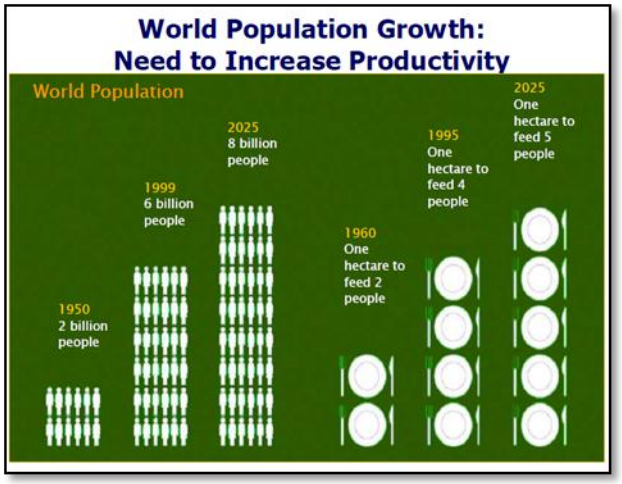
- Cabinet Committee on Agriculture with all concerned Ministers headed by PM
- A Mission secretariat
- A think tank

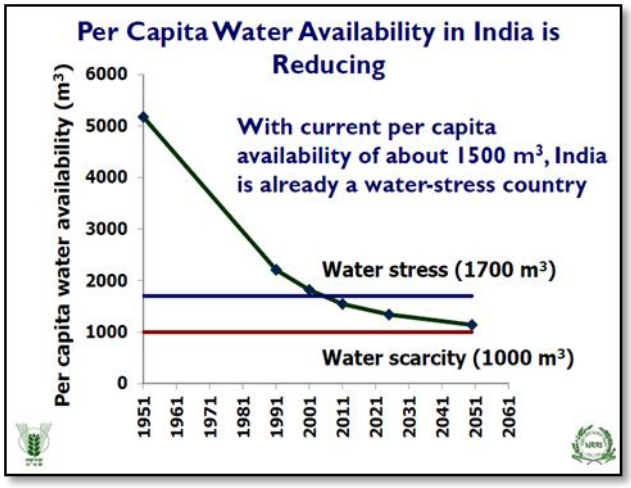
Session 5: Himanshu Pathak, ICAR-NRRI, Cuttack

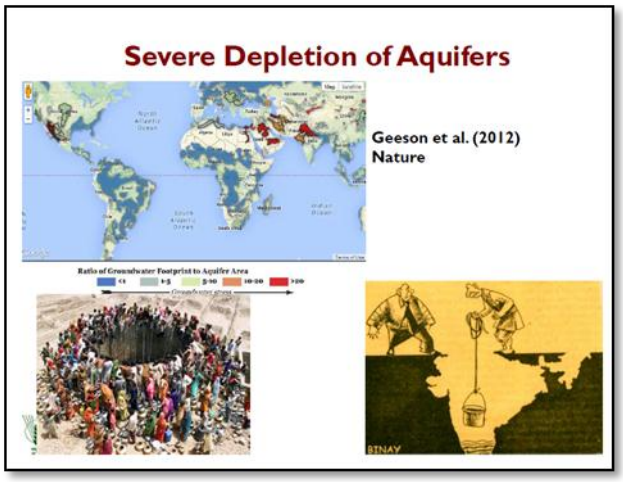


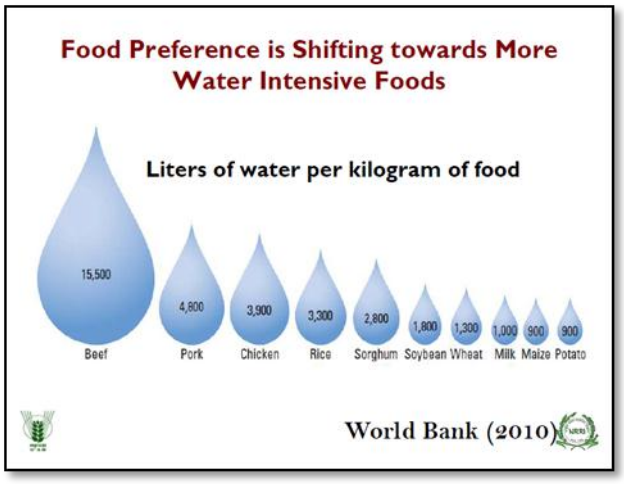


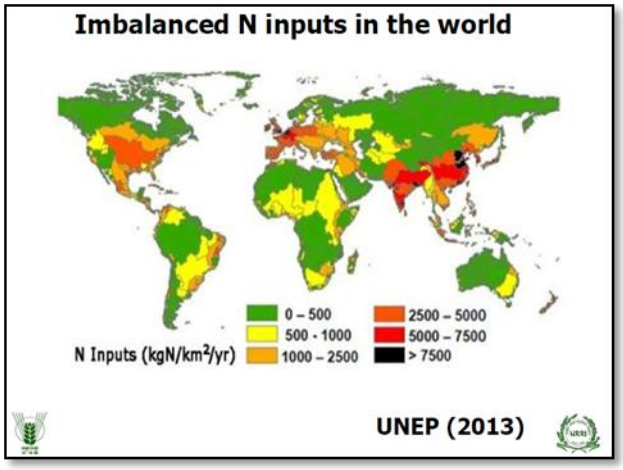


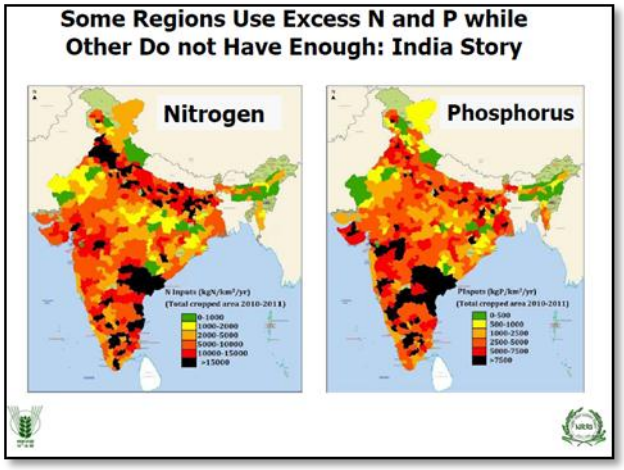

World Population Growth:
Need to Increase Productivity
World Population
1950
2 billion people
1999
6 billion people
2025
8 billion people
1960
One hectare to feed 2 people
1995
One hectare to feed 4 people
2025
One hectare to feed 5 people


Per Capita Water Availability in India is Reducing
Per capita water availability (m³)
6000
5000
4000
3000
2000
1000
0
With current per capita availability of about 1500 m³, India is already a water-stress country
Water stress (1700 m³)
Water scarcity (1000 m³)
1951
1961
1971
1981
1991
2001
2011
2021
2031
2041
2051
2061

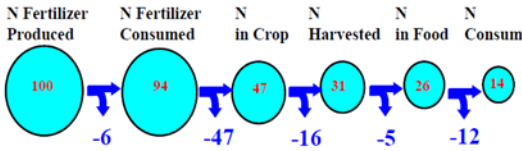

Severe Depletion of Aquifers
Geeson et al. (2012)
Nature
BINAY


Food Preference is Shifting towards More Water Intensive Foods
Liters of water per kilogram of food
15,500
Beef
4,800
Pork
3,900
Chicken
3,300
Rice
2,800
Sorghum
1,800
Soybean
1,300
Wheat
1,000
Milk
900
Maize
900
Potato
World Bank (2010)


Imbalanced N inputs in the world
N Inputs (kgN/km²/yr)
0 – 500
500 - 1000
1000 – 2500
2500 – 5000
5000 – 7500
> 7500
UNEP (2013)

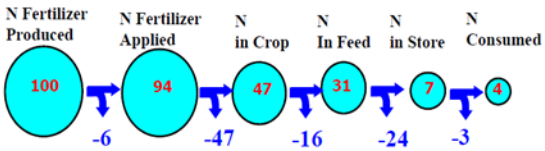

Some Regions Use Excess N and P while Other Do not Have Enough: India Story
Nitrogen
Phosphorus

Fate of Fertilizer Nitrogen: Vegetarian



14% of the N produced in the Haber-Bosch process enters the human mouth if you are a vegetarian

Fate of Fertilizer Nitrogen: Non-Vegetarian

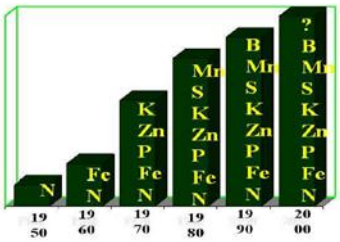


4% N produced in the Haber-Bosch process enters the human mouth If you are a non-vegetarian

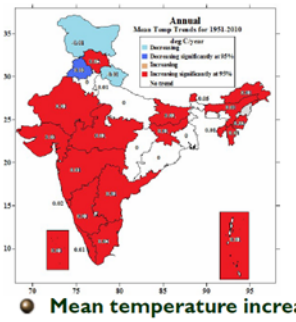
Polluted Environment and Declined Ecosystem Services

Progressive growth in the occurrence of nutrient deficiencies in soil

- Nutrient deficiencies multiplied with every passing decade.
- Exclusive focus on NPK, nutrient mining, weak soil testing.
- Disuse of organic manure, tillage, removal/burning of crop residues.



Climate Change Scenarios in India

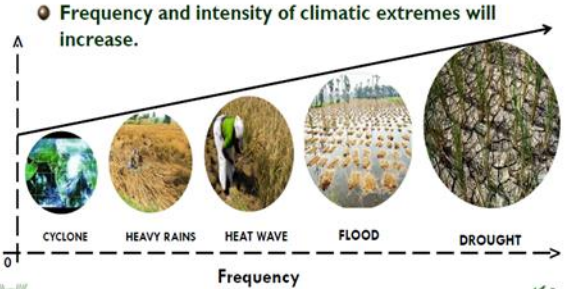


Year	Rainfall Departure (%)
2000	-8
2001	-15
2002	-19
2003	+2
2004	-13
2005	-1
2006	-1
2007	+5
2008	-2
2009	-23
2010	+2
2011	+1
2012	-8
2013	6
2014	-12
2015	-14

- Mean temperature increased b
- Seasons have shifted.
- Winter season has shortened.
- Rainfall variability and intensity has increased.

Increasing Frequency of Extreme Weather Events

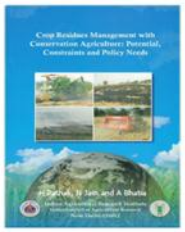
- Frequency and intensity of climatic extremes will increase.



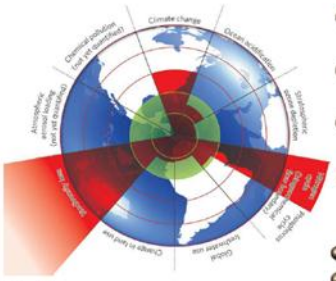
IPCC (2014)

On-farm Burning of Crop Residues

- The country generates about 600 Mt of crop residues annually.
- We estimated that about 125 Mt of crop residues are burnt on-farm.
- In Punjab alone, about 15 Mt of rice straw is burned.
- The practice of on-farm burning is spreading to other states and other crops.
- Burning of crop residues has adverse environmental consequences.



Planetary Boundaries:
We have crossed 3 out of 9 boundaries



- Climate change
- Nitrogen cycle
- Biodiversity loss

About to cross 2 more boundaries:

- Phosphorus cycle
- Ocean acidification

Rockstrom et al. (2009)

So, what to do?

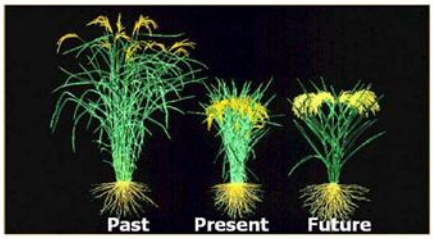
Way Forward

- The need of the hour is to convert the 'green revolution' into an 'ever-green revolution'.
- Mainstreaming the principles of ecology in technology development and dissemination.
- Developing a sustainable and equitable food security system.

Prof. M.S. Swaminathan

Opportunities for Ever-Green Agriculture

New Plant Types of Crops



Greater absorption of sun light, better root system, drought tolerant, photo-insensitivity, high yield

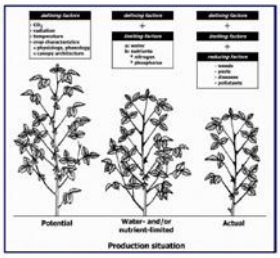
Next Generation Super Rice

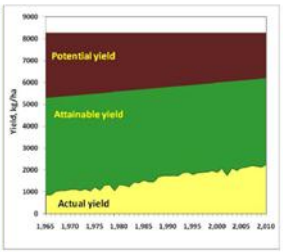
- A plant type was identified with medium heavy panicle of 6-7 g with 200-225 grains, moderately heavy tiller.
- Grain yield of 9.0 t ha^{-1} during wet season.
- A farmer claimed to have harvested 10.8 t ha^{-1}.

High Protein Rice (CR DHAN 310)

- Protein content: 10.2%
- Grain yield: 4.5 t ha^{-1}
- Grain type: Medium slender
- Efficient in nitrogen use

There is a large untapped potential of currently available agricultural technologies





Water-saving Technologies

Laser land leveling - A Precursor technology

Raised bed planting

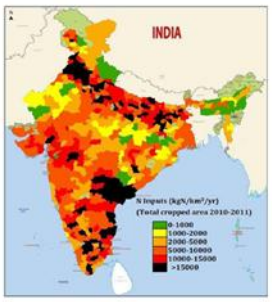
Irrigate when water is 15 cm below surface

Improved Nutrient Management

1. Right Product: Neem coated
2. Right Rate: Soil/plant test
3. Right Time: LCC
4. Right Place: Soil incorporation
5. Right Method: Foilar/placement

Soil Health Card

- Soil Testing Kits
- Soil Testing Laboratories
- Balanced Use of Fertilizers
- Organic Farming
- Integrated Nutrient Management



Conservation Agriculture for Saving Energy, Water and Nutrient

Conservation Agriculture Technologies (CAT)

	Conventional	CAT
1. Reduced tillage (No-till, minimum-till)		
2. Laser land leveling		
3. Water saving tech. (DSR, SRI, Drip)		
4. Nutrient saving tech. (LCC, USG, NI)		
5. Crop diversification		

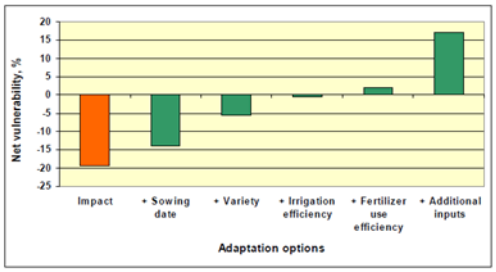
Exploiting the biodiversity

Weather Services, Insurance and Marketing

- Providing value-added weather services
- Promoting insurance for climatic risk management
- Facilitating community partnership in food, forage and seed banks
- Compensating farmers for environmental services
- Sharing experiences across similar regions
- Better marketing facilities

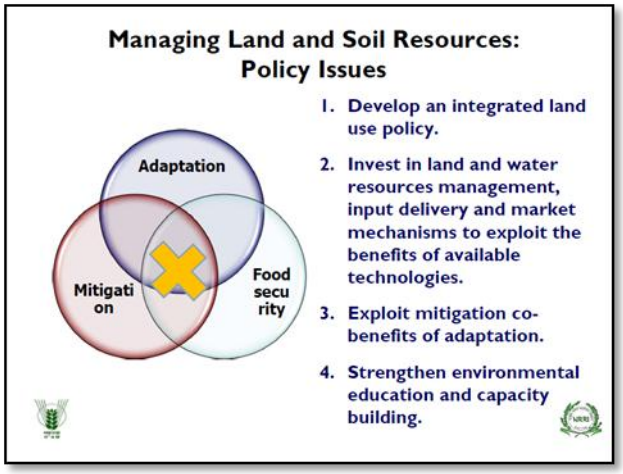
Aggarwal et al. (2012)

Simple Adaptation Options can Reduce Vulnerability and Improve Productivity

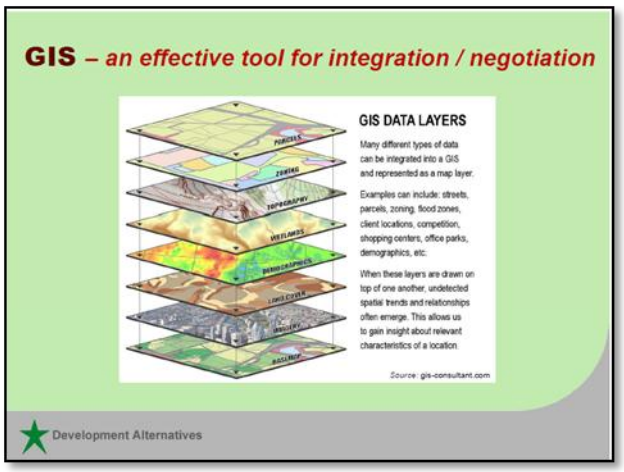


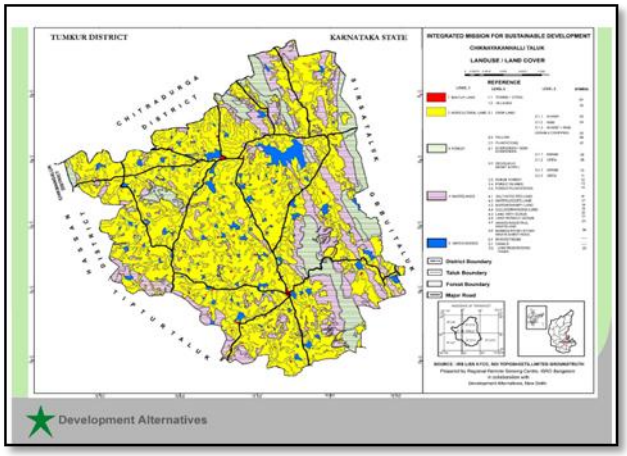
Managing Land and Soil: Approaches

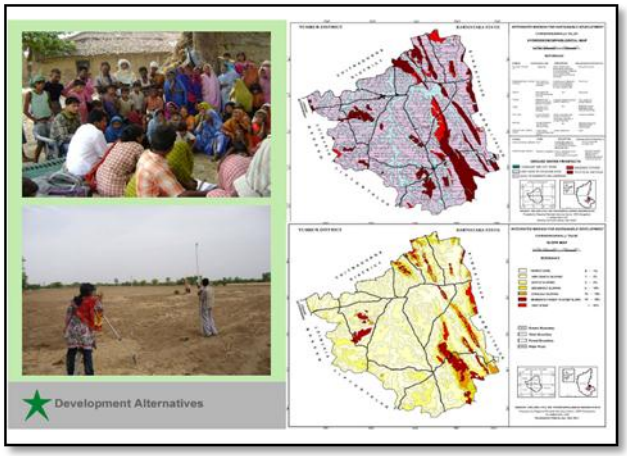
1. From carbon-negative (C^-) to carbon-positive (C^+) agriculture
2. From polluting to pollution-neutral green agriculture
3. From climate-prone to climate-proof agriculture
4. From low-efficiency to high-efficiency agriculture
5. From state-oriented to globally-competitive human resources in agriculture

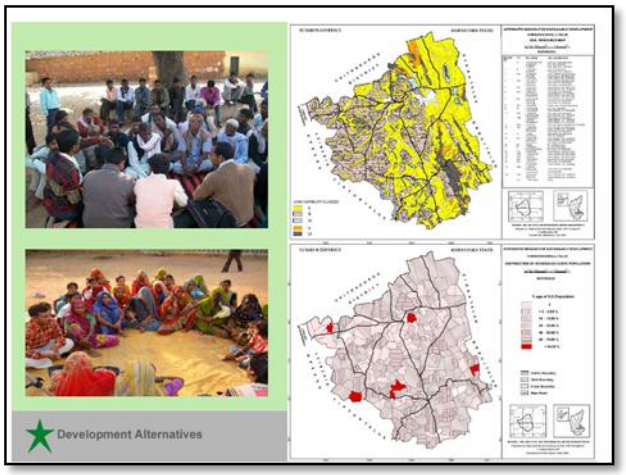


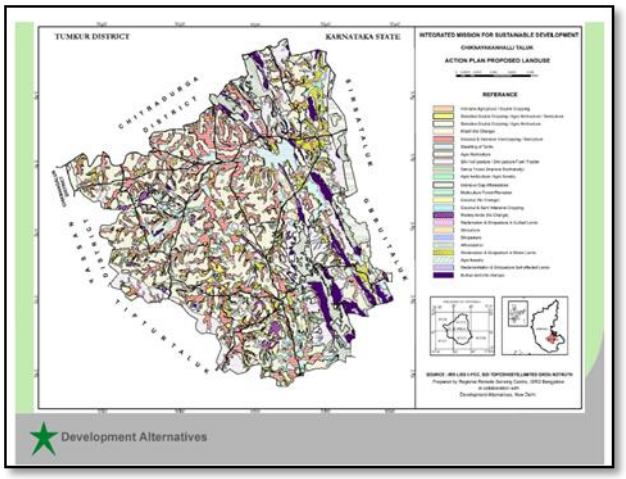
Session 6: George C Varughese, Development Alternative




TUMKUR DISTRICT
KARNATAKA STATE
Development Alternatives


Development Alternatives


Development Alternatives


TUMKUR DISTRICT
KARNATAKA STATE
Development Alternatives


Natural Resource Management
– watershed / wasteland regeneration
Contour Trenching
Gabion Structure
Check Dam
ADMIT Technologies
Farm Ponds
Farm Demos
Development Alternatives


Natural Resource Management
– farm level (food security/climate adaptation – wadi)
Drip Irrigation
Organic Farming Practices
Sprinkler Irrigation
Organic Fruits / Vegetables
Development Alternatives

Session 6: Sushil Gupta, Consultant, World Bank

SECURING THE FORESTS, LAND AND SOIL FOR ALL

WATER TO CONNECT LAND, SOIL AND FOREST RESOURCES

(Special Reference : Ground Water)

SUSHIL GUPTA
FORMER: CHAIRMAN, CENTRAL GROUND WATER BOARD, GOVERNMENT OF INDIA
PRESENT: PROGRAM DEVELOPMENT CONSULTANT, WORLD BANK

CLUB OF ROME CONFERENCE, NEW DELHI
23rd & 24th November 2016

Scenario

- By 2050-
  - World – food for 9 billion people with the same amount of land and water used today.
  - For this agricultural production must increase by 70 percent.
  - India the **food requirement** will be about 450 million tons as against the present production of around 198 million tons
  - Agriculture already accounts for more than two-thirds of the world's freshwater use, and one of the major factors contributing to deforestation.

- To quote: World Bank Agriculture Director Juergen Voegele **"You can't have food security without ecosystem services to sustain agriculture, and you can't conserve forests and other ecosystems without thinking about how to feed a hungry population, and you can't grow food without enough water,"**
- Must consider holistic approach – **efficient** management of land, water, and forest resources necessary to meet an area's food security needs and promoting inclusive green growth as one system that interacts.

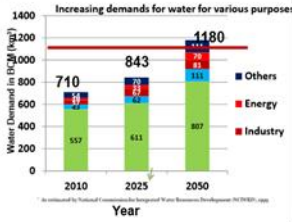
India's Water Resources

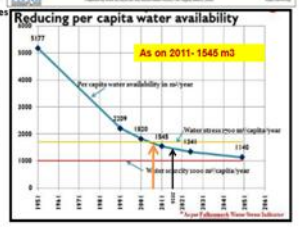
Nearly17.5% of the global population, but only 4% of the total freshwater resources.

Estimated average annual precipitation (including snowfall)	**4000 BCM**
Average annual potential (in rivers)	1869 BCM
Estimated utilizable water	**1123 BCM**
(i) Surface water	690 BCM
(ii) Ground water	433 BCM
Per capita water availability (based on census 2011)	1545 Cubic Meter
Storage Capacity of Major & Medium Completed Projects	253 BCM
Per capita water storage	**208 Cubic Meter**
Estimated Surface Water Utilization	**450 BCM**
Annual Ground Water withdrawal	245 BCM
•Floods Prone Area (12%)	**40 million ha. (mha)**
•Drought Prone Area (16%)	**51 mha**

Water Availability_ Indian Scenario

- Total Precipitation : 4000 BCM
- Annual water Availability: 1869 BCM
- Utilizable water : 1123 BCM (60%)
  - Surface Water : 690 BCM
  - Ground Water : 433 BCM
    - GW Utilization – 245 BCM

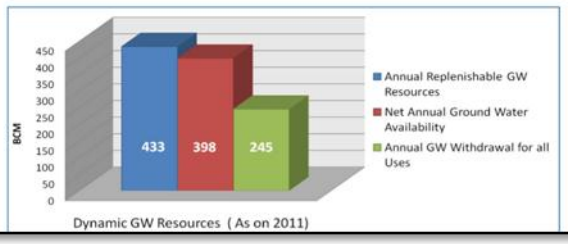




Water Availability_ Indian Scenario

Ground water accounts for

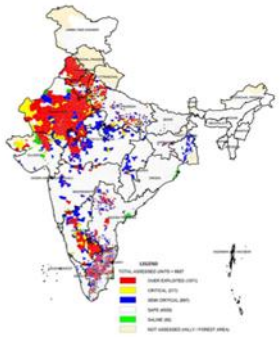
- 60 % of irrigation needs
- 85% of rural drinking water needs
- 50% of urban water needs
- *Last 40 years – GW contributed to 84% of increase in Net Irrigated area.*
- Contributes about 9 % to GDP



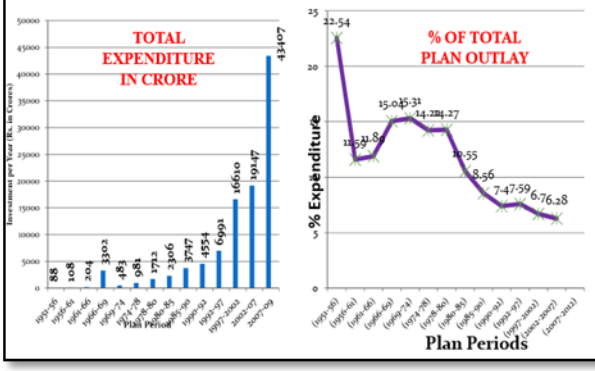
Ground Water

GW irrigated lands increased by 105% in two decades since 1970s

Stage of Ground Water Development	**62%**
CATEGORIZATION OF BLOCKS/ MANDALS/ FIRKKA/ TALUKAS	
Total Assessed Units	6607
Safe	4530
Semi-Critical	697
Critical	**217**
Over Exploited	**1071**
Saline	**92**



EXPENDITURE IN IRRIGATION SECTOR



Irrigation Potential

Sector	Ultimate Irrigation Potential (mha)	Potential Created by End of XIth Plan # (mha)	Balance Irrigation Potential to be created (mha)
Major and Medium Irr. (MMI)	58.47	47.35	11.12
Minor Irrigation			
SW	17.38	15.31	2.07
GW	64.05	49.61	14.44
Total	139.9	112.3	27.63
# Anticipated			

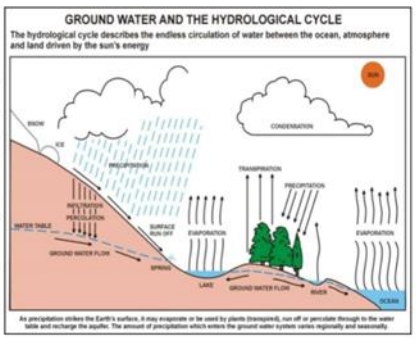
2/3rd food grain is obtained from irrigated areas

Gap between Irrigation Potential Created & Irrigation Potential Utilized

Scheme	Potential created (mha) upto X Plan	Potential utilized (mha) upto X Plan	Gap between UIP created & Utilized (mha)	%age	Ultimate Irrigation Potential (Mha)	Likely Gap between UIP created & Utilized
Major & Medium	42.35	34.42	7.93	19%	58.47	11.11
Minor Irrigation						
Surface Water	14.31	12.00	2.31	16%	17.38	2.78
Ground Water	46.11	40.81	5.30	11%	64.05	7.05
Total	102.77	87.23	15.54	15%	139.9 say	20.94 21 mha

HYDROLOGIC CYCLE AND WATER, SOIL, LAND & FORESTS

- Processes influencing hydrologic cycle are dynamic- thus the factors impacting water resources – FORESTS, SOIL AND LAND USE- most important
- Water, especially GW utilization for expanded agriculture to increase manifold
- More energy needed



HUMAN VS. NATURAL RESOURCES

- Water resources – both the availability and the quality – are considerably affected by the changes in the land use in the form of farmlands- more food required, urbanization- more population, industrialization- needs and economic growth and changes in the forest cover.
- The above have profound effect on hydrological cycle.
- various processes which influence the hydrological cycle are dynamic & very complex .

FORESTS VS. GROUND WATER

- Groundwater is a major component of the hydrologic cycle and present in all forested catchments. Therefore, forest management activities will inevitably have some effect on groundwater systems.
- In every hydrogeologic landscape - **a rise in water table can be expected to follow harvest.**
- Water table increases may in turn have a range of effects on the surrounding environment, depending on the geology and topography of the harvested area.
- Effective watershed management, sustainable forest management, and protection of present and future groundwater resources will rely on our having a greater understanding of the role of each component in the hydrologic cycle
- Closing these knowledge gaps will help us better manage groundwater resources for the future

Judicious and efficient use

- ***CONJUNCTIVE USE OF FRESH AND SALINE WATER***
- *INLAND SALINE GROUND WATER -**1150 BCM.***
  - *CAN BE USED TO IRRIGATE SALT TOLERANT CROPS*
  - *CAN ALSO BE MIXED WITH FRESH WATER FOR WATER SUPPLIES*
- ***USE OF TREATED WASTEWATER** FOR NON-POTABLE APPLICATIONS-CONSTRUCTION , INDUSTRIAL PROCESSES, IRRIGATION*
  - ***DELHI WASTE WATER** GENERATION APPROX **2200 MLD***
    - *TREATED WASTE WATER **APPROX 550 MLD USED** FOR HORTICULTURE*
    - ***BALANCE 1650 MLD** CAN BE UTILISED*

Water Use Efficiency in Irrigation Sector

- Present WUE in irrigation sector :
  - Surface water – 35-40%
  - Ground Water – 65-70%
- Total water use in Agriculture 525 BCM – 83%
- Main reasons of low WUE :
  - Deficiencies in water delivery systems
  - Inefficient water management in the fields
- with 10% increase of WUE in irrigation projects, an additional 14 m.ha area can be brought under irrigation from the existing irrigation capacities

MAXIMISE USE PER DROP OF WATER

- ***ENERGY EFFICIENCY***
  - ***Total electricity consumption** 31.3.15 (CEC) = 940 billion KWH*
  - *Agriculture sector consumed nearly = 173.20 billion KWH (18.45%) of electricity supplied*
  - *Saving potential @25% due to Energy Efficient (EE) pumps = 43 billion KWH*
- ***Total Agricultural pump-sets** = 20 million*

POLICY SETTINGS

- *CAPACITY BUILDING, AWARENESS, INCENTIVES DIS-INCENTIVES*
- *DATA IN PUBLIC DOMAIN TO BE IN FORMAT THAT CAN BE USED BY USERS, ESPECIALLY FARMERS.*
- *REGULATORY SYSTEMS TO BE BASED ON MONITORING, DATA COLLECTION & SHARING OF DATA IN TRANSPARENT MODE*
- *EFFICIENT WATER MANAGEMENT PRACTICES SUPPORTED BY RESEARCH AND DEVELOPMENT STUDIES.*
- *RESEARCH MAY ALSO INCLUDE EFFECT OF URBANIZATION AND INDUSTRIALIZATION AND DEFORESTATION ON GROUNDWATER QUALITY*

- *DEVELOP MODELS TO STUDY HOW CHANGE IN FOREST COVER OR EVEN TYPES OF TREES WOULD AFFECT*
  - *WATER FLOWS*
  - *GROUNDWATER REGIME*
  - *LAND EROSION*
  - *CLIMATE CHANGE*
- ***MOST IMPORTANT : INVOLVE THE COMMUNITY AND LOCAL LEADERS , NGOs IN THE DECISION MAKING PROCESS-SENSE OF OWNERSHIP- NGMIP WORLD BANK AIDED PROJECT***

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