Proceedings of webinar on: "Estimation of the Current Emission and Sequestration Potential of Different Land-Use Sectors to Achieve Land Degradation Neutrality in India"

Date: Wednesday, 22nd July, 2020
Time: 1500 to 1700 pm, IST

For more information

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Back Drop

Land is a vital resource for food production, preserving forests and biodiversity, facilitating the natural management of water systems and acting as a carbon store. Appropriate land management can protect and maximize these services for society. India is a signatory to the United Nations Convention for Combating Desertification (UNCCD), the Ministry of Environment, Forest and Climate Change (MoEFCC) is the nodal Ministry of Government of India (GoI) that oversees implementation of the Convention in the country. Stressing on the importance of the convention, the Prime Minister of India has called on the international community to set up a global water action agenda as the central theme to achieve land degradation neutrality. He announced that India will restore an additional 5 million hectares of degraded land by 2030, raising the total land to be restored in India to 26 million hectares.

The commitment is backed with the fact that the emission intensity of India’s Gross Domestic Product (GDP) has reduced by 21% over the period of 2005- 2014. As per the Biennial Update Report-II of India, submitted to UNFCCC, emission from India stood at 2607.49 million tonnes CO_2 eq in 2014. Out of the total emissions, the energy sector accounted for 73%, Industrial Processes and Product Use (IPPU) was 8%, agriculture was16% and waste sector was 3% whereas the Land Use, Land Use Change and Forestry sector was able to offset about 12% of India’s total emissions.

A study has been conducted by TERI where five land use sectors have been identified for the study viz. forestry (Forests and Tree cover), animal husbandry, wetlands, mining and agriculture. The major objectives of the study were estimation of the emission, status of sequestration/emission offset), and estimation of future potential of sequestration/ emission reduction to achieve land degradation neutrality of different land use sectors in India.

The total emission from the five land use sectors in 2020 is estimated to be 1113.03 million tonnes of CO_2e, which is projected to increase to 1240.23 million tonnes of CO_2e and 1340.87 million tonnes of CO_2e till 2030 an 2050 respectively. It was inferred that forestry sector (48.43%) is the major contributor of emission out of the five sectors, followed by agriculture (24.35%) and animal husbandry (22.33%).

This webinar on **"Estimation of the Current Emission and Sequestration Potential of different land use sectors to achieve Land Degradation Neutrality in India"** held on **Monday, July 22nd, 2020 from 03:00 pm to 05:00 pm, IST**, focussed on analysing the emission, sequestration/emission offset status, and suggest future potential of sequestration/ emission reduction to achieve land degradation neutrality of different land use sectors in India.

The key panelists for the webinar were **Dr R.P. Gupta, Secretary, Ministry of Environment, Forest & Climate Change; Dr Alka Bhargava, Additional Secretary, Department of Agriculture, Cooperation and Farmers Welfare; Mr Jigmet Takpa, Joint Secretary and head, Desertification Cell, Ministry of Environment, Forest & Climate Change; Mr Umakant, Joint Secretary, Department of Land Resources, Ministry of Rural Development; Dr Ajay Mathur, Director General, TERI; Dr J.V. Sharma, Director, Land Resources Division, TERI; and Dr Reena Singh, Associate Director, Sustainable Agriculture Division, TERI. The session was moderated by Mr. Yatish Lele, Associate Fellow, Land Resources Division, TERI.** The webinar was attended by 250 participants from various organizations working in diversified fields. **Annexure I** present the detailed agenda for the webinar. Copies of all the presentation as delivered by the panelists has been attached as **Annexure II.**

Discussion session

Dr Ajay Mathur initiated the discussion with his welcoming remarks. Dr. Mathur emphasised that desertification and land degradation, along with climate change and loss of biodiversity are identified as the greatest challenges to sustainable development. Land degradation has also created an adverse impact on population of 2 billion and 1.9 trillion hectare land, globally. Dr Mathur also stated that the present study conducted by TERI estimates that the total emission from the five land use sectors in 2020 is around 1.13 billion tonnes of CO_2e which would have large impact both on the economy and environment as a whole. He concluded by highlighting the importance of monetising the benefits through carbon market mechanism so as to achieve land degradation neutrality.

Dr R.P. Gupta while delivering the keynote address mentioned that land is a building block of whole biosphere and loss of biodiversity and climate change is a root cause of land degradation. He emphasized on the fact that to achieve land degradation neutrality we have to ensure the conservation of biodiversity and climate change mitigation. Dr Gupta briefed about the commitments made by Government of India in COP 14 of UNCCD and the efforts being made by the Government in order to achieve these targets will also help in achieving the different Sustainable Development Goals (SGD 1, 2, 3, 5, 6, 8 and 13). Dr Gupta also mentioned that Government of India has taken decision to establish the Centre of Excellence for Sustainable Land Management at ICFRE which will help in integrating the work of various institutions and schemes in the country for combating land degradation, and it will also identify the policy, institutional and financial gaps to achieve Land degradation Neutrality in India that will help further country to prepare strategy to achieve LDN target. Dr. Gupta in his concluding remarks mentioned that combating land degradation and restoring degraded land is an urgent priority for Government of India.

Dr Alka Bhargava gave a brief overview about the important role of agriculture sector in achieving land degradation neutrality in India. She mentioned that the Biennial Update Report-II of India, submitted to UNFCCC, states that emission from agriculture accounts for 16% of the total emissions of all the production sectors. Thus, more attention is needed toward agriculture sector schemes and policies which can help in combating land degradation. Dr Bhargava emphasised on the point that India has already maximized its use of agriculture land and now the need of the hour is to adopt strategies to increase productivity on these lands along with cropping intensity and crop diversification. She also mentioned about the importance of different schemes which are taken up by the Department of Agriculture for reducing emissions and enhancing income to farmers. ICAR has developed models which includes integrated farming practices and will further help in reducing emissions. Through these schemes, 13 SDGs are addressed directly and 4 SDGs are addressed through landscape and cluster based models.

Mr Jigmet Takpa made a presentation explicating on ***the status of land neutrality targets and India's commitment to UNFCCC***. He highlighted upon water erosion, vegetation degradation and wind erosion as the main drivers of degradation in India, and elaborated on 3 measures for setting the key Land Degradation Neutrality (LDN) targets i.e. avoid, reduce and reverse the land degradation to bring a balance for maintaining neutrality to contribute to the food security, human wellbeing and healthy environment. Mr Takpa further discussed about the negative and positive land cover trends highlighting the percent change in area of grasslands (-31.38%), croplands (18.46%), artificial areas (24.05%), water bodies (-0.26%), tree-covered area (0.39%) and wetlands (2.19%). Land productivity dynamics and soil organic carbon degradation were also discussed elaborately. He added that the current levels of degradation accounts for 96.4 million hectare covering 29.32% area of the country. Data from a recent study "Economics of Desertification, Land Degradation and Drought in India" conducted by TERI in 2018 mentions the costs of land degradation accounting for Rs 3,177 billion which comprises of 2.54% of India's GDP. 82% of these costs are due to land degradation while 18% is due to land use change. At the end, he shared the tentative targets for land restoration by 2030 taken up by MoEFCC, MoRD and Ministry of Agriculture and Farmer Welfare along with Ministry-specific projects, programs and schemes to achieve the aforementioned targets.

Dr J V Sharma and **Dr Reena Singh** made a presentation on ***"Estimation of current emission and sequestration as well as future potential of sequestration/emission reduction to achieve land degradation neutrality in India"***.

Dr J V Sharma started off by highlighting the importance on analyzing the status of emissions and sequestration reduction of land use in India so as to take actions and initiatives for combating land degradation. He stressed on the role of agro-forestry, farm-forestry and farmers in the process of achieving land degradation neutrality.

He further highlighted on the objectives and findings of the study conducted by TERI relating to status of emission and sequestration of different land use sectors, emission reduction from different land use sectors in India and the future potential of sequestration to achieve land

degradation neutrality. The key contributions of five land-use sectors such as forest (Forest and Tree cover), animal husbandry, wetland and mining were further stressed upon. While concluding the presentation, Dr. Sharma highlighted the fact that shifting to alternate energy source for cooking and using energy saving device would help in reducing the dependency on fuelwood and emissions from forestry sector. He also suggested the need for a Carbon Neutrality Policy and Registry of Carbon transaction at national level which would help the sequestration under the umbrella of Polluter Pays Principle and Payments for Ecosystem Services (PES) Mechanism.

Dr. Reena Singh shared the insights on agriculture sector and highlighted 3 major contributors of emissions in agriculture sector namely enteric fermentation, synthetic fertilizers and rice cultivation. She highlighted on the emission levels caused from burning of crop residues (incl. rice, wheat, maize and sugarcane crops); direct and indirect emissions from crop residue of 9 major crops incl. barley, beans, maize, millet, rice, sorghum, soyabean and wheat). She also highlighted the role of cultivation of organic soils, manure applied to soils, manure management, rice cultivation and synthetic fertilizers in the agriculture sector. Dr Reena recommended utilisation of wasteland, optimizing modern technologies and use of mycorrhiza technology and nano-fertilisers as key strategies for reducing chemical fertilisers and GHG emissions. She further suggested on use of a multi-disciplinary approach with multiple R&D institutions, farmers and policy makers to collectively address this complex challenge and meet the sustainable development goals.

Mr Umakant, delivered his presentation on the topic "Role of Rain fed and Degraded Lands in India in realizing the LDN". He highlighted the key challenges faced in the development of the rainfed & degraded land both nationally and internationally such as data harmonization, verifiable achievements on LDN, transforming data on internationally accepted matrix and ensuring sustainability of development of rainfed & degraded lands. In his presentation, Mr. Umakant described about the evolution of the WDC-PMKSY and also the present status of the projects of schemes run by DoLR. He highlighted the physical progress of indicators such as no. of water harvesting structures, additional area brought under protective irrigation, no. of farmers benefited, area

brought under plantation (afforestation / horticulture etc.), area of culturable wastelands treated. Mr. Umakant also highlighted the role of DoLR is conducting real time monitoring using the space technology tied up with NRSC to monitor the programme and do physical and qualitative assessment of works. In this regard certain apps such as Srishti geo-portal and Drishti mobile app were focused upon. Later he explained about the Watershed Management Programme by 2024, in which the DoLR intends to complete all ongoing watershed projects by 2021 and develop 20 million ha of rainfed at the rate of 5 million ha/year. In his concluding slide Mr. Umakant, mentioned some key points for way forward which were related to:

- Climate mainstreaming in rainfed and degraded areas related projects,
- Drawing more focus on the LRI technique,
- Improving monitoring mechanism
- Effective convergence with related schemes at field level,
- Capacity building of States, Panchayat and watershed committee members,
- Strengthening of institutions involved in implementation process
- Need for leadership at the community level

Question and Answer Session:

Question: India has started collection and monitoring of data in the forestry sector regarding the emissions after signing the protocol, so how is progress now in achieving the target India's forestry NDC target? Also to what extend the plantation drives and commercial plantations make up for the carbon sinks lost in deforestation?

Answer (Dr. JV Sharma): As in the India's forestry NDC target, the word 'additional' has been used twice, so first the concept behind usage of "additional" word twice in the target needs to be clarified and the GoI has to decide how much carbon has to be enhanced by 2030. For the baseline year should be decided as 2015 in order to quantify the India's forestry target to be achieved by 2030 and the target should be increase in carbon sink over the business as usual (BAU). He also suggested that state wise targets should be communicated. According to him institutional strengthening, capacity building of various stakeholders and innovative financial mechanisms are very important to achieve the NDC goals. Answering the later part of the question, Dr. Sharma specified two strategies that should be taken up for enhancing forest cover and carbon stock in India - promoting alternatives fuelwood technologies and LPG through Ujwala scheme for reducing dependence of forest depending communities and also promote agroforestry practices among farmers.

Question: What can be the role of Indigenous knowledge to combat land degradation and desertification?

Answer (Mr.Jigmet Takpa): Good traditional knowledge and techniques are available with India to combat land degradation, there is not much need of looking upto foreign nations for such approaches. Successful examples of such soil and water conservation practices can be seen in the states of Maharashtra, Rajasthan and other Himalayan regions of the state. According to him promoting local knowledge is highly important to promote sustainable land management.

Question: Are there any policy interventions to deal with the stubble burning problem in the state of Punjab and Haryana?

Answer (Dr.Alka Bhargava): Stubble burning is one of the major concerns in the Ministry of Agriculture and there is special dedicated cell for the agriculture mechanisation in the ministry. They have been making considerable efforts in giving equipment and subsidies to the farmers of Punjab and Haryana, so that there is less cutting and burning and the residue can be mulched back in soil. There are centres by the government where such machinery can be rented on a per hour basis and also various mobile applications are in place to assist farmers.

Concluding remarks:

In concluding remarks, Dr. Bhargava appreciated the study conducted by TERI on the "*Estimation of the current emission and sequestration potential of different land use sectors to achieve land degradation in India*". Highlighting the recommendations from the study in the agriculture sector, she stated that successful trails have been undertaken by ICAR regarding the use of nano-fertilisers but simultaneously trails have to be conducted by Ministry of Health as nano-particles in the fertilisers might have some toxic effect on the human health. Dr. Bhargava also touched upon the fact that the Pan India movement of agro-forestry produce is an important aspect to consider. Later, she also focused on the point of 'data harmonization' as it is very important that there is a single database which can be referred by various ministries.

Key findings of the discussion and recommendations:

In the light of the discussions, following points were taken into consideration:

- The data available in context of land degradation in India is fragmented. The Centre of Excellence for sustainable land management to be set up in ICFRE must harmonise the data and overlapping schemes and also integrate with institutions dealing with land management issues.
- The status of emissions from land use sector must be reviewed every five years to take corrective measures in the policies and programs for achieving Land Degradation Neutrality.

- Forest Survey of India should provide the data of fuelwood consumption (from recorded forests and TOF both) biannually in the India State of Forest Report so that the state wise consumption of fuelwood and the exact estimates of emission & sequestration potential can be known, and policy makers may initiate strategies accordingly.
- Forest Survey of India should provide the data related to forest cover within the recorded forest area and also for trees outside forest separately.
- The Government of India should adopt the policy of carbon neutrality under the Polluter Pays Principle and Payment Mechanism for Ecosystem Services as mandated in the fundamental right under Article 21 of Indian constitution.
- Implementation of Agroforestry Policy in true spirit and also creating better market for Agroforestry produce such as higher import duty, Quality Planting Material, rationalize, transit (which will be valid for pan-India) and felling rules, and rules for Wood Based Industries. The Ministry of Environment, Forest & Climate Change has decided to introduce pan-India transit permit for timber, bamboo and other forest produce.
- Technologies that can reduce the amount of methane production in rumen or total release of methane into atmosphere should be adopted for efficient use of feed. Mitigation of GHG emissions from animal husbandry sector can be achieved by decreasing the emission rate due to enteric fermentation. Different animal feeding management, manure management (collection, storage, spreading), management of feed crop production and dietary manipulation are the key strategies.
- The extent of wetlands both within and outside the forests along with various trends that may result in more accurate estimates of the carbon emissions as well as sequestration potential should be provided in the India State of Forest Report by Forest Survey of India.
- Ministry of Mines (MoM) should develop a centralised database of all the post mining restoration initiatives undertaken by the agencies. Key aspects such as tree species, age, height, girth etc should be regularly documented along with the carbon sequestered by the trees every 5 years. The plantations should adopt scientific processes in which the ecological succession should be followed to ensure restoration of habitat suitable for the local biodiversity.
- Monitoring mechanism should be adopted and followed regularly as per the guidelines issued by Ministry of Mines. Rehabilitation of mines should be undertaken regularly to reduce and mitigate the emissions from the mining sector.
- Climate compatible crop development for the future using new horizon game changing technologies such as mycorrhizal technology, integrated nutrient management, CRISPR/Cas9 and Nano- fertilizers for precision agriculture must be promoted.

- Carbon-neutral practices should be adopted in agriculture sector in order to have a synergistic impact on crop productivity, soil health, and on the GHG sequestration.

Mr. Yatish Lele proposed the vote of thanks and concluded the event to be successful.

Annexure I. Agenda of the webinar

Webinar on:

"Estimation of the Current Emission and Sequestration Potential of different land use sectors to achieve Land Degradation Neutrality in India"

Date 22nd July, 2020
Time: 03:00 pm – 05:00 pm IST

02:45pm – 03:00 pm	**Joining calls**	
03:00 pm– 03:10 pm	**Welcome address**	**Dr Ajay Mathur** Director General, TERI
03:10 pm – 03:25 pm	**Keynote Address**	**Dr R.P. Gupta** Secretary, Ministry of Environment, Forest & Climate Change
03:25 pm – 03:40 pm	**Overview of the role of agricultural sector in land degradation neutrality in India'**	**Dr Alka Bhargava** Additional Secretary, Department of Agriculture, Cooperation and Farmers Welfare
03:40 pm – 03:55 pm	**Land neutrality targets and India's commitment to UNFCCC'**	**Mr Jigmet Takpa** Joint Secretary and head, Desertification Cell, Ministry of Environment, Forest & Climate Change
03:55 pm – 04:15 pm	Presentation on Concept Paper - **'Estimation of the Current Emission &Sequestration, as well as Future Potential of Sequestration/Emission Reduction to achieve Land Degradation Neutrality in India**	**Dr JV Sharma** Director, Land Resources Division, TERI **Dr Reena Singh** Associate Director, Sustainable Agriculture Division, TERI
04:15 pm – 04:30 pm	**Role of Rain fed and Degraded Lands in India in realising the LDN**	**Mr Umakant** Joint Secretary, Department of Land Resources, Ministry of Rural Development
04:30 pm – 04:45 pm	**Q & A**	
04:45 pm – 05:00 pm	**Concluding remarks**	**Dr Alka Bhargava** Additional Secretary, Department of Agricultural Cooperation and Farmers Welfare

सत्यमेव जयते

Desertification Cell
Ministry of Environment, Forest and Climate Change

Jigmet Takpa
Joint Secretary MoEFCC

Desertification and Land Degradation – What does it

- **Land Degradation:** Deterioration in the quality of land (its topsoil caused usually by excessive or inappropriate exploitation)

- **Desertification:** Degradation of land in arid, semi-arid, and dry sub-humid areas (Not the natural expansion of existing deserts)

  - **Causes:** Overexploitation, overgrazing, deforestation, and poor irrigation practices
  - **Solutions:** Prevention of Soil Erosion, Water Resource Management, Sustainable Practices

Extent of Land undergoing Degradation

- World – 40000 Lakh hectares (1/3 rd of total geographic area)
- India - 960 Lakh Hectares (29.32 % of total geographic area)

Major Process of Degradation in India
(29.32 % of Total Geographic area)

- Water Erosion – 10.98 %
- Vegetation Degradation – 8.91%
- Wind Erosion – 5.55%
- Other Process – 3.44%

Land Degradation Facts

- Only 20% of World is habitable
- Every minute 23 hectare of land is lost land degradation and drought
- 24 billion tons of fertile soil lost every year.
- 7.3 million hectares of forest lost every year.
- In 1960, there was around 0.5 hectares of farmland per person on Earth, by 2020, that figure will have fallen by two thirds
- Up to 40% of the world's agricultural land is thought to be badly degraded
- (IPCC) special re
- port on Land and Climate Change
- (IPBES) Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services 75% of the Earth’s land surface has been exposed to degradation.
- 3.2 Billion people are trapped in the degraded land experiencing extreme poverty

India

- India contributing to 2.4% of the global land area
- supports 18% of the world's human population
- 15% of the world's livestock population
- 96.40 mha area of the country is undergoing process of land degradation (**29.32% of country's TGA**).
- **Economics of desertification, land degradation and drought"**, desertification, land degradation and drought cost India **2.54% of its Gross Domestic Product** (GDP) in 2014.
- The annual costs of land degradation (Rs 3177 billion), outstrip the total costs of reclamation (Rs. 2948 billion
- The **total reported area for Land Use is 307.82 mha** and **total geographical area of India is 328.73 mha**.
- **The agriculture sector employs nearly half of the workforce in the country.**
- **However, it contributes to 17.5% of the GDP**

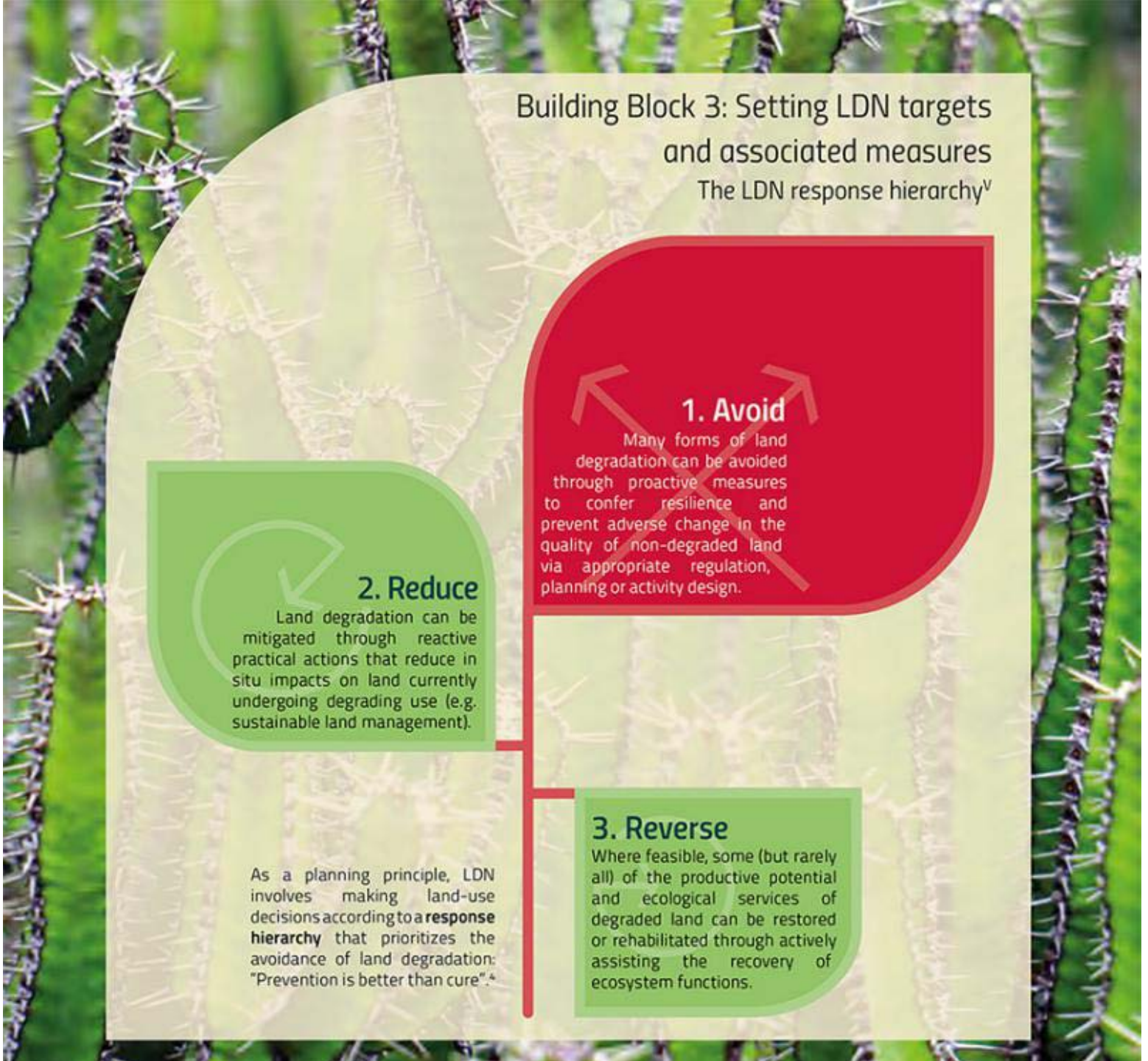
Agriculture

- India ranks first in the world with highest net cropped area.
- India exported $38 billion worth of agricultural products in 2013,
- seventh largest agricultural exporter worldwide
- The sixth largest net exporter.
- India is one of the world's five largest producers of livestock, with one of the fastest growth rates,
- 2017 275 million tonnes (MT). The country’s requirement for food grains in order to provide for its population is projected to be 300 million tonnes by 2025). By 2025, to meet this demand of 300 million tonnes, land productivity must be improved manifold.

- Chemical Fertilizers and Pesticides on Impacted Agriculture and allied sectors in the country,

Degradation

Category	Total Area (Mha)	Degraded Area (Mha)	% Degradation
Forests	71.79	20.56	28.63
Non-Agricultural and Non-forest land categories (Wasteland and Common Property Resources) - (Sum of "Area not available for Cultivation" + "Uncultivated land")	69.72	31.45	45.11
Agriculture Land (Net sown area+ Fallow land)	166.31	44.39	26.7
		96.4	29.32



Building Block 3: Setting LDN targets and associated measures

The LDN response hierarchy[v]

1. Avoid

Many forms of land degradation can be avoided through proactive measures to confer resilience and prevent adverse change in the quality of non-degraded land via appropriate regulation, planning or activity design.

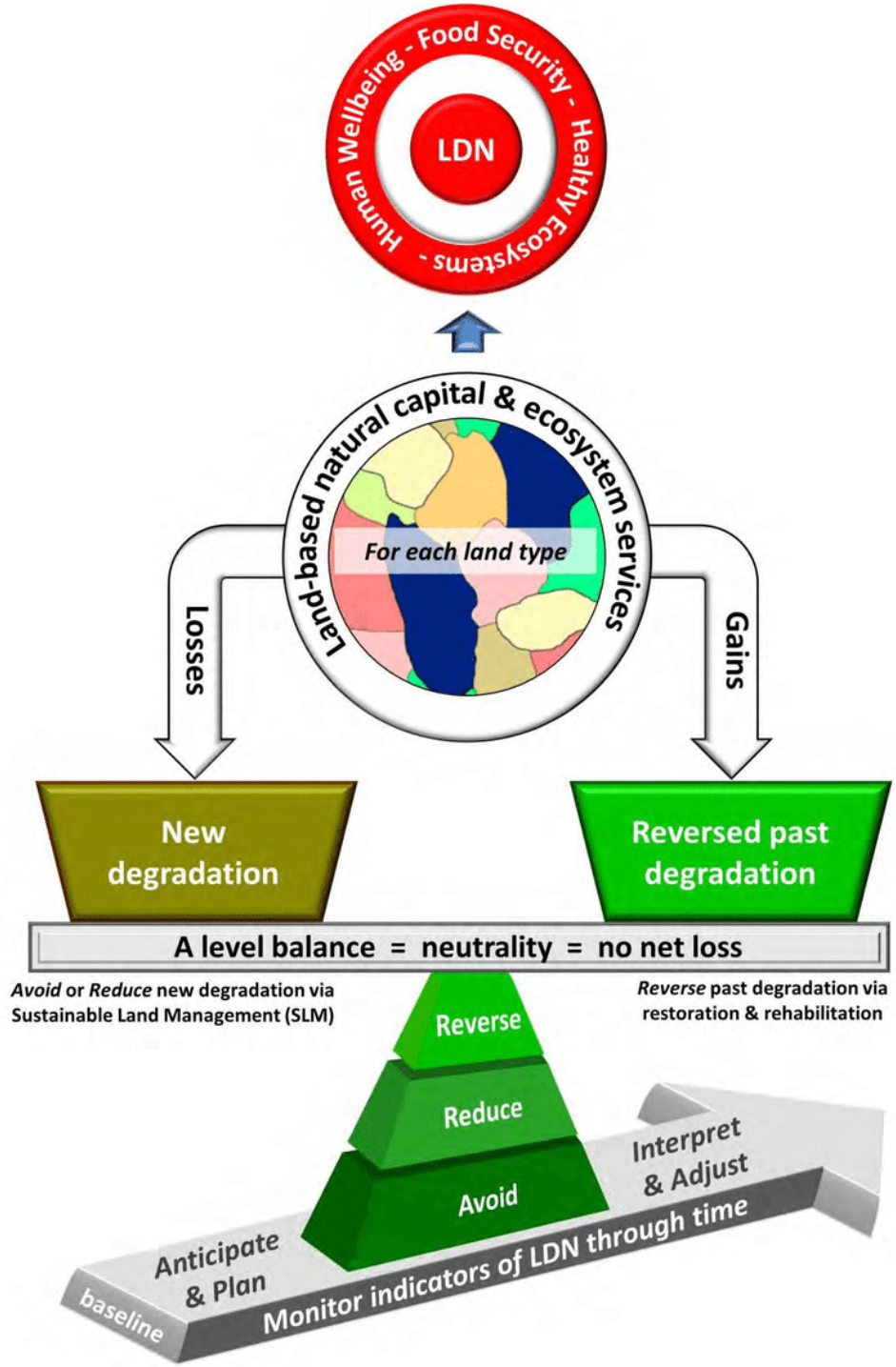
2. Reduce

Land degradation can be mitigated through reactive practical actions that reduce in situ impacts on land currently undergoing degrading use (e.g. sustainable land management).

3. Reverse

Where feasible, some (but rarely all) of the productive potential and ecological services of degraded land can be restored or rehabilitated through actively assisting the recovery of ecosystem functions.

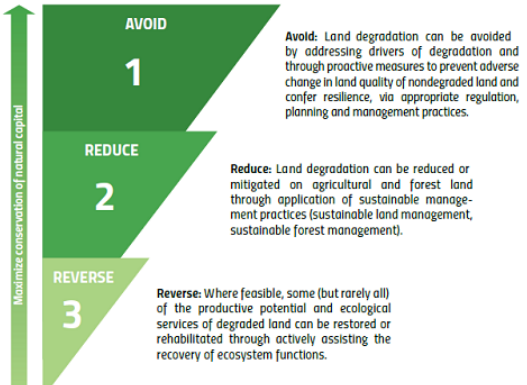
As a planning principle, LDN involves making land-use decisions according to a **response hierarchy** that prioritizes the avoidance of land degradation: "Prevention is better than cure".[4]

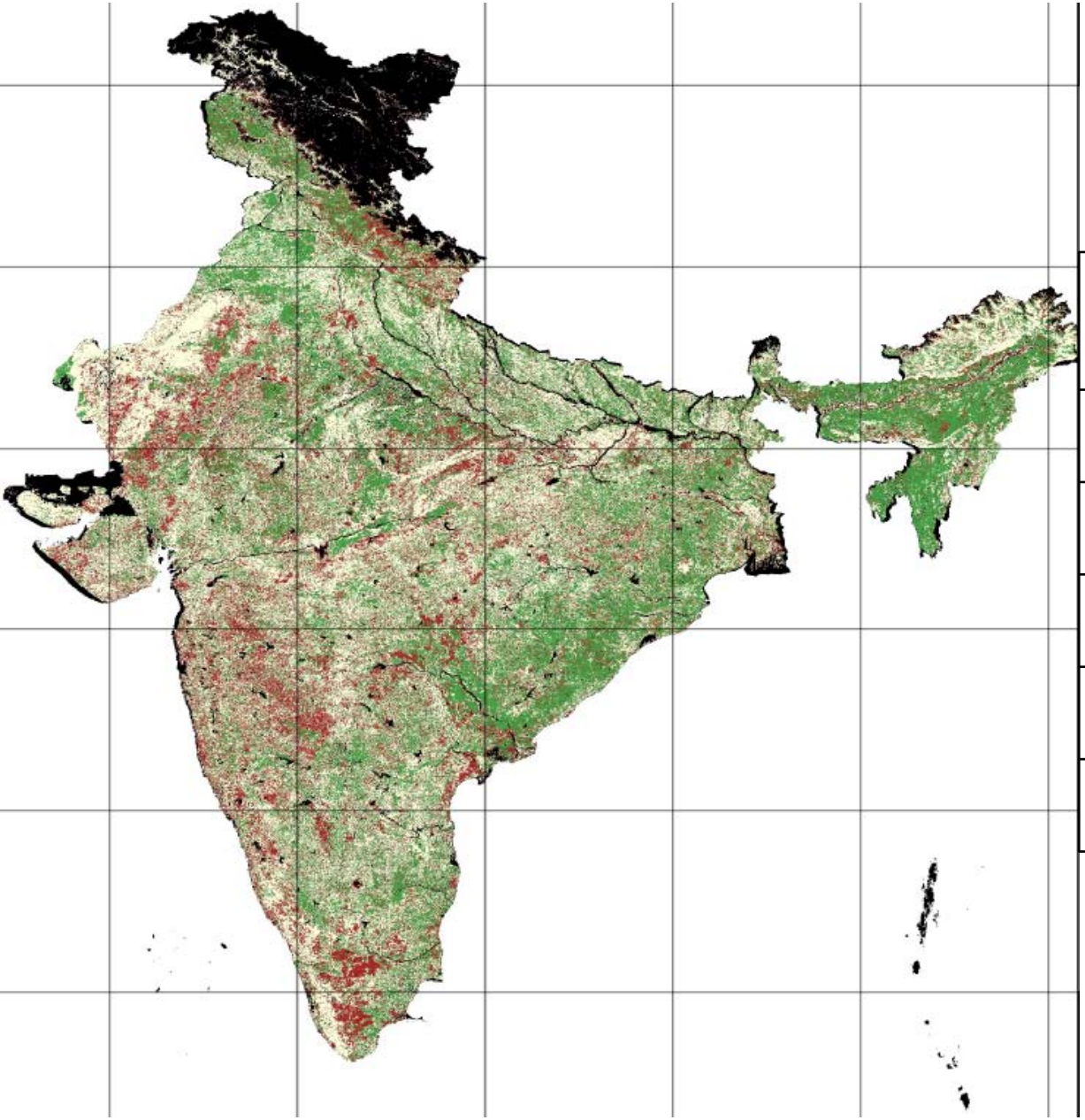

Human Wellbeing - Food Security - Healthy Ecosystems -
LDN
Land-based natural capital & ecosystem services
For each land type
Losses
Gains
New degradation
Reversed past degradation
A level balance = neutrality = no net loss
Avoid or Reduce new degradation via Sustainable Land Management (SLM)
Reverse past degradation via restoration & rehabilitation
Reverse
Reduce
Avoid
Interpret & Adjust
Anticipate & Plan
baseline
Monitor indicators of LDN through time

Land Degradation Neutrality (LDN)

- **SDG target 15.3**, Combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world;

- **Mainstreamed LDN targets** national strategies, planning and policies.
- **Cabinet Note** has been prepared on India's inspirational goal for prevention-mitigation and reclamation of 26 million hectares land.
- **Inter-ministerial committee** under the chairmanship of Additional Secretary is proposed to review the progress of LDN target
- Adopt the concept of avoid, reduce and reverse land degradation;
- **Dashboard** for updating the progress of land reclamation by GIM.

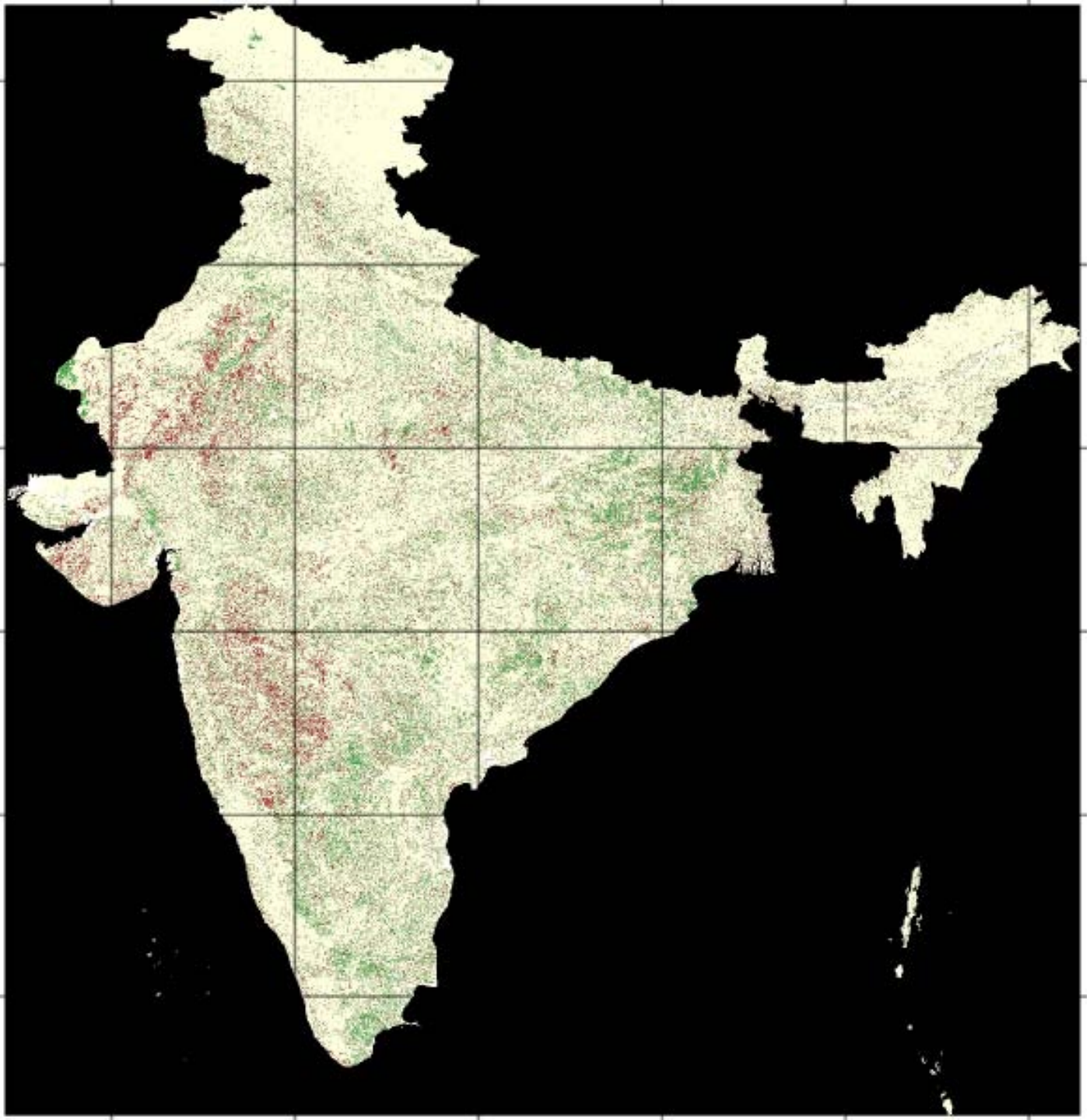




Land Degradation Map of India

	Area (sq km)	Percent of total land area
Total land area:	3,153,178.4	100.00%
Land area improved:	1,094,301.7	34.70%
Land area stable:	844,754.3	26.79%
Land area degraded:	870,996.6	27.62%
Land area with no data:	343,125.8	10.88%

Using National data on Land Use/Land cover (**NRSC**)
National data on LPD **(SAC)**
National Data on Soil organic Carbon (**NRSC**)



Land Cover Degradation Map of India

Land cover degradation (2005 to 2016)

- No data
- Degradation
- Stable
- Improvement

Hotspots of Land Cover Degradation

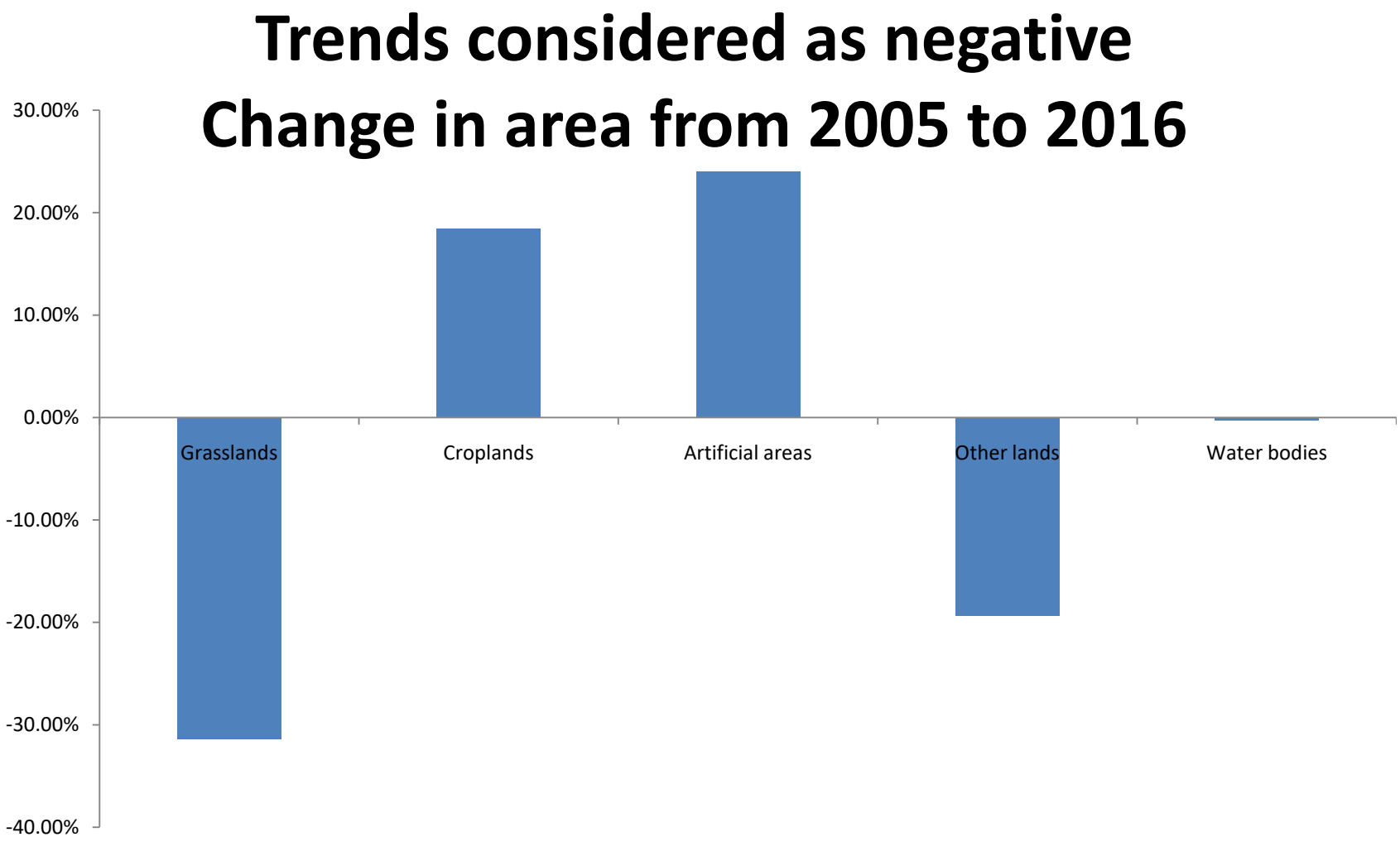
	Area (sq km)	Percent of total land area
Total land area:	3,123,773.2	100.00%
Improved land cover:	365,446.1	11.70%
Stable land cover:	2,483,454.5	79.50%
Degraded land cover:	267,294.7	8.56%
No data for land cover:	7,577.9	0.24%

- Rajasthan
- Maharashtra
- Karnataka
- Gujarat
- Uttar Pradesh

Land cover change by cover class

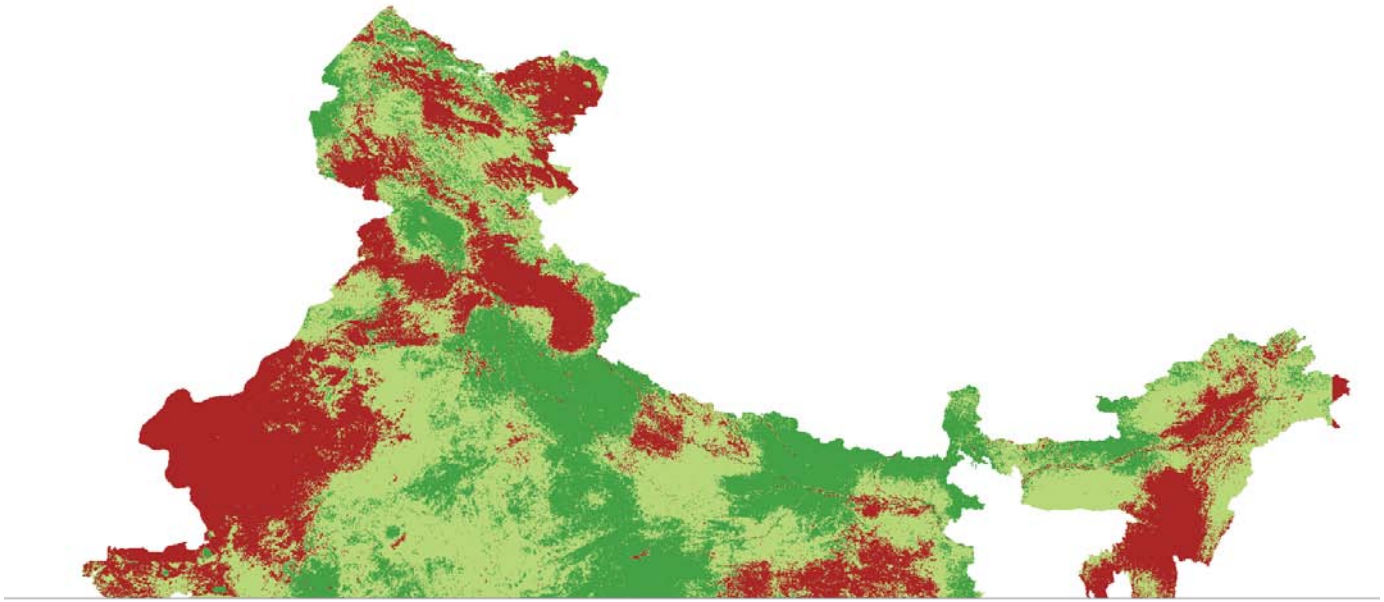
	Baseline area (sq. km)	Target area (sq. km)	Change in area (sq. km)	Change in area (percent)
	2005	2015		
Land Cover Classes				
Negative Trends				
Grasslands	180,067.72	123,559.80	-56,507.92	-31.38%
Croplands	1,136,137.63	1,345,888.03	209,750.40	18.46%
Artificial areas	78,256.07	97,074.19	18,818.12	24.05%
Other lands	905,238.68	730,158.93	-175,079.75	-19.34%
Water bodies	118,870.03	118,558.94	-311.09	-0.26%
Total:	*3,263,269.20*	*3,263,269.20*	*0*	
Positive Trends - Protection				
Tree-covered areas	841,195.33	844,448.87	3,253.55	0.39%
Wetlands	3,503.74	3,580.43	76.69	2.19%

Land Use and Land cover Change

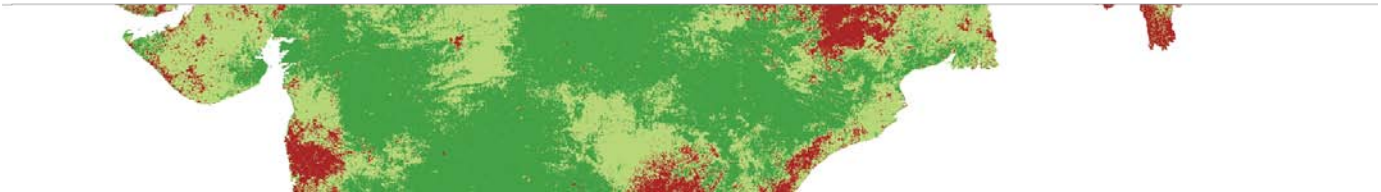


Land Cover Transition (sq. km)

		Land cover type in target year									
Land cover type in baseline year		Tree-covered areas	Grasslands	Cropland	Wetlands	Artificial areas	Other lands	Water bodies	*Total:*	Negative Changes	Positive Changes
	Tree-covered areas		503	19746	85	4395	28865		***53594***	53509	85
	Grasslands	5776		47483	63	3040	7672		***64035***	58195	5839
	Croplands	23481	1103		44	9392	124519		***158539***	133955	24584
	Wetlands	97	0	43		7	74		***222***	222	0
	Artificial areas	2807	144	6708	6		4996		***14661***	0	14661
	Other lands	24388	9483	291198	110	16417			***341596***	16417	325179
	Water bodies								***0***		
	Total:	***56549***	***11234***	***365177***	***309***	***33251***	***166127***	***0***	***632647***	**262298**	**370349**
	Negative Changes	97	503	67272	44	33251	166127	**267295**			
	Positive Changes	56452	10730	297906	265	0	0	**365353**			



Land Productivity Change Map of India

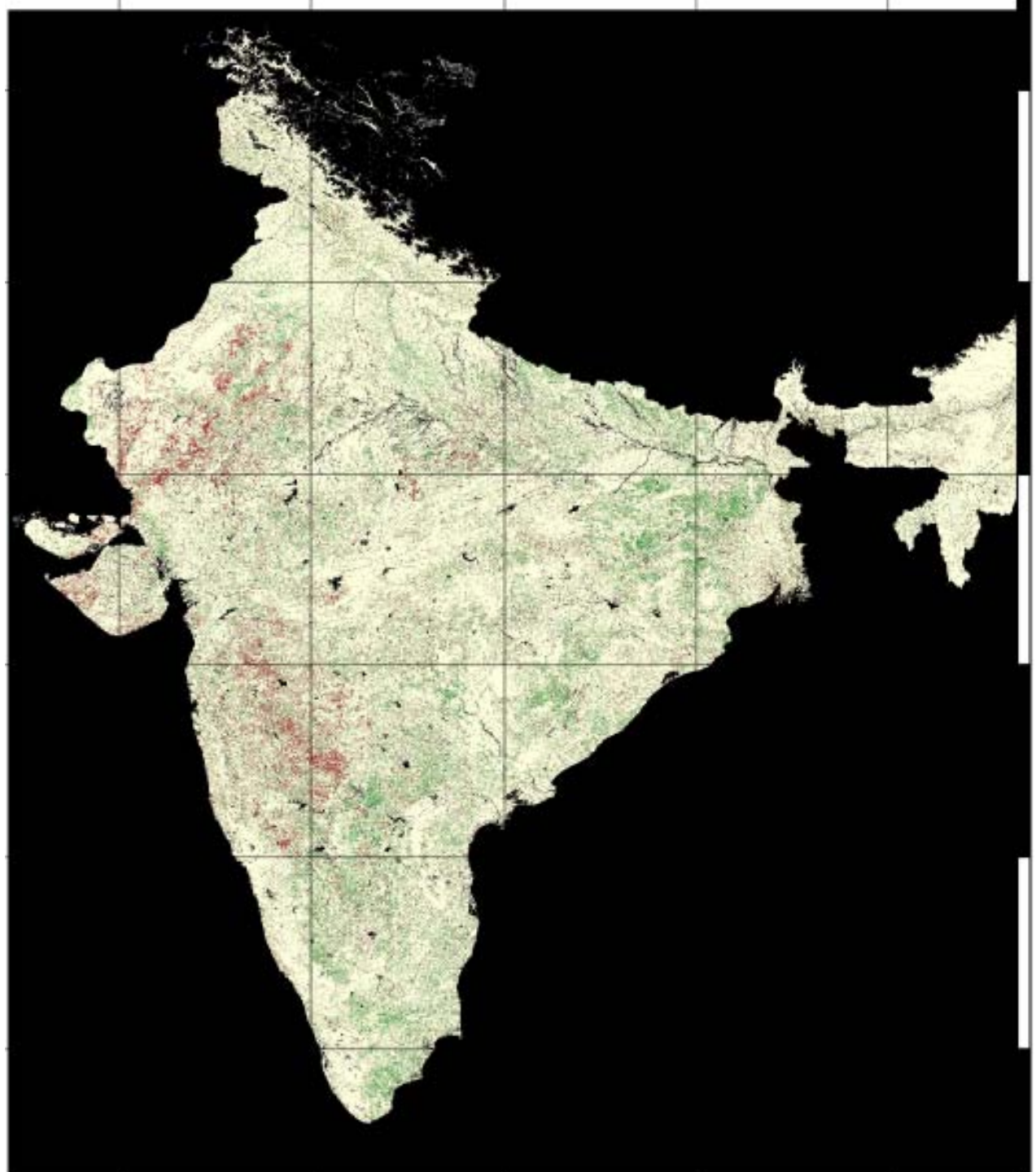


Hotspots of Decrease in Land Productivity

	Area (sq km)	Percent of total land area
Total land area:	3,153,178.4	100.00%
Land area with improved productivity:	1,113,128.8	35.30%
Land area with stable productivity:	1,343,110.0	42.60%
Land area with degraded productivity:	667,269.5	21.16%
Land area with no data for productivity:	29,670.0	0.94%

Trends in land productivity or functioning of the land
(for pixels with unchanged land cover)
Net land productivity dynamics (2000-2010 sq. km)

Land cover class	Declining	Stable	Increasing	Total	Percentage Declining
Tree-covered areas	188907	374958	214506	784731	24
Grasslands	35828	49055	26725	111835	32
Croplands	118208	401679	450361	970522	12
Wetlands	406	1920	541	3162	13
Artificial areas	16373	26242	20317	63002	26
Other land	185112	212539	134633	550655	34



Soil Carbon Change Map of India

Soil organic carbon degradation (2005 to 2016)

- No data
- Degradation
- Stable
- Improvement

Soil organic carbon change from baseline to target

	Baseline soil organic carbon (tonnes / ha)	Target soil organic carbon (tonnes / ha)	Baseline area (sq. km)	Target area (sq. km)	Baseline soil organic carbon Million (tonnes)	Target soil organic carbon Million (tonnes)	Change in soil organic carbon Million (tonnes)	Change in soil organic carbon (%)	change in area
Tree-covered areas	10.92	10.95	838,105	841,060	915.19	920.91	5. 71	0.62%	2,955.26
Grasslands	5.03	4.95	175,844	123,043	88.46	60.90	-27.55	-31.15%	-52,800.79
Croplands	5.98	6.05	1,128,946	1,335,584	675.48	808.27	132.788	19.66%	206,637.81
Wetlands	4.34	4.27	3,393	3,481	1.47	1.48	0.01	0.71%	87.48
Artificial areas	5.59	5.69	77,663	96,253	43.42	54.78	11.36	26.17%	18,589.99
Other lands	4.01	4.23	892,151	716,681	357.33	-303.10	-54.22	-15.18%	-175,469.75
		Total:	***3,116,102***	***3,116,102***	***2,081.37***	***2,149.46***	***68.09***		

Hotspots of Decrease in Soil Organic Carbon

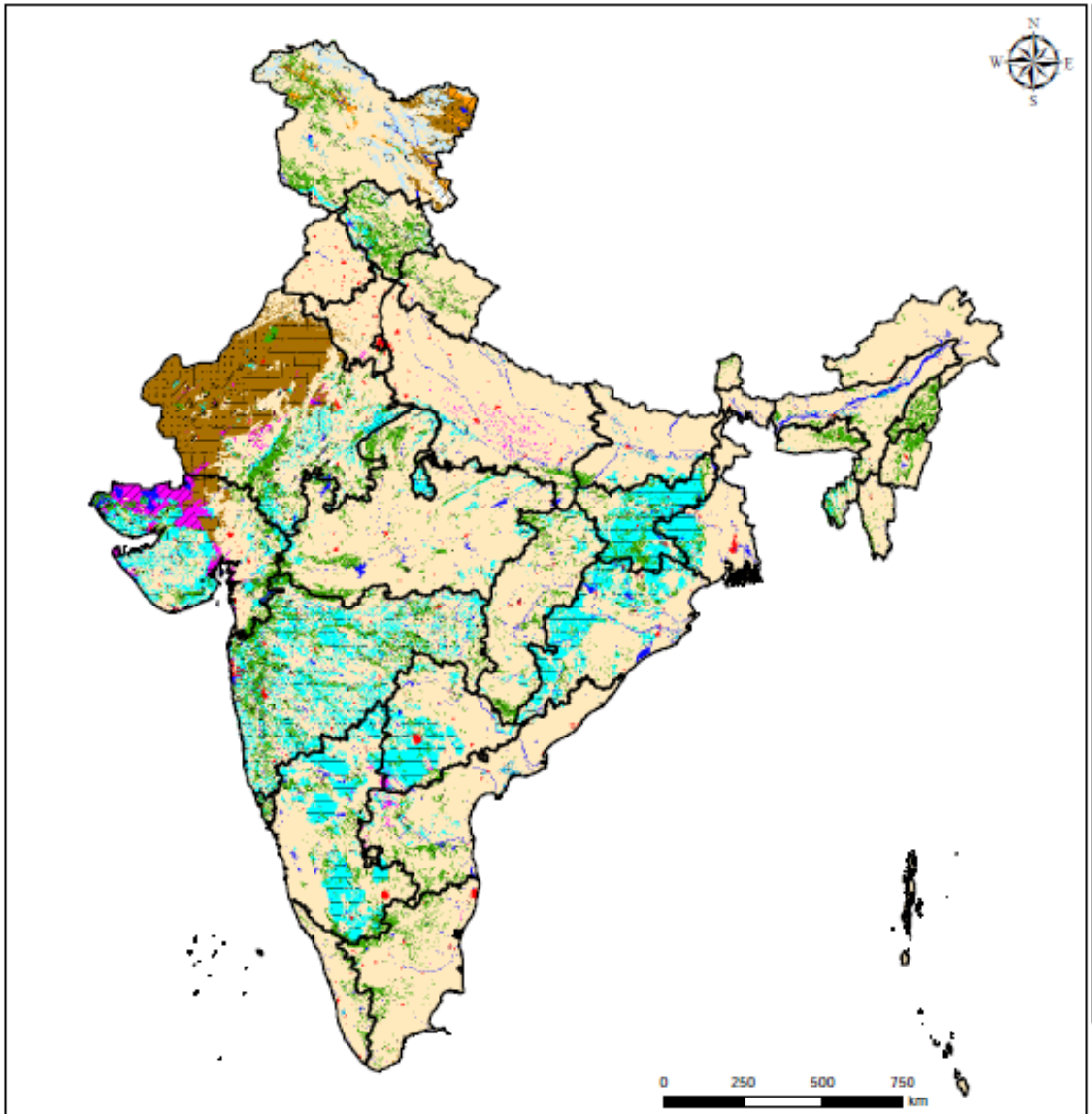
	Area (sq km)	Percent of total land area
Total land area:	2,821,530.3	100.00%
Improved soil organic carbon:	324,485.3	11.50%
Stable soil organic carbon:	2,282,459.2	80.89%
Degraded soil organic carbon:	205,158.2	7.27%
No data for soil organic carbon:	9,427.6	0.33%

Other Estimates of India's Status of Degradation

- Desertification and Land Degradation Atlas of India - first prepared in 2007 and in 2016 by SAC covering the years 2003-05 and 2011-13
- Current Levels of Degradation 96.4 M ha covering 29.32 % area of the country
- Cumulative increase - 1.87 mha area undergoing process of DLD (constituting 0.57% of the TGA) during the time frame 2003-05 and 2011-13.
- Most significant process of desertification/ land degradation - Water Erosion (10.98% in 2011-13 & 10.83% in 2003-05), followed by Vegetation Degradation & Wind erosion.

Desertification Processes – Space Application Centre

DESERTIFICATION / LAND DEGRADATION STATUS MAP OF INDIA - 2011-13



Legend

Symbol	Code	Description
	Fv1,2	Forest, vegetation degradation
	Gv1,2	Grassland / Grazing land, vegetation degrad
	Sv1,2	Land with scrub, vegetation degradation
	Iw1,2	Agriculture irrigated, water erosion
	Dw1,2	Agriculture unirrigated, water erosion
	Fw1,2	Forest, water erosion
	Sw1,2	Land with scrub, water erosion
	Bw1	Barren, water erosion
	Ew1	Dune / Sandy area, water erosion
	Ie1,2	Agriculture irrigated, wind erosion
	De1,2	Agriculture unirrigated, wind erosion
	Se1,2	Land with scrub, wind erosion
	Be1	Barren, wind erosion
	Ee1,2	Dune / Sandy area, wind erosion
	Is1,2	Agriculture irrigated, salinity / alkalinity
	Ds1,2	Agriculture unirrigated, salinity / alkalinity
	Gs1,2	Grassland / Grazing land, salinity / alkalinity
	Ss1,2	Land with scrub, salinity / alkalinity
	Bs1,2	Barren, salinity / alkalinity
	Il1,2	Agriculture irrigated, water logging
	Dl1,2	Agriculture unirrigated, water logging
	Fl1	Forest, water logging
	Gl2	Grassland / Grazing land, water logging
	Sl1,2	Land with scrub, water logging
	El1,2	Dune / Sandy area, water logging
	Bg2	Barren, mass movement
	Rf1	Rocky, frost shattering
	Lf1,2	Periglacial, frost shattering
	Fm1,2	Forest, man made
	Tm1,2	Others, man made
	B	Barren
	R	Rocky
	S	Settlement
	W	Water body/ Drainage
	NAD	No Apparent Degradation

Data Source: IRS AWIFS (2011-13), Ancillary Information

Prepared by:
Space Applications Centre,ISRO, Ahmedabad

		2011-13	2003-05	
Land Use Class as used by SAC	Possible Processes of Degradation	Status Of Degradation in Million Hectares	Status Of Degradation in Million Hectares	Change in Million Hectares
Forest Grasslands Land with Scrub	Vegetation Degradation	29.3	28.28	1.02
Forest Land with Scrub Agriculture Irrigated Agriculture UnIrrigated Barren Dune/Sandy Area	Water Erosion	36.1	35.61	0.49
Grasslands Land with Scrub Agriculture Irrigated Agriculture UnIrrigated Dune/Sandy Area	Water Logging	0.65	0.6	0.05
Land with Scrub Agriculture Irrigated Agriculture UnIrrigated Barren	Wind Erosion	18.23	18.35	-0.12
Grasslands Land with Scrub Agriculture Irrigated Agriculture UnIrrigated Barren	Alkalinity	3.67	4.01	-0.34
Forest Others	Man Made	0.41	0.37	0.04
Settlement	Settlement	1.88	1.48	0.4
	Frost Shattering	3.34	3.11	0.23
	Mass Movement	0.93	0.84	0.09
	Barren/Rocky	1.89	1.88	0.01

Economic Costs of Degradation

- A recent study completed in **2018** "**Economics of Desertification, Land Degradation and Drought in India**" quantified and projected cost of land degradation.

- **Highlights of the study**

- Costs of Land Degradation – Rs 3,177 Billion is the total cost of degradation comprising 2.54 % of India's GDP

82 % of these costs are due to land degradation and 18 % due to land use change.

Assessing LDN – Sample Drivers of Degradation…

Direct drivers of land degradation	Indirect drivers of land degradation
• **Adverse Land use Conversions through Encroachments, Allotments and Land Diversions** • **Deforestation** • **Over-exploitation for domestic use** • **Overgrazing** • **Poor agricultural practices** • **Urbanisation and infrastructure** • **Industrial activities, waste and mining** • **Discharges of effluents** • **Disturbance of water cycle** • **Over-extraction of water**	• Population pressure • Land tenure • Poverty • Lack of Access to basic services like Education and Health • Lack of Capacities and Skills • Governance • Institutional settings and policies (including taxes, subsidies, incentives, territorial master plans)

- Status of land degradation (baseline)
- Land degradation trends and drivers
- Institutional and legal framework

सत्यमेव जयते

The Desertification Cell

- Focal Point of United Nations Convention to Combat Desertification (UNCCD)
- Combat and mitigate the desertification/land degradation and drought;
- Improve productivity of land, Sustainable management of land and water resources;
- Achieving Land Degradation Neutrality (LDN) in India, by 2030.

- **Land degradation status** of India in collaboration with

  Space Application Centre Ahmedabad
  National Remote Sensing Centre Hyderabad
  National Bureau of Soil survey and land Use Planning (NBSS&LUP)

- **Asia-Pacific regional workshop**
- **Land Degradation Reporting biannually through PRAIS Portal**

  Performance Review and Assessment of Implementation System (PRAIS)

- **LDN Target Setting Programme**
- **Economics of Land Degradation,** Desertification and Drought in collaboration with TERI.
- **World Day to Combat Desertification** on June 17 spread awareness
- **Desertification Atlas** of India

Activities and projects

1. India's Commitment made by Hon'ble PM at COP 14

- **Achieve Land Degradation Neutrality (LDN) by 2030**
- **Land Restoration** of 26 mha of land by 2030 (21 m hectares of Bonn Challenge target)

2. Co-ordination-MoEFCC (NAEB, GIM, Forest Wing, CC, CBD)

Inter-ministerial coordination ; MoAFW, MoRD, DOLR, Panchati Raj, Jal Shakti

3. Projects

- Legacy Project
- Transformative Project
- Demonstrative Projects
- GEF Funded Projects

4. **Capacity Building** Centre of Excellence for South-South Cooperation at ICFRE D Dun.
5. **Land degradation status** of India in collaboration with ISRO SAC, NRSC, NBSS&LUP
6. **National Action Plan-** Implementation
7. **Modelling Toll** For **Land –Water-Energy NEXUS** Model with IIASA Austria.
5. **COP Presidency** Hon'ble Minister MEFCC for two Years terms till end of 2021**.**
6. **UNCCD Focal Point**
7. **LDN reporting** through the PRAIS Portal**.**
8. **SDG 15** (life on Land reporting) and land related SDGs
9. **Mainstreaming** the Land Degradation and Desertification in the national policies.
10. **Synergies** the 3 Rio Conventions (UNFCCC, UNCBD, UNCCD)
11. **Innovative Financing** for investment in Land.

Lets Move towards a greener future

UNCCD COP14 NEW DELHI INDIA 2019

Restore land. Sustain future

सत्यमेव जयते

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

United Nations Convention to Combat Desertification

COP 14
UNITED NATIONS CONVENTION
TO COMBAT DESERTIFICATION, LAND DEGRADATION AND DROUGHT

2nd-13th September, 2019 | India Expo Centre & Mart, Greater Noida, Delhi NCR

About UNCCD

United Nations
Convention to Combat Desertification

❖ United Nations Convention to Combat Desertification (UNCCD) – Bonn (Germany)

- Legally binding international agreement linking environment and development to sustainable land management;

- One of the 3 Rio Conventions to evolve from the historic 'Earth Summit' held at Rio De Janerio, Brazil, in 1992. Adopted in Paris in June 1994

  - UNFCCC
  - CBD
  - UNCCD

- India became a signatory in 1994 and ratified in 1996.

Nature Protects if She is Protected

Conference of Parties (COP) – What is it?

- Established by the Convention –
  - The Supreme decision-making body ;
  - 197 country parties (including EU) as constituent members.

- Main Functions -
  - Review reports submitted by the Parties & make recommendations, adopt new annexes to the Convention
  - Guides the Convention as global circumstances and national needs change.

- COP meetings held biennially since 2001. **COP-13:** Held in Ordos, China in Sept 2017.
- **COP-14 (2-13 September):** India Took over COP Presidency from China for the next two years (2019-2021).

COP-14 Decision

<u>COP adopted about 36 decisions</u>

- COP -23,
- CST -6
- CRIC- 7

Delineating on how to implement thematic policy frameworks addressing:

- Land degradation;
  - Drought established the “Inter-governmental Working Group” (IWG).
  - Gender mainstreaming
  - Sand and dust storms;
  - Involvement of Corporate and Private and public sectors in the SLM
  - Land degradation induced Migration
  - Land Tenure relevance of the (Voluntary Guidelines on the Responsible Governance of Tenure of Land (VGGT)
  - The **Delhi Declaration:** Investing in Land and Unlocking Opportunities :

Hon'ble Prime Minister announcements at UNCCD COP-14

- **Centre for Excellence**
  - Indian Council for Forest Research and Education (ICFRE) Dehradun,
  - Initiative for enhanced South-South Cooperation that aims to share India's experiences on cost-effective and sustainable land management strategies;

- **India committed to achieve** by 2030
  - Land Degradation Neutrality (LDN)
  - Restore 26 million hectares of degraded land;

- Adopted the Delhi Declaration (Investing in Land and Unlocking Opportunities).

ICFRE-Centre for Excellence

India's knowledge and technology for Sustainable land Management demonstration for the transformative programmes and projects with the focus on:

- Capacity Building
- Technology transfer
- Promoting best practices
- Scaling Up Sustainable Land Management(SLM) technologies
- Developing ideas for transformative projects and programes to achieve LDN

Initiatives of Govt of India for restoring degraded land

- **National Afforestation & Eco Development Board (NAEB)**

  will be covering 24 million ha till 2030 @ 1.6 mha per year under(2.23 m ha this year)

  NAP, GIM, Nagar Van, CAMPA

- **Department of Land Resources (DOLR)**, Ministry of Rural Development :

  Restored an area of 20.5 million hectares till March 2020;

  New programme under which to cover 20 million hectares till 2024 @ 5 mha/yr

- **Ministry of Agriculture and Farmers Welfare**

Numerous programme, Sub Mission under Agro-Forestry, National Bamboo Mission, rainfed Area Dev. PKVK, Organic Farming will treat 18.82 mha.

सत्यमेव जयते

Tentative targeted area for Land Restoration by 2030

Ministry/Department	Programme/scheme/interventions	Target Area in mha				
		Per Year	2015- 2020	2020-2025	2025- 2030	Total area for restoration by 2030
Ministry of Environment, Forest and Climate Change	The National Afforestation and Eco-Development Board (NAEB), for the States under Twenty Point programme GIM	1.60	8.00	8.00	8.00	24.00
Department of land resources (DoLR), Ministry of Rural Development	Watershed Development Component of Pradhan Mantri Krishi Sinchayee Yojana (WDC-PMKSY)		20.50	20.00		40.50
Ministry of Agriculture and Farmer welfare	Paramparagat Krishi Vikas Yojana, promotion of organic farming and other schemes		7.651	5.535	5.635	18.821
	TOTAL AREA RESTORED		36.15	33.53	13.635	83.321

Ministry Agriculture and Farmer welfare
Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW).

SNO	Programe/Scheme	Area of Land Treated/ Restored in mha			Total Area of land to be Treated
		2015-2020	2021-2025	2026-2030	
1	Sub-Mission on Agroforestry (SMAF)	0.168	0.015	0.015	0.198
2	National Bamboo Mission	0.007	0.02	0.02	0.047
3	Pradhan Mantari Krishi Sinchayee Yojna - Per Drop More Crop	4.44	5	5	14.44
4	Integrated Farming System under Rainfed Area Development (RAD)	0.368	0.5	0.6	1.468
5	Paramparagat Krishi vikas Yojana (PKVY), Mission Organic Value Chain Development in North East Region (MOVCDNER)	0.65			0.65
6	3rd party Certification	2			2
7	Reclamation of Problem Soils (Alkaline/Saline & Acid)	0.018			0.018
	TOTAL	7.651	5.535	5.635	18.821

Department of Land Resources , Ministry of Rural Development

Watershed project	No	Area in mha	Period
Sanctioned	8214	39.07	2009-10
Uninitiated	345		
Preparatory Phase transferred State	1487		
DOLR Funded Project	6382		
Completed	2475	20.5	Approval up to 03/2020
Batch V	459		Mar-21
Batch VI	118		Mar-22
Subject to approval of Government			
New Programme @ 5 mha/yr		20	2020-21 to 2023-24
On going Project	577		
TOTAL		40.5	

Ministry of Rural Development

Waste/ Fallow Land Development under Mahatma Gandhi NREGA						TOTAL
Financial year	2019-20	2018-19	2017-18	2016-17	2015-16	2015-2020
Number of Works	141244	102436	139420	379104	211330	973534
Expenditure in Crores	1758.65	1675.89	1065.64	2271.87	1951.98	8724.03

Waste/ Fallow land Plantation under Mahatma Gandhi NREGS						TOTAL
Financial year	2019-20	2018-19	2017-18	2016-17	2015-16	
Number of Works	23773	13333	2010	3630	318	43064
Expenditure in Crores	528.02	425.46	58.72	39.43	39.43	1051.63

Land-Water-Energy Nexus Modelling

Integrated Decision Making Tool

International Institute for Applied Systems Analysis

Project	**Project**	Outcomes	Tenure of the Project	Budget of the Project (in crore)
Land-Water –Energy NEXUS Model	An integrated model for analyzing linkages between India's water land and energy policies and the SDG.	1.Tool for assessing the interlinkages between India's Land-warter and energy SDG Goals and the associated and solutions for avoiding trade-offs. 2. Achievement of SDG goals associated with land water and energy and climate change.	1 year	0.85

Thank You

ESTIMATION OF CURRENT EMISSION AND SEQUESTRATION AS WELL AS FUTURE POTENTIAL OF SEQUESTRATION/EMISSION REDUCTION TO ACHIEVE LAND DEGRADATION NEUTRALITY IN INDIA

Dr. J.V. Sharma

Director, Land Resources Division, TERI

Dr. Reena Singh

Associate Director, Sustainable Agriculture Division, TERI

Introduction

United Nations Convention to Combat Desertification

- The United Nations Convention to Combat Desertification (UNCCD) is one of 3 Rio Conventions which focuses upon Desertification, Land Degradation and Drought (DLDD). SDG 15 also specifically focuses on combating desertification, land degradation and restoring the degraded land.
- India has mandated to restore 26 million hectares degraded land to achieve land degradation neutrality (LDN) while degraded land is 96.4 MHA and impact on GDP is 2.54%
- As per the Biennial Update Report-II of India, submitted to UNFCCC, **emission from India stood at 2607.49 million tonnes CO_2 eq in 2014.**
- Out of the total emissions, the energy sector accounted for 73%, Industrial Processes and Product Use (IPPU) 8**%, agriculture 16%** and waste sector 3% . Forests are source and sink of GHGs.

Land-Use Sectors

Five land use sectors have been identified for the study viz. forestry (Forests and Tree cover), animal husbandry, wetlands, mining and agriculture.

Land use Sectors	Area	Source
Forest and Tree Cover	**80.72 Mha**	**ISFR (2019)- 24.56%**
Agriculture	**152.5 Mha**	
• Net sown area	140.13 Mha	Agricultural Statistics (2014-15)
• Culturable Wasteland	12.47 Mha	Agricultural Statistics (2014-15)
Animal husbandry	**36.44 Mha**	
• Permanent Pasture & other Grazing Land	10.26 Mha	Agricultural Statistics (2014-15)
• Fallow lands	26.18 Mha	Agricultural Statistics (2014-15)
Wetlands	**15.26 Mha**	**National Wetland Atlas- 2011-12)- 4.63%**
Mines	**0.45 Mha**	**Mining Sector -0.14% 454706.15 ha**
Other sectors		
• Non-agricultural use	26.88 Mha	Agricultural Statistics (2014-15)
• Barren & Un-culturable Land	17 Mha	Agricultural Statistics (2014-15)
Total Land	**328.73 Mha**	

Objectives

- Analyze the emission of different land use sectors in India
- Analyze the status of sequestration of different land use sectors in India
- Analyze the emission reduction from different land use sectors in India
- Analyze the future potential of sequestration to achieve land degradation neutrality.

Sector-Wise Emission Status

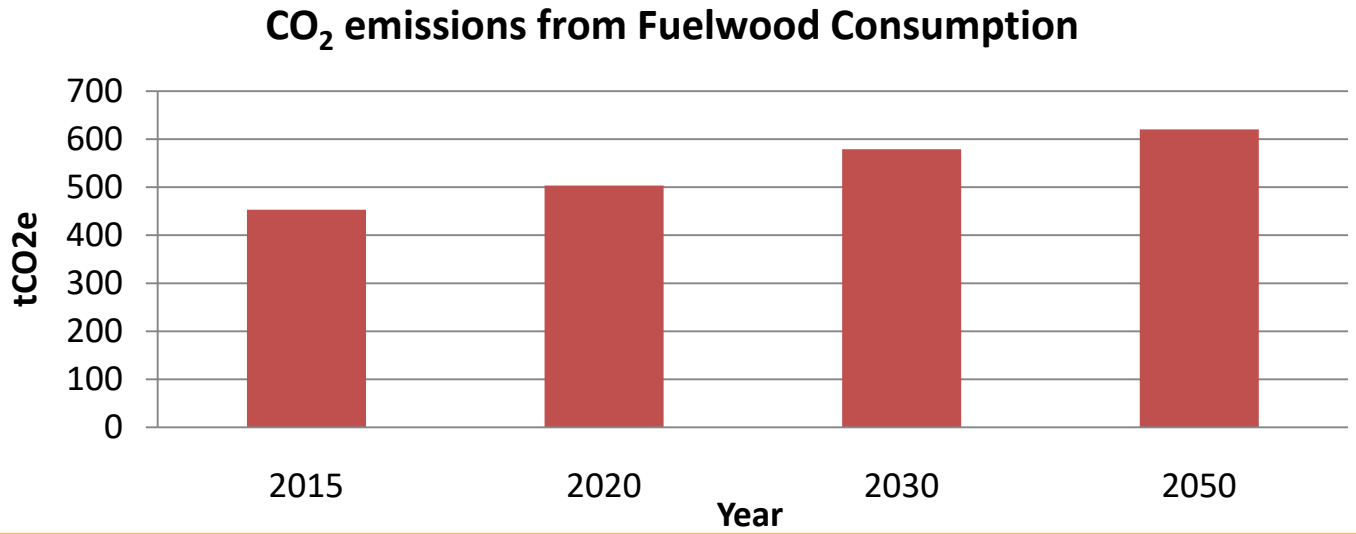
The total emission from the seven land use sectors in 2020 is estimated to be **1113.03 million tonnes of CO_2e,** which is projected to increase to 1240.23 million tonnes of CO_2e and 1340.87 million tonnes of CO_2e till 2030 an 2050 respectively.

Land use Sector	Emissions in 2020 (million tonnes of CO_2e)	Emissions in 2030 (million tonnes of CO_2e)	Emissions in 2050 (million tonnes of CO_2e)
Forestry	**539.13**	**626.91**	**680.12**
Fuelwood	503.45	579.01	620.46
Forest fire	8.18	9.40	10.06
Paper and Pulp	27.5	38.5	49.6
Animal husbandry	**248.58**	**254.53**	**266.60**
Mining	**25.66**	**27.33**	**30.67**
Wetlands	**28.63**	**26.30**	**21.65**
Agriculture	**271.03**	**305.16**	**341.83**
Total	**1113.03**	**1240.23**	**1340.87**

Forestry sector (48.43%) is the major contributor of emission out of the five sectors, followed by agriculture (24.35%) and animal husbandry (22.33%).

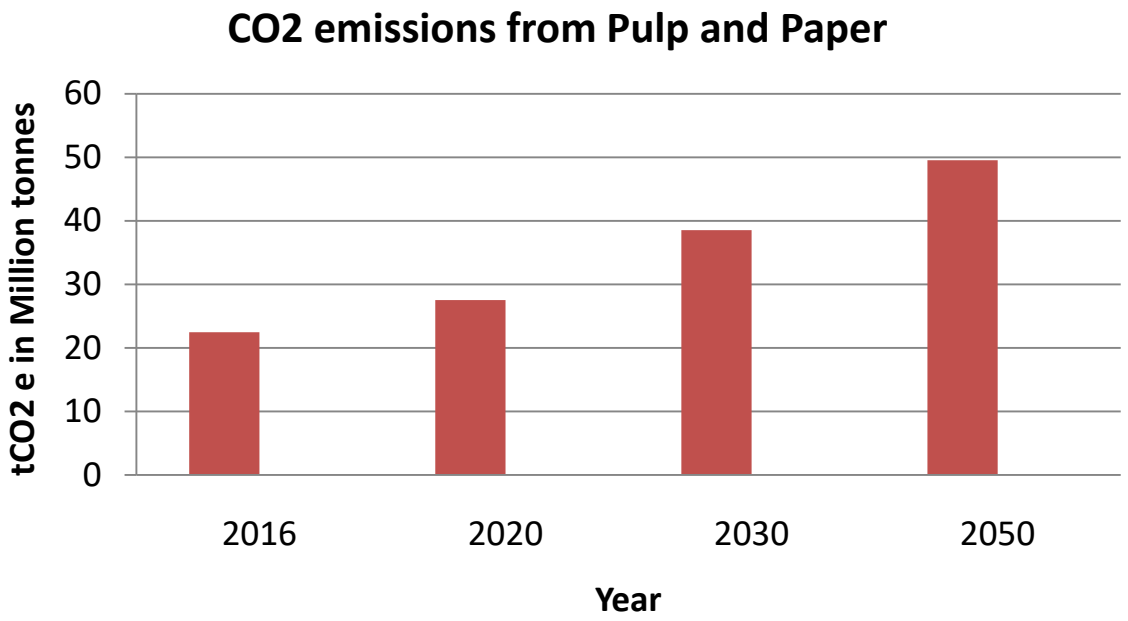
Forestry – I. Fuelwood

- 216.42 million tonnes of fuelwood is being used for energy requirement, out of which 58.75 million tonnes comes from natural forests (FSI 2011).
- In 2019, 274.36 million tonnes of fuelwood is being used to meet the energy requirement annually out of which 85.29 million tonnes of fuelwood are collected from natural forests (ISFR 2019).
- The total CO_2emissions from the fuelwood consumption in 2020 has been estimated as **503.45 million tonnes of CO_2e**. The emissions in 2030 will increase to 579.01 million tonnes of CO_2e and to 620.46 million tonnes of CO_2e in 2050 respectively considering population growth and economic status of rural people.



Forestry – II. Pulp and Paper

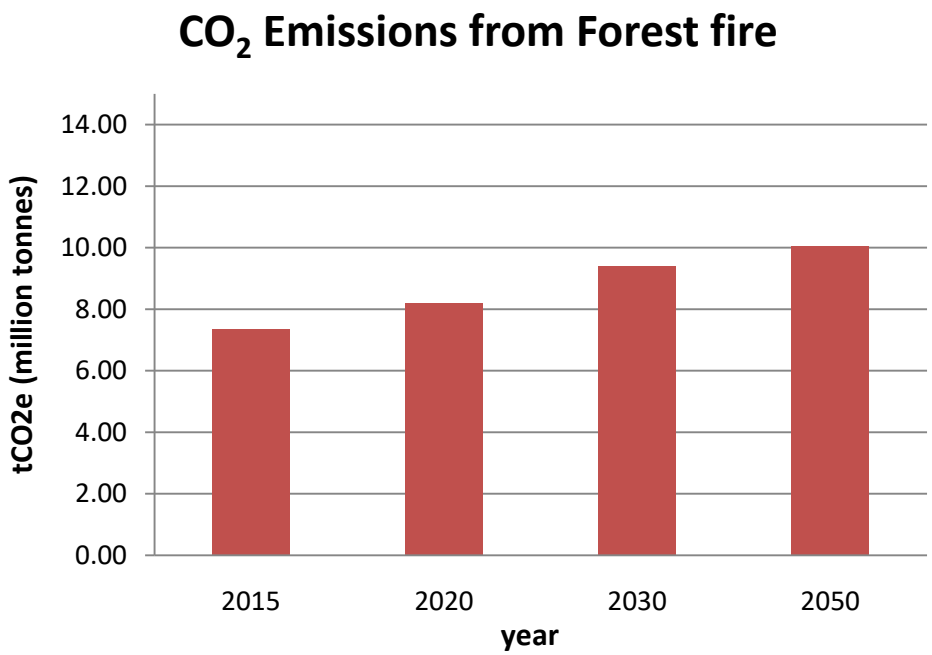
According to a study conducted by TERI in 2016 the annual biomass consumption in paper and pulp industry in 2016 was calculated to be 12.25 million tonnes and the CO_2 emissions from the paper and pulp industry was estimated as 22.47 million tonnes of CO_2e. Based on this we have projected the values for 2020, 2030 and 2050. The emissions in 2020 have increased to **27.52 million tonnes of CO_2e in 2020** and to 38.53 million tonnes of CO_2e and 49.55 million tonnes of CO_2e in 2030 and 2050 respectively.



Forest Fire

- Greenhouse gas emissions from forest fires strongly impact climate change.
- According to ISFR 2019, an analysis of fire prone forest areas was carried out by FSI.

Sl. No.	Categories	Area (in sq.km.)
1.	Extremely fire prone	22,622
2	Very highly fire prone	42,495
3	Highly Fire prone	75,952
4	Moderately fire prone	96,422
5	Less fire prone	4,20,627
	Total area	**6,58,118**

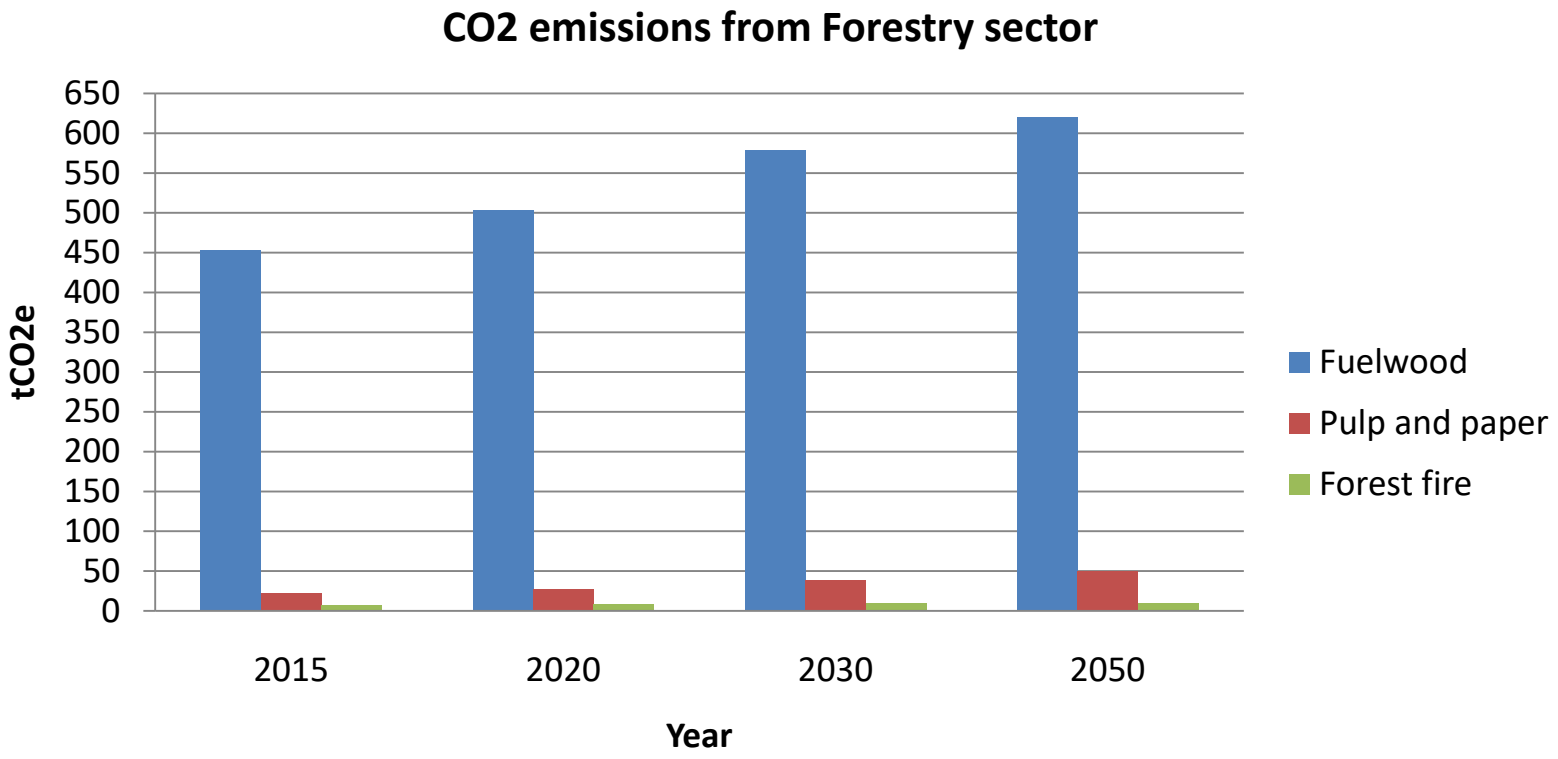


As per study conducted by TERI in 2016, the estimated biomass consumed in forest fire contributing to CO_2 emissions (Mt) in 2020 is 4.46 million tonnes. Therefore the estimated CO_2emissions from forest fire is **8.1841 million tonnes of CO_2e**.

It was observed from the study that dense types of forests are contributing to release more emissions. As compared to open forests, dense forests have more quantity of fuel that leads to high biomass burning and consequently high carbon emissions.

Overall emissions from Forestry sector

The total estimated CO_2 emissions from fuelwood, pulp and paper and forest fire in 2020 is **539.14 million tonnes of CO_2e.** The CO_2 emissions will increase upto 626.91 million tonnes of CO_2e and 680.11 million tonnes of CO_2e in 2030 and 2050 respectively. The graphical representation below shows the projections of CO_2 emissions till 2050.



Status of sequestration

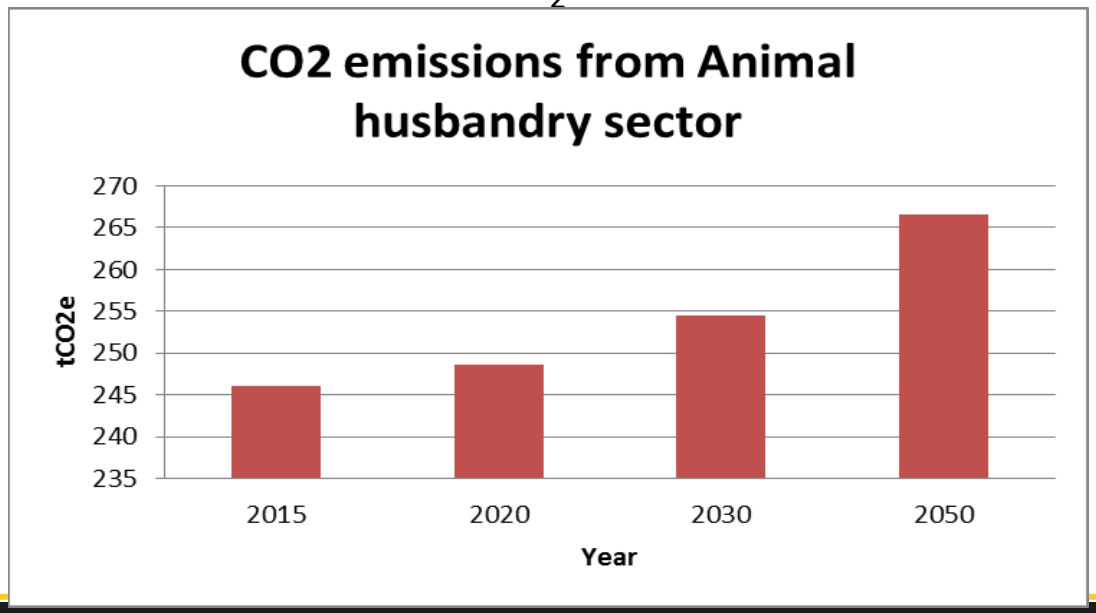
- The **gain and loss method** is used for estimating the annual sequestration.
- Average annual productivity in Forests - 1.8m^3/ha/year ; and TOF - 10m^3/ha/year (ISFR, 1987).
- Biomass expansion factor : For Dense forest - 3.4, Moderately dense forest - 2.5 and Open forests -1.14.
- In case of forests, average annual productivity × total area ×biomass expansion factor
- In case of trees outside forests, the average annual productivity × total area.
- Carbon sequestered from forests is estimated to be **631.54 Million Tonnes of CO_2e**, and carbon sequestered from TOF is estimated to be **293.84 Million Tonnes of CO_2e**. Therefore the total carbon sequestered in 2020 is **925.38 Million Tonnes of CO_2e.**

Reduction in CO_2 Emissions & Enhancing Sequestration

- Use of LPG save 90% and ICD save 25-35% Emission in comparison to fuel wood. 453 MT CO_2 could be saved if LPG refilling continues.
- Carbon Neutrality Policy and Registry of Carbon transaction at National level will boost the sequestration under the umbrella of Polluter Pays Principle and PES Mechanism
- Implementation of Agroforestry Policy in true spirit and also creating better market for Agroforestry produce such as higher import duty, QPM, rationalize ,transit and felling rules, and rules for WBI.
- NFP-1988 slogan must be Grow more wood and use more wood, enhance forest based livelihood with sustainable use of resource and water conservation

Animal Husbandry

- Major source of GHG emissions from animal husbandry sector are CO_2, CH_4, N_2O, fluorinated gases and some other gases which accounts 18% of GHG emissions of India.
- Livestock production results **in methane (CH_4) emissions from enteric fermentation** and **CH_4 and nitrous oxide (N_2O) emissions from livestock manure management systems.** The emissions from manure management has been included in the agricultural sector, therefore we haven't included it in animal husbandry.
- Total CO_2 emissions from animal husbandry sector increases from **248.58 million tonnes of CO_2e in 2020** to 254.53 and 266.60 million tonnes of CO_2e in 2030 and 2050 respectively.

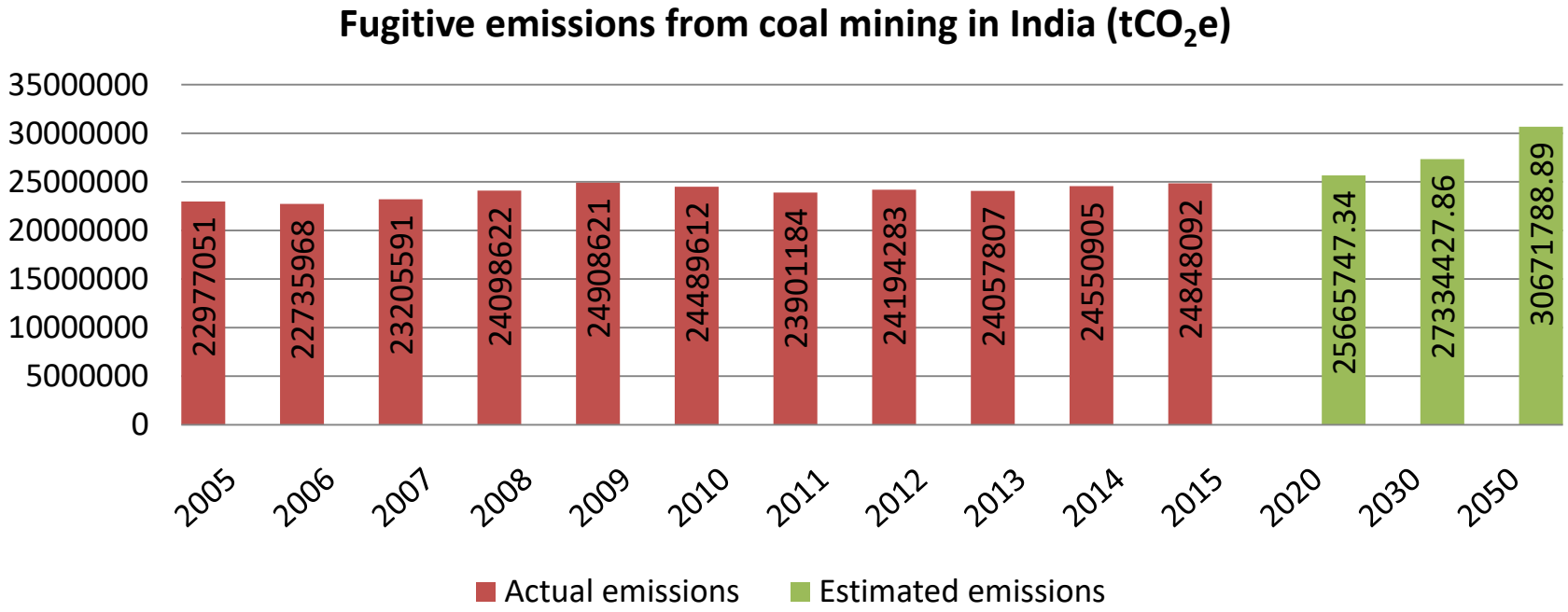


Mining Sector

- Mining is a major sector contributing to economy of India
- Carbon emission from mining sector results during (i) Conversion of forest land to mines (ii) Extraction and production of minerals.
- Total land diverted from forest for mining purpose under FCA, 1980 is 0.**14 million hectares**
- The total carbon stock of SOC was estimated to be 6.58 million tonnes which is 58.35% of the total carbon stock of all the pools. The emissions from diversion of forest land from mining are estimated to be **24.14 mtCO_2e** from 1980 - 2018

Mining Sector

- In mining sector, the highest emissions are from coal mining. The emissions are in the form of methane which escapes during the process of extraction.
- In 2015, the emissions from coal mining in India accounts to 24.82 million tCO_2e as per the GWP- AR5 of IPCC.



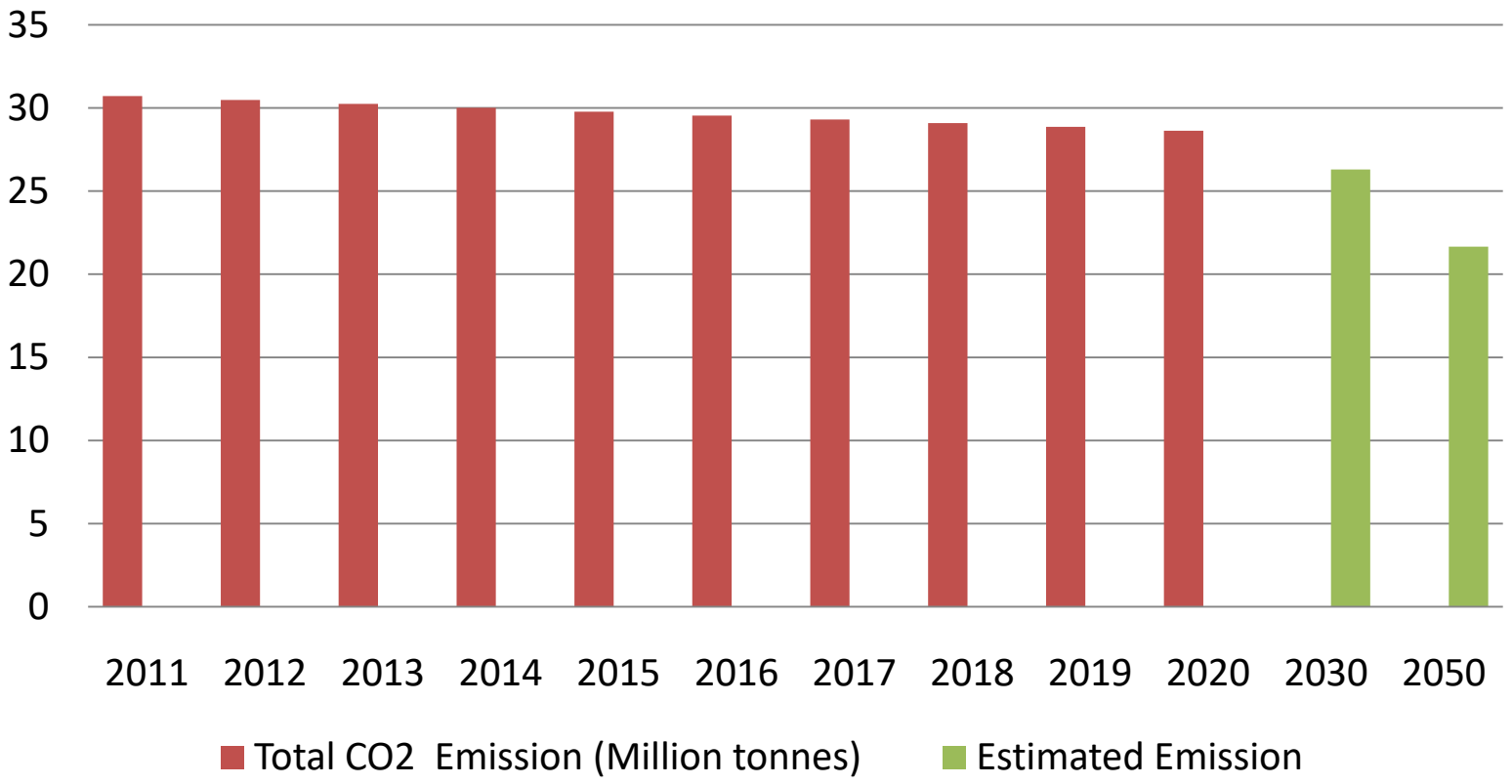
Based on the BAU trend of fugitive emissions over the years, the fugitive emissions for 2020 are estimated to 25.66 million tCO_2e.

In terms of the future scenario, the emissions by 2030 are expected to grow by 10% to 27.33 million tCO_2e as compared to 2015. The emissions might increase up to 30.67 million tCO_2e by 2050.

Wetlands

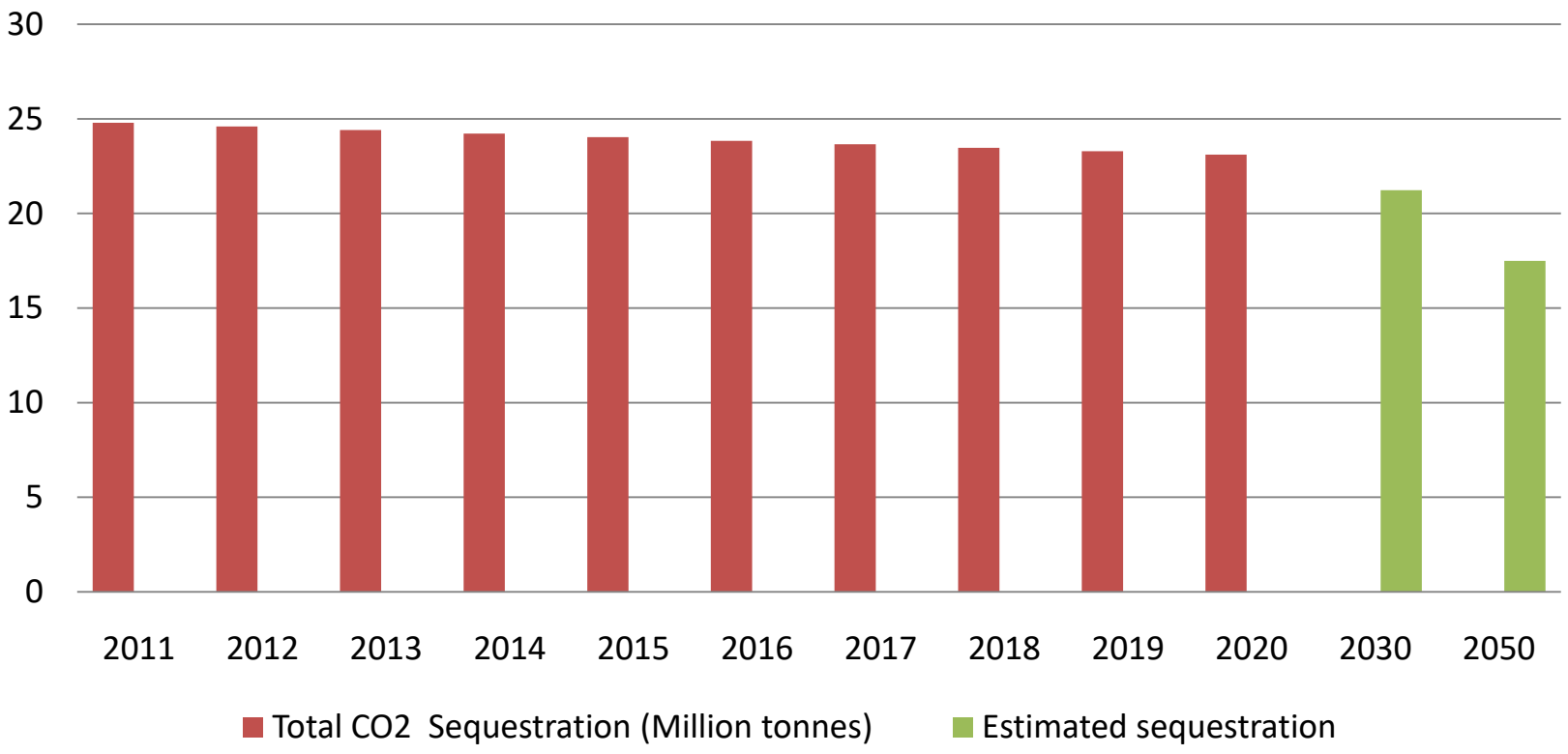
- Wetlands cover about 5-8% of the Earth's surface and contain 20-25 % of global terrestrial carbon (350-535 Gt or billion metric tonnes C) (Gorham, 1995; Mitsch & Gosselink, 2015).
- In India, wetlands are broadly categorised into inland wetlands and coastal wetlands (both natural and human made).
- The National Wetland Atlas prepared by Space Application Centre in 2011 (SAC 2011) identifies the area under inland wetlands to be 10.56 (million hectares) mha (including rivers and streams that were not included by SAC, 1998) and area under coastal wetlands to be 4.14 mha leading to a total figure of **14.7 mha.** Post-monsoon: **8.6 mha** while Pre-monsoon: **5.8 mha**
- Data was available only for 11 wetland types out of 19 provided by SAC 2011 and was used to extrapolate the emissions and sequestration of these specific 11 wetland types represented by our measurements to the whole of India and thereby estimate the influence of wetland net CO_2 storage on India's greenhouse gas inventory.
- Considering the average annual rate of natural wetland loss of -0.78% a year as estimated by the Wetland Estimate Trend (WET) Index (Ramsar 2018), emission & sequestration rates have been calculated.

Total CO_2 emissions from Indian wetlands



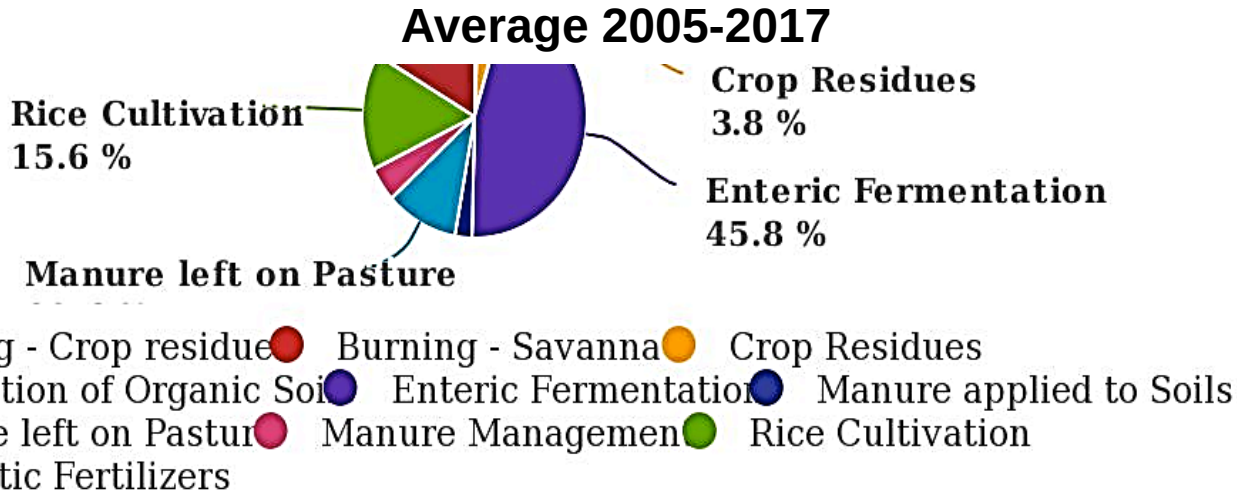
The total estimated CO_2 emissions from wetlands in 2020 is **28.63 million tonnes of CO_2e.** The CO_2 emissions will decrease upto 26.29 million tonnes of CO_2e and 21.65 million tonnes of CO_2e in 2030 and 2050 respectively. The graphical representation below shows the projections of CO_2 emissions till 2050.

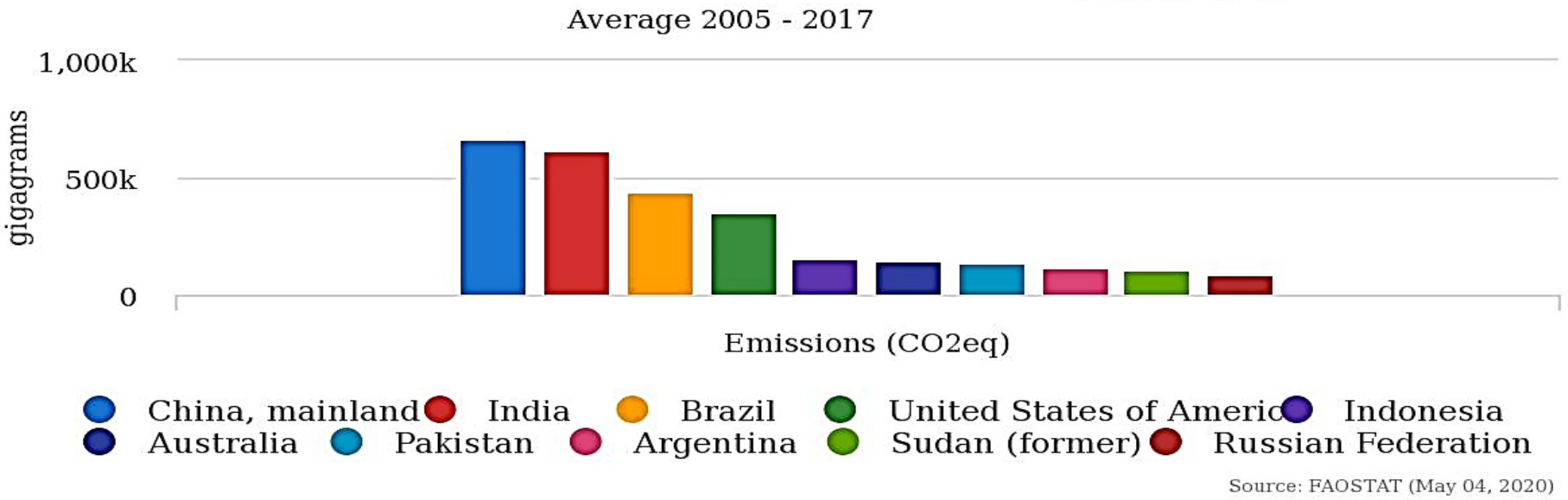
Carbon sequestration from Indian Wetlands



The total estimated CO_2 sequestration from wetlands in 2020 is 23.10 **million tonnes of CO_2e.** The CO_2 sequestration will decrease upto 21.22 million tonnes of CO_2e and 17.47 million tonnes of CO_2e in 2030 and 2050 respectively. The graphical representation below shows the projections of CO_2 sequestration till 2050.

Agriculture- GHG Story of Indian Agri. (Total)

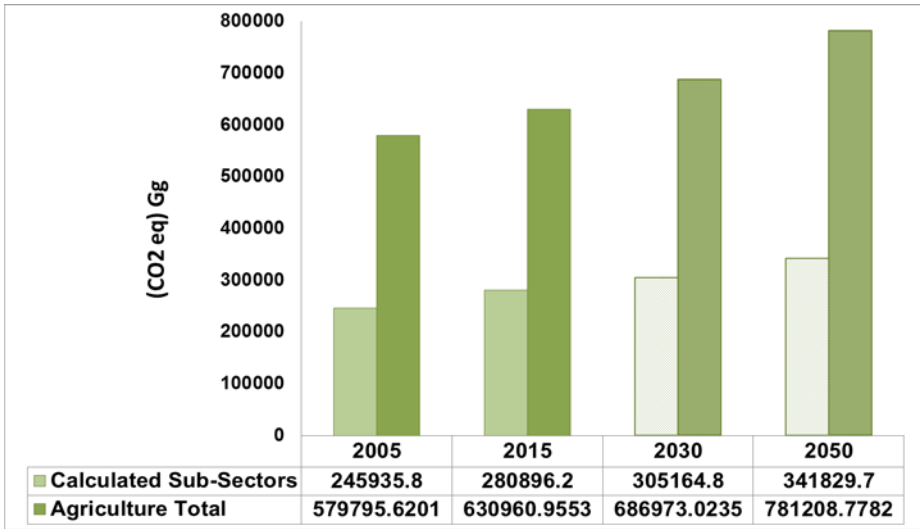




Source: FAOSTAT (May 04, 2020)

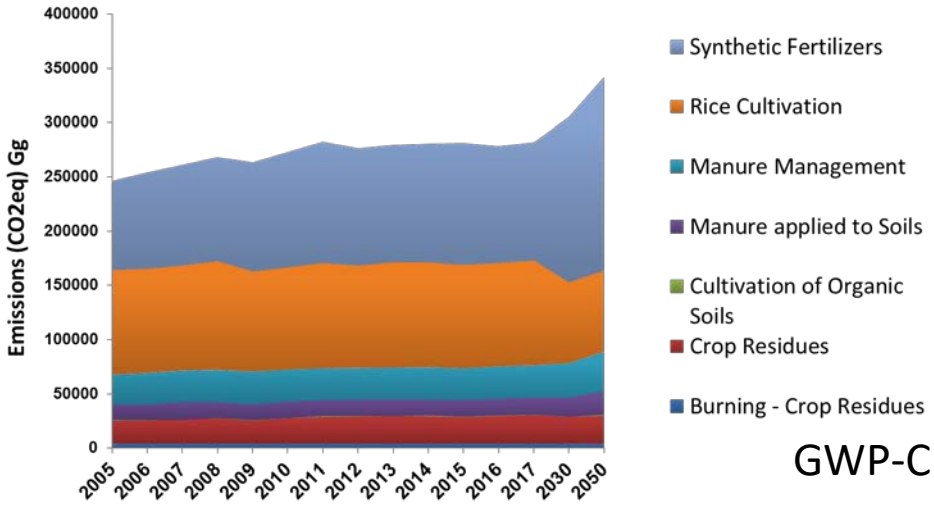
ENERGY AGRICULTURE ENVIRONMENT HABITAT RESOURCE SECURITY CLIMATE HEALTH & NUTRITION

Emissions - Land Use



	2005	2015	2030	2050
Calculated Sub-Sectors	245935.8	280896.2	305164.8	341829.7
Agriculture Total	579795.6201	630960.9553	686973.0235	781208.7782

Comparison with Total Agricultural Emission



Emission Highlights (CO2eq) Gg from the seven calculated sub-sectors

GWP-CH4 = 21; GWP-N2O = 310 as per IPCC AR4

ENERGY AGRICULTURE ENVIRONMENT HABITAT RESOURCE SECURITY CLIMATE HEALTH & NUTRITION

Future potentials

- Carbon-neutral or negative management practices can have a synergistic impact on crop productivity, soil health, and on the GHG sequestration.

- Climate compatible crop development for the future using new horizon game changing technologies such as mycorrhizal technology, CRISPR/Cas9 and Nano-fertilizers for precision agriculture (integrated nutrient management).

- Effective carbon sequestration in major cropping systems in India needs to know-how, proper technology dissemination channel, financial reward system and government policies. Any single practice cannot improve the SOC in the soil. There is a need for a multidisciplinary approach with multiple R&D institutions, farmers, and policy-makers to collectively address this complex challenge and meet the national sustainable development goals.


Thank You

Role of Rainfed & Degraded Lands in India In Realizing the Land Degradation Neutrality (LDN)

22nd July, 2020

Umakant

Joint Secretary

Department of Land Resources

Ministry of Rural Development

Government of India

National Context

- Approx. 329 mha TGA : 141.43 mha (42.98%) - net sown area; of which 68.10 mha (48.15%) irrigated and remaining 73.33 mha (51.85%) RAINFED *(source: M/o Agri., & Farmers Welfare)*
- 29.32% of TGA experiencing land degradation *(Source: Desertification Atlas)*
- DoLR: 2014 -15 to June, 2020: developed 23 mha rainfed & degraded land developed under Watershed programme; still 62.0 mha to be developed.
- SDG 15.3: Land Degradation Neutrality (LDN): 26 mha by 2030 (includes 13 mha by 2020 + 8 mha by 2030 under Bonn Challenge) and another 5 mha by 2030 added by Hon'ble PM)
- Focal Point on UNCCD (MOEF&CC) roped in IUCN for collection and collation of data for reporting on Internationally acceptable matrix
- Challenges (National & International perspective): (a) data harmonization, (b) verifiable achievements on LDN, (c) transforming data on Internationally accepted matrix, (d) ensuring sustainability of development of rainfed & degraded lands

Evolution of WDC-PMKSY

- **1995- 2009:**

  Desert Development Programme (DDP)

  Drought Prone Areas Programme (DPAP)

  Integrated Wastelands Development Programme (IWDP)

- **2009-2015:**

  Integrated Watershed Management Programme (IWMP) (w.e.f. 26.02.2009)

- **2015 - till date:**

  From 01.07.2015 IWMP amalgamated as the Watershed Development Component of the Pradhan Mantri Krishi Sinchayee Yojana (WDC-PMKSY)

Present Status

- **8214** projects sanctioned during **2009-10 to 2014-15** in **28** States; 1837 with 9.50 million ha target returned to states in 2018; 6382 remained with DoLR for central funding.
- **39.07 million ha.** (approx.); revised target: 29.57 million ha
- No new watershed projects sanctioned since FY 2015-16.

Phase of projects	No. of projects as on 21.07.2020
Works Phase	2067
Consolidation Phase	254
Administrative Completion / Closure	4061(63.63%)
Uninitiated projects transferred to States on 08.2.2018.	345
Projects in preparatory phase transferred to States on 01.8.2018	1487

Physical Progress

Indicators / Parameters	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	Total**
No. of Water Harvesting Structures (in Lakh)	1.08	1.05	1.55	1.37	0.81	0.90	6.86
Additional Area brought under protective Irrigation (in Lakh ha) *	1.87	2.47	3.07	2.87	2.57	1.52	14.55
No. of Farmers Benefited (in Lakh)	4.40	5.07	5.20	4.73	6.52	4.23	30.76
Area brought under plantation [Afforestation / Horticulture etc.] (in Lakh ha)	-	-	-	-	0.70	0.56	1.36
Area of culturable wastelands treated in completed / closed projects (in Lakh ha)	-	-	-	-	1.78	0.77	2.59
No. of man-days generated (in Lakh man-days)	-	-	-	-	168.96	86.16	275.48

* Target : 11.50 Lakh ha (as per PMKSY) ** includes progress upto Q1 2020-21

- Note :The bottom three new indicators were introduced in 2018-19 by NITI Aayog.

End-line Evaluation Reports

Andhra Pradesh	
Indicator	**Achievement**
Water Table	+15%
Cultivated Area	+30%
Crop Productivity	+30%
Crop Production	+20%
Area under Water Bodies	+8%
Milk Production	+40%
Vegetation Cover	+50%

Maharashtra	
Indicator	**Achievement**
Water Table	+0.2 m to 2m
Cultivated Area	+2.29%
Crop Productivity	+2-3 qt/Ha
Cropping Intensity	+ 18.3%
Stream Flow duration	+1.24 months.
Dependence on Tankers	-2.47 months.
Annual Income	+70.13%
Outmigration	-32%

End-line Evaluation Reports (contd...)

Karnataka	
Indicator	**Achievement**
Water Table	+2 m to 3 m
Irrigated Area	+ 6 %
Gross Cropped Area	+ 6.82 %
Crop Productivity	+ 41.5 % to 61.5 %
Crop Intensity	+ 6%
Vegetation Density	+ 3 to +24 times (Forestry)
Milk Production	+ +14 % to 29 %
Per Capita income	+ 21 % to 254 %

Rajasthan	
Indicator	**Achievement**
Water Table	+0.41 m to 1.32 m
Irrigated Area	+ 26.29 %
Gross Cropped Area	+26.28 %
Crop Productivity	+ 7.03% to 97.62 %
Crop Intensity	+ 3.23%
Outmigration	-1.34 %
Milk Production	+18.60 % to 37.86%
Avg Annual income	+ 8.28 % to 18.72 %

Besides States, NITI Aayog is also evaluating projects through WAPCOS and KPMG

End-line Evaluation Reports (contd...)

Nagaland	
Indicator	**Achievement**
Water Table	+32.04 %
Irrigation Potential	+60 ha per project (average)
Area of Wasteland (brought under productive use)	-52.06%
Area under Plantation	+79 ha per project (average)
Employment Generation	+67.93%
Milk Production	+100.48%
Outmigration	-48.28%
Average Annual Income	+71.85%

Real Time Monitoring

- Space Technology: Tied up with NRSC to monitor the programme (2015 / 2016)
  - Srishti geo-portal
  - Drishti mobile app
- Geo-coded and time stamped photographs of works are uploaded using mobile application ‘Drishti’
- 13.30 lakh photos uploaded till 21.07.2020.
- The tool aids in physical and qualitative assessment of works.

Watershed Management Programme by 2024

Target:

DoLR intends to (a) complete all ongoing watershed projects by 2021
(b) development of 20 million ha of rainfed & degraded areas @ 5 million ha/year

Way Forward:

- Revision in Cost Norm (@ Rs. 22,000-25,000/ha); EFC Memo under finalization.
- Guidelines revision under progress; will incorporate lessons learnt
- Climate mainstreaming
- LRI technique being focused upon
- FPOs, SHGs and UGs: Market linkages, Post harvest mgt and transport
- Close monitoring from Centre
- Effective convergence with other related schemes at field level: HKKP and PDMC, MGNREGA, Agro-forestry schemes, fisheries, AH, Goatary etc.
- Capacity building of States, Panchayat and watershed committee members
- Strengthening of Institutions involved in implementation

World Bank Assisted Projects: REWARD (Rejuvenating Watersheds for Agricultural Resilience through Innovative Development)

- Still in formulation phase with DEA & World Bank
- Objective: To provide technical assistance as well as implementation support.
- Project cost: USD 250 million; USD 178.50 loan component
- Three states onboard: Karnataka, Odisha and Andhra Pradesh; 70:30 laon and with DoLR with 50:50 loan.
- World Bank and States under separate agreements; DoLR also separate agreement.
- Reimbursement model P4R
- Saturation mode of activities
- DoLR will anchor, coordinate, monitor, make available National & International Knowledge exchange and report overall progress.

Concerns for achieving sustainable LDN

- For NDC, internationally accepted matrix required.
- Climate resilience: adaptation & mitigation
- Sustainability: post project management challenges, WDF, IEC, Local Community level engagement, FPOs, SHGs, Ugs
- LRI: Micro-watersheds, Soil profiling, Land Mgt Unit, Crop suitability, water budgeting
- 'Land' state subject: States' role is critical
- Convergence: JSA, GKRA
- **Local Leadership holds the key to success:** Hibre Bazar, Ralegaon Sidhi and Piplantri models

Continuous Contour Trench (CCT) and Deep CCT

IWMP-3 (2010-11) Project, Gram panchayat - Akhodiya khed Block - Rajsamand, District -Rajsamand, Rajasthan,

Karnataka

Checkdam-III, PMKSY-III Batch, 2016-17, Alaghatta, Hosadurga Taluk.Chitradurga Dist

Water Absorption Trench

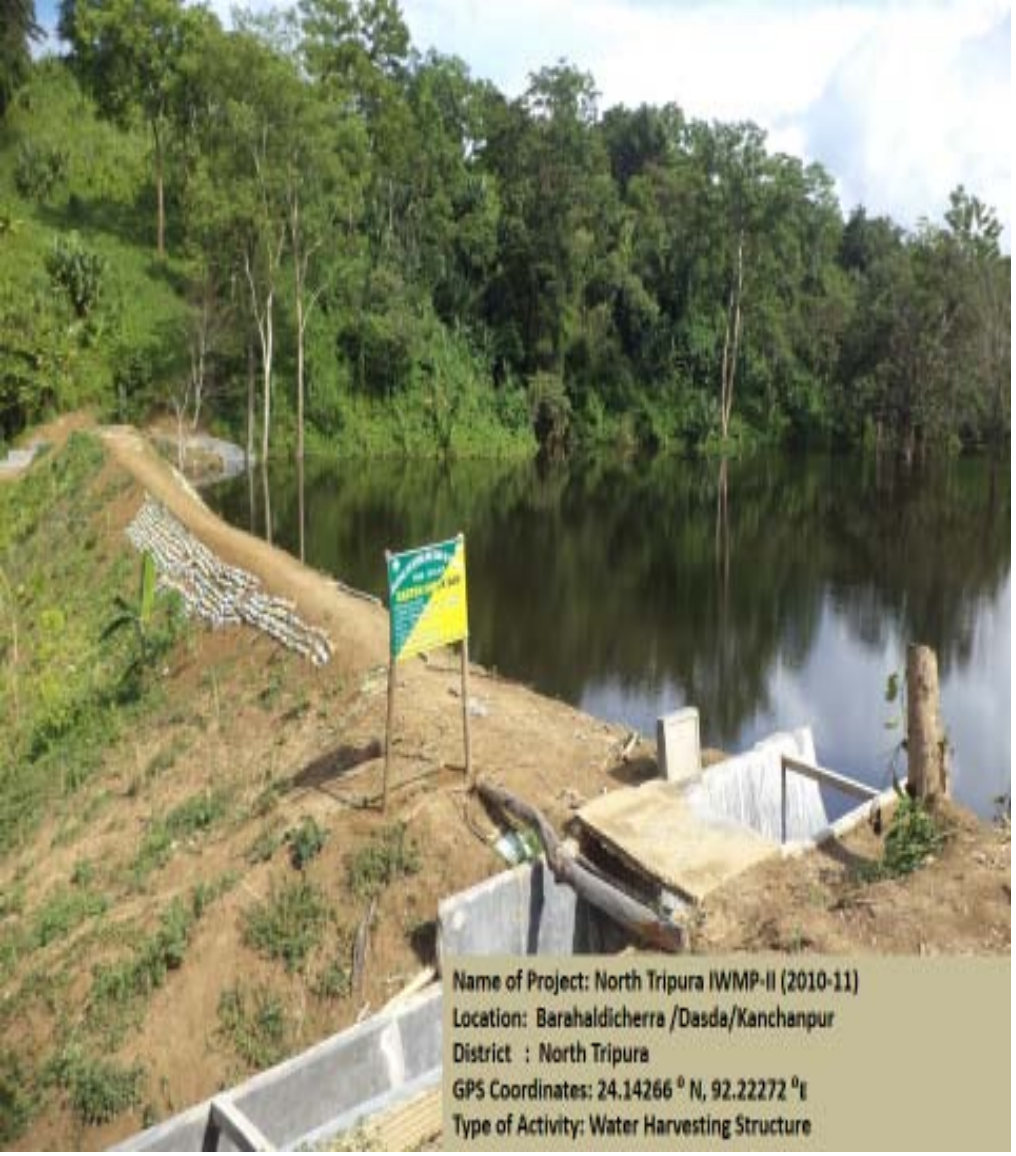
IWMP-1 (2009-10) Project, Block- Saharapada, District-Keonjhar, Odisha

Farm Pond at Ajmer District Rajasthan
(IWMP Batch II projects)

Diversion channel in Batch IV at Kolar District Karnataka

Contour bunding with tree plantation : Field visit by Secretary & DoLR team at Kolar District Karnataka

Drumstick Plantation with Convergence at Kolar District Karnataka



Water Harvesting Structure
IWMP-2/ (2010-11) Project, District -North Tripura, Tripura

Before

Work in Progress

Village Pond Construction at Jaswantgadh Village in Amreli District, Gujarat

Storage capacity : 0.38 Mcft

Area covered 45 ha

Project cost : Rs. 1.69 Lakh

Completion

Dry Land Horticulture (Mango)

District	Y.S.R. Kadapa
Batch	2009-10
WCC	RAYACHOTY
Work Name	DRY HORTICULTURE
Location	T. VENKATAMMA
Work ID	21457
Mandal	VEERABALLI
Mega Watershed	VEERABALLI
Micro Watershed	Gurrappagaripalli-III
Latitude	14.07.37
Longitude	78.53.14

IWMP-6 (2009-10) Project, District Y.S.R. Kadapa, Andhra Pradesh

Pre-monsoon

Post-monsoon

Anicut IWMP-8 (2011-12) Project, Gram panchayat -Pilak, Block - Jhadol, District - Udaipur, Rajasthan

Farm pond at Kolar District Karnataka

Ground nut Crop with harvested rain water & Sprinkler through Convergence at Kolar District Karnataka

IWMP – IX / 2012-2013, Thodupuzha Block,
Idukki – Bund construction with Coir Geo Textiles, Kerala

Name of the Project: Dhalai IWMP-II/B-II
Location: Jarulcherra IWMP
District : Dhalai, Tripura
Type of Activity: Pineapple plantation

Capacity building of Self Help Groups

IWMP-1 (2010-11) Project, Village - Katlabodi , Block –Umred Nagpur, Maharashtra


Thank You!