



# General Studies Manual for UPSC and State Public Services Examinations 2014

Environment, Biodiversity and Climate Change  
Module-6: Environment Related Issues and Concepts-3

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**Contents**

Chapter 1. Critical Wildlife Habitats.....	4
Chapter 2. National Green Tribunal .....	4
Chairperson and Members of NGT .....	5
Qualification for Chairperson .....	5
Qualification for Judicial member .....	5
Qualification for Expert members.....	5
Post retirement jobs .....	5
Other Notes .....	5
Jurisdiction .....	5
Some more notes.....	6
Chapter 3. The Story of Go and No-Go and “Inviolate” areas .....	6
Fall Out of the policy.....	7
The BK Chaturvedi Panel .....	7
Scrapping the Go, No Go.....	7
The Tishyarakshit Chatterjee Committee .....	7
The EGoM and current position of the Inviolate Areas.....	8
Chapter 4. Environmental Problem of Phumdies.....	8
Chapter 5. Coastal Regulation Zone Notification 2011 .....	9
Objectives: .....	9
Background: .....	9
What is the limit of the CRZ Area?.....	9
Does the above area impose any restriction on Fishing activities? .....	9
What is CZMP? .....	9
What is the definition of the No development Zone?.....	10
What is proposed enactment to protect the traditional rights of the Fishermen? .....	10
What about the demand for Coastal Zone Regulation law? .....	10
Why CRZ Notification is so important? .....	10
What is allowed and what is not allowed? .....	10
Chapter 6. Plastic Waste (Management and Handling) Rules, 2011 .....	10
Chapter 7. Desertification & UNCCD.....	11
Role of Jojoba Plant in fight with desertification.....	12
How it is beneficial to India?.....	13
Area Producing: .....	13
Chapter 8. Heat Resistant Crops & NICRA.....	13
Chapter 9. Various Topics on Biofuels .....	14
Biodcohols.....	14
Ethanol v/s Gasoline .....	14
Ethanol blending Programme.....	14
Biodiesel .....	15
Jatropha Plant.....	15
National Policy on Biofuels .....	16
Chapter 10. The Climate Change Negotiations .....	17
Earth Summit 1992 .....	17
Rio Declaration on Environment and Development.....	17
Agenda 21 .....	17
United Nations Framework Convention on Climate Change .....	18
Is UNFCCC is legally binding? .....	18
Date of enforcement and members? .....	18
Secretariat.....	18
Convention entering into force.....	19
Classification of the Parties .....	19
Annex-I Countries:.....	19
Annex II Countries: .....	19
Developing Countries: .....	19
Why no emission reduction targets for Developing countries? .....	20
What is the issue? .....	20
Conference of Parties.....	20

Chapter 11. Kyoto Protocol .....	21
Kyoto mechanisms .....	22
Extension of Kyoto Protocol Beyond 2012 .....	22
COP 18 - Extension of Kyoto Protocol: The Doha Climate Gateway .....	23
India and Kyoto Protocol.....	24
Emissions Trading.....	24
Emissions Trading in India: Market Friendly Emissions Scheme (MFES).....	25
Carbon Credit , Kyoto Units and Assigned Amount Units.....	26
Certified Emission Reductions (CERs).....	27
Joint Implementation Mechanism .....	27
Clean Development Mechanism .....	27
Programme of Activities (PoA) .....	29
Chapter 12. United Nations Conference on Sustainable Development (Rio+20).....	29
Objectives of Rio+20 .....	29
Outcomes .....	30
Chapter 13. Ministry of Environment & Forests.....	31
Botanical Survey of India (BSI) .....	32
Indian Botanic Garden, Howrah .....	32
Central National Herbarium, Howrah .....	32
Botanic Garden of India Republic (BGIR), NOIDA.....	32
Zoological Survey of India (ZSI) .....	33
Forest Survey of India.....	33
ANIFPDCL.....	33
Central Zoo Authority.....	33
Wildlife Institute of India, Dehradun .....	34
National River Conservation Directorate .....	34
National Ganga River Basin Authority .....	34
National Afforestation and Eco-Development Board (NAEB).....	34
G.B. Pant Institute of Himalayan Environment and Development, Kosi-Katarmal, Almora .....	35
Indian Council of Forestry Research and Education (ICFRE), Dehradun.....	35
Indian Institute of Forest Management (IIFM), Bhopal.....	36
Chapter 14. National Environment Policy .....	36
Chapter 15. Climate Change Concepts & Questions – Compendium-2 .....	36
What is Carbon Leakage? .....	36
What was the Bali Action Plan ? .....	36
What was Delhi Ministerial Dialogue ? .....	37
What is ICIMOD ? .....	37
National Mission for Sustaining the Himalayan Ecosystem (NMSHE).....	37
National Ganga River Basin Authority (NGRBA) .....	38
Yamuna Action Plan (YAP).....	40
What is the role of Paddy Fields in Global Warming? .....	41
What are Eco-sensitive Zones?.....	41
List of India's Eco Sensitive Zones .....	42
Protection of Olive Ridley Turtles .....	42
Protection of Kachuga dhonkoga.....	43
Great Indian one-horned Rhinoceros Census.....	43
2013 as Year of Water Cooperation .....	44
New Pashmina Development Scheme.....	44
Issue of the Dongria Kondh tribe and Vedanta .....	44
Vinod Rishi Panel to study legal cover for elephant habitats.....	44
NAPCC and its 8 missions.....	45
Planning Commission's Environment Performance Index .....	46
Impact of Walker circulation on Indian Monsoon .....	47
Fluoride water and Tridax procumbens .....	47
Some more notes:.....	47

**Chapter 1. Critical Wildlife Habitats**

The Critical Wildlife Habitats have been envisaged in **Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006**. This act defines the Critical wildlife habitats (CWH) as the “*areas of national parks and sanctuaries where it has been specifically and clearly established, case by case, on the basis of scientific and objective criteria, that such areas are required to be kept as inviolate for the purposes of wildlife conservation...*”.

The above definition makes it very clear that the **Critical Wildlife Habitats are absolutely free of human presence**. But the same act duly recognizes the traditional rights of the Forest dwellers.

The power to notify the rules to designate a CWH rests with **Ministry of Environment and Forests**. The State Government are needed to initiate the process for notification of a critical wildlife habitat by submitting an application on a case by case basis, to the Ministry of Environment and Forests, which is the nodal agency under the said Act.

***Critical Wildlife Habitats are thus, declared by Central Government ONLY.***

The Ministry of environment and forests had come under severe criticism in 2011 for its guidelines on the CWH, however, under pressure from forest rights activists, the ministry changed the guidelines.

*For your examination, you must not forget the following observations:*

- ✓ Maintaining such critical areas is of utmost importance for the protection of the wildlife but equally sensitive issue is the rights of the forest dwellers and tribals. While the Forest Rights Act allows for some areas in forests to be kept free of human presence, stringent conditions have been set for the identification of these areas.
- ✓ Before a critical wildlife area is notified, not only do the rights of the tribals and forest dwellers have to be settled, but also scientific evidence has to be provided to establish that people's presence would adversely impact the wildlife in area.
- ✓ The affected gram sabha is also required to give its assent to the creating these inviolate areas or critical wildlife habitats. The free informed consent of the Gram Sabha must be given before any relocation of the forest dwellers is carried out.
- ✓ There is a National Steering Committee, which shall make the final decision on the notification of such habitats.

**Chapter 2. National Green Tribunal**

*Green Benches refers to the benches of the National Green Tribunal.* NGT was established by a Government Notification using the powers of Section 3 of the NGT Act 2010. The objective of establishing a National Green Tribunal were as follows:

- ✓ To provide effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment.
- ✓ Giving relief and compensation for damages to persons and property

- ✓ Other Related Matters.

#### **Chairperson and Members of NGT**

It has a full time chairperson and following members:

- ✓ At least 10 and maximum 20 Full time Judicial members
- ✓ At least 10 and maximum 20 Full time Expert Members

#### **Qualification for Chairperson**

The person should have been either a Judge of India's Supreme Court or Chief Justice of a High Court in India.

#### **Qualification for Judicial member**

A Judge of Supreme Court of India, Chief Justice of High Court, Judge of a High Court

#### **Qualification for Expert members**

- Either a degree in Master of Science (in physical sciences or life sciences) with a Doctorate degree or Master of Engineering or Master of Technology
- Or an experience of fifteen years in the relevant field and administrative experience of fifteen years in Central or a State Government or in a reputed National or State level institution.

#### **Post retirement jobs**

Once retired, the chairman or judicial members can not take up any job related to matters of this tribunal for at least 2 years.

#### **Other Notes**

- Appointment of members is done by Central Government.
- Chairperson of NGT is appointed by the Central Government in consultation with the Chief Justice of India.
- Judicial Members and Expert Members of the Tribunal are appointed on the recommendations of such Selection Committee.
- Chairperson, Judicial Member and Expert Member hold office for 5 years.
- Maximum age of the chairman 70 years if he has been a Supreme Court Judge and 67 years, if he has been a high court judge.
- Chairperson can be removed from his office via an order made by the Central Government after an inquiry made by a Judge of the Supreme Court in which such Chairperson or Judicial Member has been informed of the charges against him and given a reasonable opportunity of being heard in respect of those charges.

#### **Jurisdiction**

The National Green Tribunal has jurisdiction over **all civil cases** where a substantial question relating to environment (including enforcement of any legal right relating to environment), is

involved and such question arises out of the implementation of the enactments specified in Schedule I of the National Green Tribunal Act 2010. The acts listed in Schedule 1 are:

1. The Water (Prevention and Control of Pollution) Act, 1974;
2. The Water (Prevention and Control of Pollution) Cess Act, 1977;
3. The Forest (Conservation) Act,
4. The Air (Prevention and Control of Pollution) Act, 1981;
5. The Environment (Protection) Act, 1986;
6. The Public Liability Insurance Act, 1991;
7. The Biological Diversity Act, 2002. It would deal with all environmental laws on air and water pollution, the Environment Protection Act, the Forest Conservation Act and the Biodiversity Act.

#### **Some more notes**

- With this effort, India joined a few countries such as Australia and New Zealand, which have such specialized environment tribunals.
- This Body, established by an Act of Parliament (being the National Green Tribunal Act of 2010) will have circuit benches also known as Green benches across the country to try all matters related to and arising out of environmental issues.
- With this, the erstwhile National Environment Appellate Authority has ceased to exist and all its the functions will be transferred to NGT.

#### **Chapter 3. The Story of Go and No-Go and “Inviolate” areas**

The concept of 'go and no go' areas was formulated by the Environment Ministry to **categorize coal-bearing areas** in the country as "go and no go" areas for miners.

The precursor to the Go-no go concept was a system of environment and forestry clearance to projects through the Forest Advisory committee (FAC), under the Forest Conservation Act , 1980. This act stipulated that all diversion of forest cover for non-forest uses requires the approval of FAC.

In 2010, under Jairam Ramesh, the environment ministry undertook an exercise for overlaying/superimposition of forest cover map on coal blocks in 2010 in 9 major coal fields to identify 'Go' and 'No- Go' areas. As per the above study the coal blocks were classified into the following 2 categories.

- Unfragmented forest landscapes having gross forest cover (GFC) >30% or weighted forest cover (WFC) > 10%, named as **category 'A' or 'No-Go' area**.
- Fragmented forest landscapes having gross forest cover (GFC) <30% and weighted forest cover (WFC) <10%, named as category 'B 'or 'Go 'area.

The coal mining could happen only in category B.

### Fall Out of the policy

After the classification, around 203 coal blocks with reserves of over 600 million tonne in nine major coalfields had been barred from any mining activity. This much coal was enough to fire a power generation capacity of 130,000 Mw. These included many mines belonging to Coal India Ltd and other private players. This gave rise to a complex issue. Without coal, power production can not sustain and at that time, the Planning Commission released the data showing that the power sector alone was losing potential production of 143,000 mw of power due to the MoEF policy.

### The BK Chaturvedi Panel

The Government set up a panel under the Planning Commission member B K Chaturvedi with representatives from power, coal and finance ministries to consider the efficacy and legality of forest clearance procedures. This panel observed that the 'Go, No-Go' concept of forest area classification for clearances to coal blocks has no legal standing and should be abandoned. The panel said that these policies are mandated neither under Forest Conservation Rules, 2003 nor under any circular issued by the ministry of environment and forests.

### Scrapping the Go, No Go

In September 2011, the Go No go concept was scrapped amid joyful clapping from the coal industry. But soon after that Environment ministry was heard working on a new concept which will demarcate some mining areas as "**inviolate areas**", where mining will be prohibited, owing to their high quality of forest cover ☺.

### The Tishyarakshit Chatterjee Committee

In March 2012, a seven member panel was established by the Environment Ministry to suggest demarcation of forest to classify them as inviolate patches based on a set of norms. This committee was headed by former environment secretary Tishyarakshit Chatterjee.

Tishyarakshit Chatterjee submitted its draft report in January 2013 that looked to give the demarcation **legal teeth** by notifying "inviolate patches" under the Environment Protection Act, 1986. The formula and criteria recommended by the Chatterjee panel generally means that areas within 1km of parks and sanctuaries and critical migratory corridors linking wildlife habitats would almost by default be regarded as inviolate. The strong pro-environment criteria recommended by the committee took more into consideration hydrological values of forests like whether green patches are catchment areas for rivers or feed wetlands. This will also command weight in demarcating the area not to be mined.

After the committee's report was with the ministry, the environment ministry came up with a draft proposal for 'inviolate forest areas'. Once these proposals accepted, the large swathes of healthy forests, including national parks, wildlife sanctuaries, tiger reserves and wildlife corridors, would be out of bounds for all mining activities (not just coal excavation).

### The EGoM and current position of the Inviolate Areas

Before anything substantial could happen, the endeavours of Environment Ministry somewhat irked the coal ministry and other sectors such as steel and cement and then there was protest against inviolate areas.

This led to creation of a Group of Ministers (GoM). This GoM in April 2013, has restricted the environment ministry from executing the system of 'inviolate' mining areas. This was a great set back to the environment ministry's efforts to secure control on implementing stricter green norms. The GoM headed by Sharad Pawar said that *the proposed inviolate mechanism would deal a blow to the country's power, steel and cement plants, which are still reeling under the impact of the earlier system of 'go', 'no-go' zones, which had rendered about 660 million tonne of coal reserves unmineable*. Since the country needs 8% growth rate, **green hurdles** should not impede it in unwarranted manner ☺.

### Chapter 4. Environmental Problem of Phumdis

Phumdis are a series of floating islands, exclusive to the Loktak Lake in Manipur. They cover a substantial part of the lake area and are heterogeneous masses of vegetation, soil and organic matter, in different stages of decay.

The largest single mass of phumdi is in the southeastern part of the lake, covering an area of 40 km<sup>2</sup> (15.4 sq mi). This mass constitutes the world's largest floating park, named **Keibul Lamjao National Park**. The park was formed to preserve the endangered Eld's Deer subspecies, called Sangai in the Manipuri language, indigenous to this area.

Phumdis are used by the local people for constructing their huts for fishing and other livelihood uses, and are inhabited by about 4000 people. Athapums are artificial circular phumdis, built by the villagers as enclosures for fish farming; aquaculture has caused proliferation of the phumdis in the lake.

Phumdis have been an environmental issue in Loktak Lake. The proliferation of phumdis, coupled with severe infestation of the lake by water hyacinth, has substantially impeded water circulation and caused an increase in siltation and deposit of pollutants in the lake ecosystem.

The building materials used to build huts on the phumdi blocks sunlight from reaching the lower depths of the lake water, which has resulted in formation of vertical profiles of the lake water body and decomposition. Further, pesticides and insecticides are used for catching fish or as insect repellent. Degradation is in the form of benthal, which, as it decays, releases toxic gases such as methane, hydrogen sulfide, and reduces dissolved oxygen (DO).

This causes the lake water to degenerate into a eutrophic condition, creating a dead water zone called the hypolimnion. Above the hypolimnion is a thin layer, known as epilimnion, where fish survive to some degree. The benthal is becoming increasingly thick, causing not only pollution of the lake water, but an increase in the shallow part of the lake.

The Government have taken steps to clean up project for Loktok Lake in Manipur and 'Phumdis' that destroy the lake have been also cleared along with other activities so far from the Loktok surface of Loktok Lake area. Loktok Lake is one of 115 wetlands identified under the National Wetlands Conservation Programme under which 100% financial assistance is given for various conservation activities.

### **Chapter 5. Coastal Regulation Zone Notification 2011**

The Ministry of Environment and Forests had constituted a Committee under the Chairmanship of Prof M.S. Swaminathan to review the Coastal Regulation Zone Notification, 1991 and to suggest specific areas that need to be addressed to protect the coast and the people who live there.

The Committee submitted a report entitled '**Final Frontier**' with various recommendations on protection and conservation of the coastal ecosystem, livelihood security of local communities, introduction of regulation to manage the proliferation of ports along the coasts, introduction of tighter standards for disposal of effluent in to coastal water, inclusion of seaward side etc.

On the basis of the recommendations of the above committee, the Ministry had issued the Coastal Regulation Zone (CRZ) Notification, 2011 in January, 2011 for the main land and also the Island Protection Zone (IPZ) Notification, 2011 for Lakshadweep, Andaman & Nicobar Islands in January, 2011 in supersession of the Coastal Regulation Zone Notification, 1991.

#### **Objectives:**

- Protection of livelihoods of traditional fisher folk communities
- Preservation of coastal ecology
- Promotion of economic activity that have necessarily to be located in coastal regions.

#### **Background:**

The CRZ Notification 1991 has been amended for 25 times up till now and among the new features, it includes Goa, Kerala, Greater Mumbai and critically vulnerable coastal areas (CVCAs) like Sunderban Mangrove Area, Chilka and Bhitarkanika (Orissa), Gulf of Khambat and Gulf of Kutchh (Gujarat), Malwan (Maharashtra), Karwar and Kundapur (Karnataka), Vembanad (Kerala), Coringa, East Godavari and Krishna Delta (Andhra Pardesh), Gulf of Mannar (Tamil Nadu).

#### **What is the limit of the CRZ Area?**

CRZ area now includes the water area up to 12 nautical miles in the sea and the entire water area of a tidal water body such as creek, river, estuary, etc.

#### **Does the above area impose any restriction on Fishing activities?**

No, it does not impose any restrictions of fishing activities.

#### **What is CZMP?**

The CRZ notification 2011 enshrines that concept of a Coastal Zone Management Plan (CZMP). It will be prepared with the fullest involvement and participation of local communities.

**What is the definition of the No development Zone?**

The “no development zone” definition has been changed. It is reduced from 200 metres from the high-tide line to 100 meters only. This has been done to meet increased demands of housing of fishing and other traditional coastal communities.

**What is proposed enactment to protect the traditional rights of the Fishermen?**

As per recommendation of the expert committee headed by Dr. M.S. Swaminathan, that Government should enact a law to protect the traditional rights and interests of fishermen and coastal communities, is under proposal. This law would be somewhat along the lines of the Forest Rights Act, 2006. Fishermen associations have supported this recommendation. The MoE&F has already prepared such a draft law in this regard and put it in the public domain for comments and suggestions.

**What about the demand for Coastal Zone Regulation law?**

There has been a demand from fishermen associations that instead of having a Notification under Environment Protection Act, 1986, Government should enact a coastal zone regulation law to be passed by Parliament. This is because a notification does provide considerable flexibility to the Executive.

**Why CRZ Notification is so important?**

India has a long coastline of 7516 km, ranging from Gujarat to West Bengal, and two island archipelagos (Andaman Island and Lakshadweep). Our coastal ecosystems provide protection from natural disasters such as floods and tsunamis to the 250 million people who live in our coastal areas. Coastal waters provide a source of primary livelihood to 7 million households. Our marine ecosystems are a treasure trove of biodiversity, which we are only beginning to discover and catalogue. Thus our coastline is both a precious natural resource and an important economic asset, and we need a robust progressive framework to regulate our coast.

**What is allowed and what is not allowed?**

Mining of limestone and other similar minerals is prohibited in Coastal Regulation Zone (CRZ) area. The Coastal Regulation Zone (CRZ) Notification, 1991 and the recently issued CRZ Notification, 2011, prohibits the mining of sand, rocks and other substrata material including limestone except rare minerals like, monazite, rutile etc., and exploitation of oil and natural gas.

All activities which are permissible under these Notifications are required to obtain clearance under these Notifications. Mining of the sand, rocks and other substrata material is expected to cause damage to the Coastal environment including the Sea water intrusion.

**Chapter 6. Plastic Waste (Management and Handling) Rules, 2011**

The Ministry of Environment and Forests has notified the Plastic Waste (Management and Handling) Rules, 2011 in February 2011 It replaces the earlier Recycled Plastics Manufacture and Usage Rules,1999 (amended in 2003). These Rules have been brought out following detailed

discussions and consultations with a wide spectrum of stakeholders including civil society, industry bodies, relevant Central Government Ministries and State Governments.

The *core philosophy is that it is impractical and undesirable to impose a blanket ban on the use of plastic all over the country*. The real challenge is to improve municipal solid waste management systems. In addition to the privatization and mechanization of the municipal solid waste management systems we must be sensitive to the needs and concerns of the lakhs of people involved in the informal sector. Some salient features are:

- **Explicit Recognition to Waste Pickers under New Rules:** The new Rules require the municipal authority to constructively engage agencies or groups working in waste management including these waste pickers. This is the very first time that such a special dispensation has been made.
- **Ban on use of plastic materials** in sachets for storing ,packing or selling gutkha, tobacco and pan masala, no food stuffs will be allowed to be packet in recycled plastics or compostable plastics, recycled carry bags to have specific BIS standards, colour to the prescription by the Bureau of Indian Standards (BIS), uniform thickness shall not be less than 40 microns in carry bags etc.
- **The Municipal authority shall be responsible** for setting up, operationalisation and coordination of the waste management system and for performing the associated functions.
- This include to ensure safe collection, storage, segregation, transportation, processing and disposal of plastic waste; no damage to the environment during this process, setting up of the collection centers for plastic waste involving manufacturers, its channelization to recyclers; to create awareness among all stakeholders about their responsibilities , and to ensure that open burning of plastic waste is not permitted.

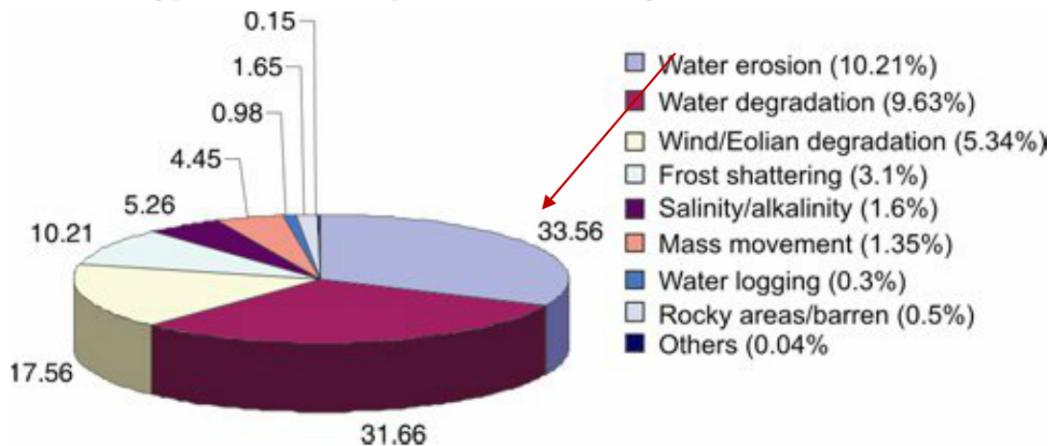
### **Chapter 7.      Desertification & UNCCD**

India is a party to the United Nations Convention to Combat Desertification (UNCCD), and the Government of India in fulfillment of one of the obligations of the parties to the convention, submitted a **National Action Programme to Combat Desertification** to the Secretariat of the UNCCD in 2001.

- In India, the total area under desertification is 81.45 mha.
- **Water erosion** (26.21 mha), wind erosion (17.77 mha), vegetal degradation (17.63 mha) and frost shattering (9.47 mha) are the major processes of desertification.
- Nearly **one third of the country's land area (32.07%) is undergoing processes of land degradation**.
- There are about **eight major processes of land degradation active in the country**.
- **Water erosion is the most pronounced process**, followed by vegetal degradation and aeolian processes. Total area under land degradation is 105.48 mha.

- **Area-wise Rajasthan, J&K, Gujarat and Maharashtra have high proportions** of land undergoing degradation.
- 81.45 mha land area of the country is undergoing the process of desertification.

The following picture shows the processwise Land Degradation status of India



### Role of Jojoba Plant in fight with desertification

In India, the Jojoba plant has also been used to combat and prevent desertification in the Thar Desert and has proved to be quite successful. The Jojoba Plant (*Simmondsia chinensis*) is native to the Sonoran and Mojave deserts of Arizona, California, and Mexico. Jojoba is grown commercially for its oil, a liquid wax ester, expressed from the seed. Jojoba oil is similar to human sebum and whale oil than to traditional vegetable oils. It is of commercial importance.



- Thus, Jojoba serves the dual purpose of fighting desertification as well as playing role as a crop of Industrial Importance.
- The shrub can live up to 150 years and can attain a height of about 3-5 meters; it can tolerate high and low temperatures.
- The commercial production of Jojoba require only about 450-650mm annual rainfall.

The oil makes up approximately 50% of jojoba seed by weight. Jojoba oil is a mixture of wax esters which have 36 to 46 carbon atoms in length. Jojoba Oil Consists of Wax esters and the wax esters are made up of fatty acid and a fatty alcohol. It is used majorly in personal care products, in moisturizers, face creams, shampoos, hair oil, lipstick, conditioners, anti-aging and sun care products. It can also be used in lubricants or additive to other lubricant, it is also considered as good substitute for sperm whale oil. It can also be used in preparation of other chemicals and in pharmaceuticals applications.

The worldwide production of jojoba seeds is approximately 5800 tons and jojoba oil is 2700 tons.

Argentina accounts for nearly 50% of all the seeds produced.

North America is the leading region as a consumer for Jojoba oil applications in the cosmetics followed by Europe

**How it is beneficial to India?**

The cost of production of Jojoba oil in India is almost one fifth times than that of other countries. Presently of all the oil that is produced in India 99 % is consumed in domestic market. The market has not reached maturity level in India, also has got huge potentials for exports.

**Area Producing:**

600-700 hectares of land is under jojoba cultivation in all over India. Out of it **85-90 % is in Rajasthan**, approx 100 hectares in Gujarat & 50 hectares in Maharashtra. Rajasthan is perfectly suitable as the climatic conditions favor the cultivation. There is also good potential for jojoba cultivation in Punjab, Haryana Orissa, Tamil Nadu, Andhra Pradesh and Karnataka.

In 1995, Government of India has set up an association of Rajasthan Jojoba Plantation and Research Project (AJORP) with 100% funding from the Department of Land Resources, under Ministry of Rural Development. As technical know-how was limited in the beginning, an MOU was signed between AJORP and HAIGUD Israel to facilitate transfer of technology in promoting jojoba plantation. This included import of a green house which was commissioned in the year 1997.

**Chapter 8. Heat Resistant Crops & NICRA**

The heat resistant or heat tolerant crops are those crops which can survive the rising temperature / drought due to climatic changes.

The growing population is demanding more food, fibre, fuel and other renewable products from agriculture. But recent events like cold wave, heat wave, drought, and floods have demonstrated the significant potential of climatic factors to influence the agricultural production, eventually leading to shortages of food grains and increased prices.

**NICRA**

National Initiative on Climate Resilient Agriculture (NICRA) was launched during February 2011 by Indian Council of Agricultural Research (ICAR) with the funding from Ministry of Agriculture, Government of India with Central Research Institute for Dry land Agriculture (CRIDA), Hyderabad as the lead centre and CIAE Bhopal as one of core institutes. The mega project has three major objectives of strategic research, technology demonstrations and capacity building.

**Scope of NICRA:**

NICRA is aimed at making the farmers self reliant by use of climate resilient agricultural technologies and management of natural and manmade resources for sustaining agriculture in the era of climate change empowered by four modules of NICRA – natural resource management, improving soil health, crop production and livestock. Scope also covers specific environment assessment and generating meaningful products from crop residues with different energy conversion process. Review and documentation of conservation methods of agriculture in order to reduce GHG emissions and other measures also stands inside its ambit.

## Chapter 9. Various Topics on Biofuels

Biofuels are fuels which are in some way derived from biomass. The term covers solid biomass, liquid fuels and various biogases.

### Bioalcohols

Bioalcohols are the biologically produced alcohols. Ethanol fuel is the most common biofuel worldwide, particularly in Brazil, because of its Sugar Industry. Such a practice is followed in several parts of the world, most notably in the US and Brazil, where the product is known as gasohol and usually contains 10% ethanol. The Indian government initiatives are part of the national biofuel policy announced in December 2009.

The Bioalcohols are produced by fermentation of sugars derived from wheat, corn, sugar beets, sugar cane, molasses and any sugar or starch. Ethanol is used in petrol engines as a replacement for gasoline; mostly blended up to 15%. But please note that it can be mixed with gasoline to any percentage.

### Ethanol v/s Gasoline

- Ethanol has smaller energy density than gasoline. This means that it takes more fuel by volume and mass to produce the same amount of work. This is the major reason why we don't use 100% Ethanol and use only a blend of Ethanol.
- The major **advantage of Ethanol is that it has a higher octane rating** than ethanol-free gasoline. The Ethanol increases engine's compression ratio for increased thermal efficiency . Further, at higher altitude locations, a few countries a a mandatory mix of gasoline and ethanol to reduce atmospheric pollution emissions.
- However, higher octane ratio makes higher compression ratios that will make gasoline engines subject to engine knocking. This can reduce efficiency or damage the engine if knock sensors are not present to retard the timing. So both the above are the reasons that Ethanol is blended in Gasoline.

### Ethanol blending Programme

The Ethanol Blended Petrol (EBP) programme earlier launched by the Government **could not sustain owing to non-availability of ethanol** in required quantity and other state specific issues. Later, to give fillip to the programme, Government

#### Ethanol and Sugar Sector

In India, Ethanol is mostly produced from molasses, a by-product of sugar manufacture. According to data from the Ethanol Manufacturers Association of India, the current capacity of the country is around 1.74 billion litres. Nearly half the capacity is exported, and about 2% is used by the pharmaceutical and cosmetics industries. The rest is used by oil marketing companies. Of this, 900 million litres are produced in Maharashtra, which houses the largest number of sugar mills and accounts for one-third of the country's sugar production. Around 40% of India's sugar production takes place in the cooperative sector. Private sector companies such as Shree Renuka Sugars Ltd, Balrampur Chini Mills Ltd, Bajaj Hindusthan Ltd and Simbhaoli Sugar Mills Ltd are among the country's listed sugar companies. Institutions such as the Central Salt and Marine Chemicals Research Institute in Bhavnagar, International Crop Research Institute for the Semi-Arid Tropics, Hyderabad, and Central Leather Research Institute in Chennai are engaged in research to seek out alternative ways of producing ethanol and bio-diesel.  
(Live Mint April 1, 2013)

gave fresh relook and decided to implement the EBP programme to the extent of the ethanol made

available by the domestic ethanol producers at the ex-factory declared price decided by the Government.

As per the current policy, after ascertaining the actual availability of ethanol in the country, percentage of blend from 0-10% would be recommended area-wise by the working group of officers constituted for the purpose.

Government fixed provisional price of ethanol at Rs. 27 per litre. In January 2013, government issued a notification which said that by 2017, every litre of petrol should be blended with 20% of ethanol.

### Biodiesel

Biodiesel is vegetable oil- or animal fat-based diesel fuel consisting of long-chain alkyl esters. It is used as a blend to Petro Diesel and ***denoted by B factor***. This means that 100% biodiesel is referred to as **B100**, while 20% biodiesel, 80% petro diesel is labeled **B20**. Similarly 5% biodiesel, 95% petro diesel is labeled **B5**.

Global biodiesel production was around 4 million tons in 2006 and around 85% of biodiesel production came from the **European Union**.

### Jatropha Plant

There are 175 species of Jatropha plant that belongs to family Euphorbiaceae. In 2007 Goldman Sachs cited ***Jatropha curcas***

as one of the best species for future biodiesel production and from here it began getting popular. The Jatropha plant is resistant to drought and pests, and produces seeds containing 27-40% oil.

In India, Jatropha is known as **Ratanjot** shows

resemblance with castor. Apart from Ratanjot, about nine species are reported out of which ***Jatropha Curcus*** has economic value by virtue of oil present in its seed.

In 2006, the Indian Council of Agricultural Research identified first ever Jatropha variety, ***SDAUJI (Chatrapati) with higher oil content and yield for commercial cultivation. The seeds contain 49.2 per cent oil and the non-edible protein in defatted seed case is 47.8 per cent***.

Farmers can get an average yield of 1000-1100 kg per hectare under rainfed conditions. The ICAR recommended it for the semi-arid and arid regions of Gujarat and Rajasthan. It is drought resistant and can be raised successfully in areas where annual rainfall is 300-500mm. The plant attains a height up to 8 feet and shows resistance to all major pests.

#### Jatropha oil as Mosquito Repellent

U.S. Department of Agriculture (USDA) scientists have identified components of Jatropha curcas seed oil that are responsible for mosquito repellency. Researchers at the Agricultural Research Service (ARS) Natural Products Utilization Research Unit (NPURU) in Oxford, Miss., often find effective plant-derived compounds to deter insects by gathering plants in the wild and investigating those used in traditional folk remedies. ARS is USDA's principal intramural scientific research agency.

After learning that people in India burn J. curcas seed oil in lamps to keep insects out of their homes and other areas, NPURU chemist Charles Cantrell extracted smoke from the plant in a laboratory and analyzed its properties. Free fatty acids and triglycerides were among a number of active compounds found to be effective at preventing mosquitoes from biting.

### National Policy on Biofuels

Union Cabinet of India had approved the National Policy on Bio-fuels & its implementation in 2009. The Union Cabinet has also approved the setting up of a National Biofuel Coordination Committee and a Biofuel Steering Committee.

The salient features of the National Policy on Bio-fuels are:-

- Bio-diesel production will be taken up from non-edible oil seeds in waste /degraded / marginal lands.
- An **indicative target of 20% blending of bio-fuels, both for bio-diesel and bio-ethanol, by 2017 has been proposed.**
- Minimum Support Price (MSP) for non-edible oil seeds would be announced with periodic revision to provide fair price to the growers.
- Minimum Purchase Price (MPP) for purchase of bio-ethanol and bio-diesel would be announced with periodic revision.
- Major thrust will be given to research, development and demonstration with focus on plantations, processing and production of bio-fuels, including Second Generation Bio-fuels.
- Financial incentives, including subsidies and grants, may be considered for second generation bio-fuels. If it becomes necessary, a National Bio-fuel Fund could be considered.
- A **National Biofuels Coordination Committee, headed by the Prime Minister,** will be set up to provide policy guidance and coordination.
- A Biofuel Steering Committee, chaired by Cabinet Secretary, will be set up to oversee implementation of the Policy.
- The Ministry of New & Renewable Energy has been designated as the co-ordinating Ministry for Biofuels development and utilization while specific roles have been assigned to other concerned Ministries.
- MNRE has taken several initiatives on various aspects of biofuel development. An exercise has been initiated with scientific agencies – ICAR, CSIR, DBT, DRDO, NOVOD Board on collection, screening and identification of elite germplasms of jatropha and on processing and end use technologies.
- The objective is to generate and make available elite planting materials for plantations. The scientific agencies and the private sector have identified **25 superior genotypes/accessions of Jatropha for further multiplication** for demonstration at various sites in potential States.
- Another exercise has been taken up on realistic costing of biodiesel which will provide guidance on review and revision of the purchase price for biodiesel.
- A survey has been undertaken to assess the status of Jatropha plantations in nine States. Major thrust is being given to development of second generation Biofuels.

- An Indo-US MoU has been signed on Biofuels with focus on joint R&D, particularly on second generation biofuels such as, cellulosic ethanol and algal biodiesel.

**Chapter 10. The Climate Change Negotiations****Earth Summit 1992**

Earth Summit 1992 was the United Nations Conference on Environment and Development (UNCED), commonly known as the Rio Summit or Rio Conference. It was a major United Nations conference held in Rio de Janeiro from 3 June to 14 June 1992. It was attended by 172 Governments. The outcome of this summit was the following documents:

- Rio Declaration on Environment and Development
- Agenda 21
- Convention on Biological Diversity
- Forest Principles
- Framework Convention on Climate Change (UNFCCC).

**Foundation of Green Cross International**

Following the Earth Summit 1992, Green Cross International was founded by former Soviet leader Mikhail Gorbachev in 1993 to help ensure a just, sustainable and secure future for all by fostering a value shift and cultivating a new sense of global interdependence and shared responsibility in humanity's relationship with nature. After that, Thirty-one countries have established Green Cross National organizations which are part of Green Cross International.

**Rio Declaration on Environment and Development**

Rio Declaration on Environment and Development consisted of **27 principles** intended to guide future sustainable development around the world.

1. The role of humans.
2. State sovereignty
3. The Right to development
4. Environmental Protection in the Development Process
5. Eradication of Poverty
6. Priority for the Least Developed
7. State Cooperation to Protect Ecosystem
8. Reduction of Unsustainable Patterns of Production and Consumption
9. Capacity Building for Sustainable Development
10. Public participation
11. National Environmental Legislation
12. Supportive and Open International Economic System
13. Compensation for Victims of Pollution and other Environmental Damage
14. State Cooperation to Prevent environmental dumping
15. Precautionary principle
16. Internalization of Environmental Costs
17. Environmental Impact Assessments
18. Notification of Natural Disaster
19. Prior and Timely Notification
20. Women have a Vital Role
21. Youth Mobilization
22. Indigenous Peoples have a Vital Role
23. People under Oppression
24. Warfare
25. Peace, Development and Environmental Protection
26. Resolution of Environmental Disputes
27. Cooperation between State and People

Some Scholars have regarded the Rio Declaration as Third Generation Human Rights.

**Agenda 21**

Agenda 21 was another outcome of the 1992 Earth Summit. It is the "*Voluntary*" action plan of the United Nations (UN) related to sustainable development. This 40 point document was a

comprehensive blueprint of action to be taken globally, nationally and locally by organizations of the UN, governments, and major groups in every area in which humans directly affect the environment.

For implementation of these points a Commission on Sustainable Development was established as a high level forum on sustainable development. The United Nations Division for Sustainable Development acts as the secretariat to the Commission and works 'within the context of Agenda 21.

- **Rio+5 :** The Rio+5 was the special session of the UN General Assembly organized in 1997 for appraisal of five years of progress on the implementation of Agenda 21.
- **LA21 :** Local programmes as per recommended in Agenda 21 are known as 'Local Agenda 21' or 'LA21'.

### **United Nations Framework Convention on Climate Change**

The United Nations Framework Convention on Climate Change (UNFCCC or FCCC) is another agreement produced at the United Nations Conference on Environment and Development (UNCED) or Earth Summit 1992.

The objective of UNFCCC is to **stabilize greenhouse gas concentrations** in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Some questions:

#### **Is UNFCCC is legally binding?**

No. UNFCCC by itself is not legally binding and does not set mandatory limits on greenhouse gas emissions for individual countries and contains no enforcement mechanisms. However, it was projected legally binding agreement as its protocols would set the emission targets and legally binding enforcements. One such important protocol is the **Kyoto Protocol**, which is legally binding. The protocol is so famous that it is now a misnomer to UNFCCC itself.

#### **Date of enforcement and members?**

UNFCCC opened for signature on May 9, 1992 and entered into force on March 21, 1994. Currently it has 195 ratifier parties.

The parties to the convention meet annually from 1995 in Conferences of the Parties (COP) to assess progress in dealing with climate change. Till now 18 Conferences have been concluded. The 2013 United Nations Climate Change Conference to be held in Warsaw, Poland from 11 to 22 November 2013, will be the 19th yearly session of the Conference of the Parties (COP).

The 1997, **Kyoto Protocol was concluded and established at the COP-3**. It is a legally binding obligation for developed countries to reduce their greenhouse gas emissions.

#### **Secretariat**

The Secretariat of UNFCCC is also known by the same name. Its offices are in **Haus Carstanjen, Bonn, Germany**. From 2006 to 2010 the head of the secretariat was Yvo de Boer. From May, 2010 his successor, Christiana Figueres from Costa Rica has been named.

**Convention entering into force**

UNFCCC was opened for signature at the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro. On June 12, 1992, 154 nations signed the UNFCCC. United States signed and later ratified the convention in 1994.

Having received the instrument of **ratification by a minimum of 50 parties**, the convention entered into force on March 21, 1994.

**Classification of the Parties**

The ratification of the UNFCCC means ratification of the voluntary "non-binding aim" to reduce atmospheric concentrations of greenhouse gases with the goal of "preventing dangerous anthropogenic interference with Earth's climate system."

The above action was primarily targeted at the industrialized countries, so that they stabilize the emissions of greenhouse gases at 1990 levels by the year 2000. Accordingly the Industrialized countries were placed in a separate category. The parties of the UNFCC are grouped into three categories:

- Annex-I Countries
- Annex-II Countries
- Developing Countries

**Annex-I Countries:**

The industrialized countries and the countries whose economies were in transition in 1992 were kept in Annex-I countries. This group comprises the 40 nations & one organization (**European Union**) as follows:

*Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, United States of America*

**Annex II Countries:**

The Developed countries which play a financial role in the development of the developing countries and pay the cost for the development in the developing countries were placed in Annex II countries.

The 23 Annex II countries are as follows:

*Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States of America*

- Please note that Annex II is just a subgroup of the Annex I countries.

**Developing Countries:**

The Developing countries, as per the UNFCCC, are **not required to reduce emission levels** unless developed countries supply enough funding and technology for their development.

**Why no emission reduction targets for Developing countries?**

This would avoid the restrictions on their development, because emissions are strongly linked to industrial capacity. The idea behind imposing a emission cut requirements for the Industrialized nations is that the developing countries can sell emissions credits to nations whose operators have difficulty meeting their emissions targets they get money and technologies for low-carbon investments from Annex II countries.

This has given rise to the issue between the Developed and Developing countries.

**What is the issue?**

It has been alleged by the opponents of the convention that it has created an unfair split between the developing and developed countries. They say that both the developing countries and developed countries need to reduce their emissions unilaterally. Some allege that the cost will stress their economy.

**Conference of Parties**

- 1995 – COP 1, The Berlin
- 1996 – COP 2, Geneva, Switzerland
- 1997 – COP 3, Kyoto, Japan: COP 3 took place in December 1997 in Kyoto, Japan. The outcome was the famous Kyoto Protocol. The Kyoto Protocol was the legally binding protocol which outlined the greenhouse gas emissions reduction obligation for Annex I countries. It also came out with some mechanisms collectively known as Kyoto mechanisms. These mechanisms include the Emissions Trading, Clean Development Mechanism (CDM) and Joint Implementation. We study them in this document.
- 1998 – COP 4, Buenos Aires , Argentina
- 1999 – COP 5, Bonn, Germany
- 2000 – COP 6, The Hague, Netherlands
- 2001 – COP 6 bis, Bonn, Germany
- 2001 – COP 7, Marrakech, Morocco
- 2002 – COP 8, New Delhi, India: Outcome of this session was the Delhi Ministerial Declaration which called the developed countries to transfer technology and minimize the impact of climate change on developing countries.
- 2003 – COP 9, Milan, Italy
- 2004 – COP 10, Buenos Aires, Argentina
- 2005 – COP 11/MOP 1, Montreal, Canada: The Kyoto Protocol had entered into force on 16 February 2005. So, next time, when the COP met, it was COP 11 and also known as MOP-1 (Meeting of Parties). It took place in between November 28 and December 9, 2005, in Montreal, Quebec, Canada. This was one of the largest meetings, in which more than 10 thousand delegates took part, making it one of the largest gatherings in Canada. Outcome of the meeting was the "Montreal Action Plan". The MAP called for an extension to the life of

the Kyoto Protocol beyond its 2012 expiration date and negotiate deeper cuts in greenhouse-gas emissions. Thus it became the basis of the negotiations for extending the Kyoto Protocol beyond 2012.

- 2006 – COP 12/MOP 2, Nairobi, Kenya
- 2007 – COP 13/MOP 3, Bali, Indonesia
- 2008 – COP 14/MOP 4, Poznań, Poland
- 2009 – COP 15/MOP 5, Copenhagen, Denmark
- 2010 – COP 16/MOP 6, Cancún, Mexico
- 2011 – COP 17/MOP 7, South Africa
- 2012 – COP 18 / MOP 8, Doha, Qatar: Outcome of this summit was Doha Climate Gateway
- 2013 – COP 19 / MOP 9, Warsaw, Poland held from 11 to 22 November 2013

### **Chapter 11.      Kyoto Protocol**

The Kyoto Protocol is a protocol or update to the United Nations Framework Convention on Climate Change. It was initially adopted on 11 December 1997 in Kyoto, Japan and entered into force on 16 February 2005. As of now, 191 states ((all UN members, except Andorra, Canada, South Sudan and the United States)) have signed and ratified the protocol.

- Out of the 40 Annex-I countries, **37 countries have committed themselves** to a reduction of 6 gases produced by them which include:
  - Four greenhouse gases (GHG) viz. carbon dioxide, methane, nitrous oxide, sulphur hexafluoride.
  - Two groups of gases viz. hydrofluorocarbons and perfluorocarbons.

#### **How much reduction?**

The Annex I countries agreed to reduce their collective greenhouse gas emissions by 5.2% from the 1990 level. This limit **does not include the emissions by the International aviation and shipping**. The above reduction is in addition to the industrial gases & chlorofluorocarbons committed under the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer.

#### **Why 1990 Benchmark?**

The Benchmark 1990 emission levels were accepted by the COP 3 on the basis of the values of "**Global Warming Potential**" calculated for the IPCC Second Assessment Report.

#### **Historic Position of United States & Canada:**

*The United States signed but did not ratify the Protocol and Canada withdrew from it in 2011. United States was the party to UNFCCC but it rejected the Kyoto Protocol.* It was responsible for 36.1% of the 1990 emission levels of Annex I countries. The United States was required to reduce its total emissions an average of 7% below 1990 levels, but neither the Clinton administration nor the Bush administration sent the protocol to Congress for ratification. The Bush administration explicitly rejected the protocol in 2001. President George W. Bush said that the Kyoto Protocol is "economically irresponsible" and the United States will not ratify it.

**Position of India, China, Brazil:**

India, China and Brazil are considered to be the most advanced developing countries. They are in non annex group and they have no binding obligations in the Kyoto protocol to limit their CO<sub>2</sub> emissions. They have not yet made up their mind to sign the treaty as Annex-I countries and come within the ambit of the legal obligations to the CO<sub>2</sub> reductions.

**Salient Features**

The establishment of commitments for the reduction of greenhouse gases that are legally binding for Annex I countries, is the most important point of Kyoto Protocol and the very heart of it. The groups were made on the basis of the countries 1997 economic capacity to commit themselves and their industry.

**Most important limitation**

Only a few countries were made part of the Annex-I group. The changes in the economy in last 15 years have raised the issues such as India and China being the advanced developing countries must enter into it as Annex I countries. The rift between developing and developed countries continues as of now.

**Kyoto mechanisms**

Kyoto Mechanisms are also known as **Flexible Mechanisms** and they include Emissions Trading, the Clean Development Mechanism and Joint Implementation to lower the cost of achieving emission targets.

- **Emission Trading:** Emissions Trading-mechanism allows parties to the Kyoto Protocol to buy 'Kyoto units'(emission permits for greenhouse gas) from other countries to help meet their domestic emission reduction targets.
- **Joint Implementation:** Any Annex I country can invest in emission reduction projects (referred to as "Joint Implementation Projects") in any other Annex I country as an alternative to reducing emissions domestically.
- **Clean Development Mechanism (CDM):** Countries can meet their domestic emission reduction targets by buying greenhouse gas reduction units from (projects in) non Annex I countries to the Kyoto protocol.

**Extension of Kyoto Protocol Beyond 2012**

The extension of the Kyoto Protocol has been an issue since 2007. On 18 December 2009 at the end of the COP 15 / MOP5 which was held at Copenhagen, Danish Capital a "Non binding Copenhagen Accord" was put forth. However, till that time, the parties could not find a consensus formula for mandatory reductions in the countries' emission of carbon dioxide and other global warming gases. By the time the 2010 summit held, some more secondary issues came up which were collectively called "Building Blocks". These included the climate financial aid in the form of a "**Green Fund**", combating deforestation and other matters.

The 2010, summit ended with a resolution to build up a Green Fund and it was envisaged that the wealthier countries would provide to the poorer countries to finance the programmes to cut emissions and cope with the drought and other methods.

The major issue in extending the Kyoto Protocol was that the developed countries did not like that countries such as India and China should be brought under the binding emission cuts. Both these countries have their own arguments to not to go for such a reversal and to extend Kyoto protocol in as it is form. India says that it is though one of the largest emitter, its per capita emissions are well below many of the countries and that is why it would not accept binding cuts. Almost same was the argument of China.

### **COP 18 - Extension of Kyoto Protocol: The Doha Climate Gateway**

The 18th session of the Conference of the Parties to the UNFCCC and the 8th session of the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol held at Doha, Qatar.

Meeting of the Clean Development Mechanism board, Least Developed Countries, Small Island Developing States Meeting, African Group and G-7 & China were held in the sidelines of COP 18.

The conference focused on five aspects of climate change:

- **Adaptation** – social and other changes that must be undertaken to successfully adapt to climate change. Adaptation might encompass, but is not limited to, changes in agriculture and urban planning.
- **Finance** – how countries will finance adaptation to and mitigation of climate change, whether from public or private sources.
- **Mitigation** – steps and actions that the countries of the world can take to mitigate the effects of climate change.
- **Technology** – the technologies that are needed to adapt or mitigate climate change and ways in which developed countries can support developing countries in adopting them.
- **Loss and damage** – first articulated at the 2012 conference and in part based on the agreement that was signed at the 2010 United Nations Climate Change Conference in Cancun. It introduces the principle that countries vulnerable to the effects of climate change may be financially compensated in future by countries that fail to curb their carbon emissions.

#### **Outcome of the conference**

The Conference document is called **The Doha Climate Gateway** over objections from Russia and other countries at the session. It said

1. A long-term global goal for emission reductions, to achieve the ultimate objective of the Convention in particular the principle of common but differentiated responsibilities and respective capabilities, and taking into account social and economic conditions and other relevant factors.
2. Enhanced national/international action on mitigation of climate change.
3. Policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries.
4. The role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries.

5. An eight year extension of the Kyoto Protocol until 2020 limited in scope to only 15% of the global carbon dioxide emissions due to the lack of participation of Canada, Japan, Russia, Belarus, Ukraine, New Zealand and the United States. This is because of the fact that developing countries like China (the world's largest emitter), India and Brazil are not subject to any emissions reductions under the Kyoto Protocol.
6. Language on loss and damage, formalized in the conference documents.
7. The conference progressed towards funding of the Green Climate Fund.

Russia, Belarus and Ukraine objected at the end of the conference.

### **India and Kyoto Protocol**

The Government of India had decided to ratify the Kyoto Protocol in 2002 after 77 countries had done so. India was not required to reduce emission of Green House Gases under the Protocol under which basically the developed countries were required to reduce emissions of GHG by an average of 5.2 per cent below 1990 level by 2012.

*Being in Developing & Non-annex countries, India ratified the convention to seek benefit from transfer of technology and additional foreign investments when the Kyoto Protocol comes into force. This was expected to be followed by new investments in renewable energy, energy generation and efficiency promotion and afforestation projects.*

India is fully committed to the Kyoto Protocol and has now recently been very active in the negotiations that led to further emission reduction commitments of Annex-I Parties in the Second Commitment Period (Post 2012).

India has been one of the major beneficiaries of the Clean Development Mechanism (CDM), a flexible mechanism under the Kyoto **Protocol** and would like that this mechanism to continue and be further strengthened.

### **Emissions Trading**

It is also known as **Cap & Trade**. In this, the central authority sets a limit of cap on the amount of a pollutant that can be emitted. This limit is sold to the firms in the form of emission permits. An emission permit represents the right to emit the specific volume of a particular pollutant. The Firm would need to hold the number of permits equivalent to their emissions. The number of these permits can not exceed a cap. If a firm wants to increase the emission permits, it would buy from those who need fewer permits. This transfer of permits is called Emission Trade.

Thus the centreline is that: The buyer is paying a charge for polluting, while the seller is being rewarded for having reduced emissions.

The emission trading schemes have great potential to lower the pollution while minimizing the costs for industries. On the industry side, units are able to choose for themselves the cheapest way to reduce pollution.

These programmes are better compared to the traditional command- and-control regulations. The command- and-control regulations do not allow for differences across industries and mandate the same standard everywhere. This generally misses the best opportunities for abatement.

Emission Trading System also provide a self- regulating system that makes pollution control more efficient. In the longer run, the reduced costs of compliance can also make it easier to introduce new regulations that increase environmental quality.

### **Components of emission trading**

The Components of the emission trading are as follows:

- **Setting the Cap-** The target for aggregate emissions from the sector where trading is introduced must be set to produce reasonable prices and emissions reductions.
- **Allocating Permits** -The permits to emit must be distributed in an equitable way to build support for the scheme. In many successful cases this allocation has been made for free relative to baseline emissions, greatly reducing the cost of compliance for industries.
- **Monitoring** - The quantity of emissions from each industrial plant must be reliably and continuously monitored with high integrity recognized by all sides.
- **Compliance** - The regulatory framework must make industries confident that buying permits is the only reliable way to meet environmental obligations.

### **Emissions Trading in India: Market Friendly Emissions Scheme (MFES)**

India has launched a pilot **Market Friendly Emissions Scheme (MFES)** in April 2012. This scheme was launched in 3 states viz. *Gujarat, Tamil Nadu and Maharashtra*, which are three most industrialized states of India. The overall objective of the scheme was to meet the National Ambient Air Quality Standards (NAAQS).

The scheme was launched by Ministry of Environment and Forests, in association with the Central Pollution Control Board (CPCB) and the State Pollution Control Boards (SPCBs) of Gujarat, Maharashtra and Tamil Nadu. This emission trading scheme was proposed by two professors from the Massachusetts Institute of Technology (MIT) in the US, one from Harvard University and another from the Harvard Kennedy School.

### **Legal Aspects of this scheme**

The regulatory framework and technical capacity to implement emissions trading and achieve these ambitious goals already exist. The Ministry is empowered by the Environment (Protection) Act, 1986 and accompanying rules to limit net adverse environmental impact from industrial activity and is ready to apply this power to support an emissions trading scheme. The State Pollution Control Boards have the power to implement such a scheme on the ground by modifying the terms of environmental Consent.

### **Organizational framework of MFES**

The government documents say that the Ministry of Environment & Forests will introduce the required regulatory framework for an emissions trading scheme. The Central Pollution Control Board will set technical standards for continuous monitoring and review bids. The State Pollution Control Boards will

revise industry Consents, implement the adoption of continuous monitoring and enforce the requirement of holding permits to emit. The evaluation of this scheme will be led by two of J-PAL's Board Members, Professor Michael Greenstone, MIT and Professor Rohini Pande, Harvard University as well as Nicholas Ryan, MIT and Anant Sudarshan, Harvard Kennedy School and J-PAL South Asia. The evaluation is being undertaken by J-PAL South Asia at the Institute for Financial Management and Research (IFMR). J-PAL South Asia will monitor the progress of the scheme and evaluate its effect on pollution emissions and industry costs.

### Carbon Credit , Kyoto Units and Assigned Amount Units

Carbon credit is a generic term for any tradable certificate or permit representing the right to emit One Tonne of Carbon dioxide or the mass of another greenhouse gas with a carbon dioxide equivalent equivalent to one tonne of carbon dioxide. The concept of carbon credits came into existence as a result of increasing awareness of the need for controlling emissions.

Carbon credit facility has been introduced with an aim to allow market mechanisms to drive industrial and commercial processes in the direction of low emissions or less carbon intensive approaches than those used when there is no cost to emitting carbon dioxide and other **Green House Gases (GHGs)** into the atmosphere. Since GHG mitigation projects generate credits, this approach can be used to finance carbon reduction schemes between trading partners and around the world.

The composting plant in Okhla, New Delhi has become the first in India to receive the carbon credits from the United Nations Framework Convention on Climate Change (UNFCCC). The plant has received Rs 25 lakh as an advance against the Carbon Emission Reduction (CER) earnings from this plant.

The carbon credits can also be traded on exchanges like **Carbon Trade Exchange**, which is like a stock exchange for carbon credits. If it is traded internationally then each transfer is validated by the UNFCCC.

The emissions trading can be international or domestic. Under the International Emissions Trading (IET), the countries can trade in the international carbon credit market to cover their shortfall in **Assigned amount units**. Countries with surplus units can sell them to countries that are exceeding their emission targets under Annex B of the Kyoto Protocol. This are mentioned in article 17 of the Kyoto Protocol.

#### Assigned amount units / Kyoto Units

The Assigned Amount Unit of AAU refers to an allowance to emit greenhouse gases comprising one metric ton of carbon dioxide equivalents calculated using their Global Warming Potential. The name is synonymous with **Carbon Credit or "Kyoto Units"**.

#### Exchanges trading Carbon Credits:

Currently there are 5 exchanges trading in carbon allowances:

- The European Climate Exchange
- NASDAQ OMX Commodities Europe
- PowerNext
- Commodity Exchange Bratislava
- The European Energy Exchange

### **Certified Emission Reductions (CERs)**

Certified Emission Reductions are one of the types of the Kyoto Units. They are issued under the Clean Development Mechanism.

The Annex-I countries can use the CERs to comply with their emission limitation targets or by operators of installations covered by the European Union Emission Trading Scheme (EU ETS) in order to comply with their obligations to surrender EU Allowances, CERs or Emission Reduction Units (ERUs) for the CO<sub>2</sub> emissions of their installations. The Government and Private entities can hold the CERs on electronic accounts with the UN.

#### **Types of CERs**

There are two types of CERs based upon their likely duration of benefit. They can be long duration (lCER) or temporary (tCER). The original entity that makes the reduction can sell both of them in the primary market. When they are resold, it becomes the secondary market. The approved CERs are recorded in CDM Registry accounts.

#### **CERT**

CERT refers to the "Carbon Emission Reduction Target". The term is used in United Kingdom, where it was earlier known as Energy Efficiency Commitment. The target is imposed on the gas and electricity transporters and suppliers under Section 33BC of the Gas Act 1986 and Section 41A of the Electricity Act 1989, as modified by the Climate Change and Sustainable Energy Act 2006.

#### **White Certificates**

In US and UK, the Energy Savings Certificate (ESC), Energy Efficiency Credit (EEC) are known as White Certificates or White Tags. They are issued by the authorities and are documents certifying that a certain reduction of energy consumption has been attained. The White Certificates are tradable and are combined with an obligation to achieve a certain target of energy savings.

### **Joint Implementation Mechanism**

Joint Implementation is based upon the Article 6 of the Kyoto Protocol. Under article 6, any Annex I country can invest in emission reduction projects in any other Annex I country as an alternative to reducing emissions domestically. The idea is to lower the cost of complying with their Kyoto targets by investing in greenhouse gas reductions in an Annex I country where reductions are cheaper, and then applying the credit for those reductions towards their commitment goal.

### **Clean Development Mechanism**

Out of the three mechanisms under the **Kyoto Mechanisms**, the **Clean Development Mechanism** is most popular. It is defined by the **Article 12 of the Kyoto Protocol**.

#### **Objectives of CDM**

There are two broad objectives of the CDM as follows:

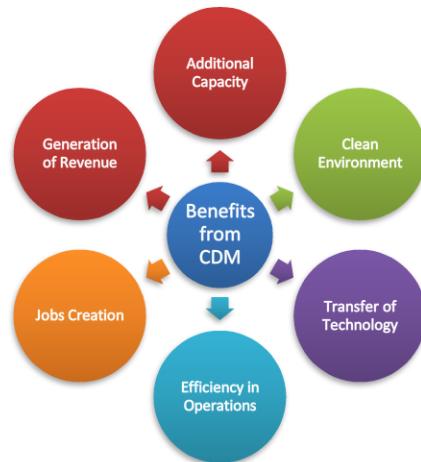
- To help the Non-Annex parties in achieving sustainable development and in contributing to the ultimate objective of the UNFCCC, i.e. to prevent the climate change.

- To help the Annex parties to achieve compliance with their quantified emission limitation and reduction commitments.

### Benefits

The benefits of the CDM are shown in the adjacent graphics, these include:

- Clean Environment
- Transfer of Technology
- Efficiency in Operations
- Jobs creation
- Generation of Revenue and
- Generation of additional capacity.



### Process:

The Process is shown in the following simple graphics:



The above graphics presents the classical structure of the CDM which uses project-by-project process for registering and verifying projects. This Clean Development Mechanism process not only takes a long time but also has high transaction costs as a result of which it has **not been very attractive for energy efficiency projects**, which are usually small in terms of investments. There is also a high risk of non registration associated with it.

The countries which are less developed or least developed and the small island states where average project sizes and the scale of national markets tend to be smaller, the relative transaction costs are higher.

To address this problem, the CDM Executive Board launched the **Programme of Activities (PoA)** modality.

### Programme of Activities (PoA)

Under this modality, a PoA Coordinating/Managing Entity (CME), which can be a government agency, NGO or business, develops a PoA which defines broad parameters for project activities. These activities are called CDM Programme Activities or CPAs. Whereas stand-alone CDM projects must be approved individually by the CDM Executive Board, a PoA needs to be registered only once by the CDM Executive Board. After that, it can include an unlimited and unspecified number of individual CPAs without recourse to the CDM Executive Board. It is expected that the PoA will reduce the transaction cost as the umbrella project registration will allow smaller projects to be included without going through the entire process of due diligence. This would enable the private investors to get CDM revenues in an expeditious manner. The registration will pave the way for an accelerated implementation of the scheme.

In India, one such example of PoA is **Bachat Lamp Yojna**.

### Chapter 12. United Nations Conference on Sustainable Development (Rio+20)

The United Nations Conference on Sustainable Development or Rio+20 was organized at Rio de Janeiro in Brazil from 13 to 22 June 2012. It was a 20 year follow up event to the 1992 United Nations Conference on Environment and Development (UNCED). United Nations Department of Economic and Social Affairs organized the event as the UNGA resolution A/RES/64/236 of December 2009. The event placed sustainable development as a top priority on the agenda of the United Nations and the international community.

The conference has two themes agreed upon by the member states. First theme was the "***Green economy within the context of sustainable development and poverty eradication***" and second theme was "***Institutional framework for sustainable development***".

#### Objectives of Rio+20

- Securing renewed political commitment to sustainable development.
- Assessing the progress and implementation gaps in meeting already agreed commitments.
- Addressing new and emerging challenges.

The 1992 Earth summit put environmental issues on the world table for the first time. It led to global conventions on climate change, biodiversity and desertification. 172 Governments participated, including 108 heads of state. It ended with the **Rio Declaration** consisting of 27 principles to guide sustainable development.

United Nations wanted the Rio+20 to endorse a '*green economy roadmap*' with environmental goals, targets and deadlines and sought action on key areas such as water, food and energy. It was tagged as biggest UN Event ever but big leaders like Barack Obama, David Cameron and Angela Merkel skipped the meet. 50,000 participants, including delegates, environmental activists, business leaders, and indigenous groups and 130 heads of state from around the world were present for the final three days of the summit.

The following outcomes were expected from the recent summit:

- An agreement on a path to an "inclusive green economy"
- An agreement on defining "sustainable development goals with clear and measurable targets and indicators"

- Progress on implementing goals through renewed commitments on trade, finance, and technology transfer.

### **Outcomes**

Negotiators made little progress on a final declaration for the summit. The concrete outcome of the recent summit was the nonbinding document, "The Future We Want," which is a 49 page work paper that largely reaffirms previous actionable plans like **Agenda 21**. This was in stark contrast with the event that was held 2 decades back. Twenty years ago, the Earth Summit, held in the same Rio convention center, resulted in five key documents. Two of those were landmark, legally binding treaties on biodiversity and climate change. There were not very high ambitions from the recent summit mainly because the world grapples with other priorities like the economic crisis in Europe. It was already declared by the UN Officials that the Rio+20 will not yield any legally binding treaties. Here is a brief discussion on the outcomes of the recent summit:

#### **Sustainable Development Goals (SDGs)**

There was an expectation that the Rio+20 would hammer out goals across core areas like food security, water and energy. However, since the politicians across the globe were more focussed on financial crisis and middle east unrest, a defined set of mandatory measures could not be arrived at. The final nonbinding agreement has proposed launching a process to agree on sustainable development goals, or SDGs, which will likely build on and overlap with a current round of objectives known as the millennium development goals, which U.N. members agreed to pursue at least through 2015. A 30-member working group will decide on a work plan and present a proposal for SDGs to the U.N. general assembly in September 2013.

#### **Fossil Fuel Subsidies**

Rio+20 could not firm up a commitment for all countries to eliminate subsidies for fossil fuels. As per the IEA (International Energy Agency), phasing out fossil fuel subsidies by 2020 would reduce annual global energy demand by 5 percent and carbon dioxide emissions by nearly 6 percent. In 2009, the G-20 leaders had agreed to phase out the fuel subsidies in principle but no timelines were set. The most recent G20 summit in Mexico, also failed to firm up the idea. The outcome document of Rio+20 merely reaffirms the previous commitments by countries to "phase out harmful and inefficient fossil fuel subsidies that encourage wasteful consumption." There is no concrete plan or timetable, thus has disappointed environmental groups.

#### **Sustainable Development Fund (SDF)**

The developing countries have a long standing demand of creating a \$30 billion sustainable development fund. However, no substantial progress has been documented in the recent summit. The outcome document has called for a new intergovernmental process to produce a report that evaluates how much money is needed for sustainable development, and what new and existing instruments can be used to raise more funds. The process will be led by a group of 30 experts, which will conclude its work by 2014. The text of the documents mentions that it "recognizes the need for significant mobilization of resources from a variety of sources."

#### **Strengthening U.N. Environment Program (UNEP)**

One important outcome of the recent summit was the strengthening UNEP - an international institution that coordinates U.N. environmental activities - to a U.N. agency with power equal to other U.N. bodies like the World Health Organization. The document proposes to give UNEP "secure, stable, adequate and increased financial resources" from the United Nations' budget and voluntary contributions to help it fulfill its role. Extension of UNEP role is largely opposed by United States.

### **Green Economy**

One of the major themes of the conference was the concept of a "green economy," or improving human well-being and social equity while reducing environmental risks, which could be a common roadmap for sustainable development.

The final document affirms that each country could have its own path toward achieving a "green economy." The text said it could provide options for policy making but should not be a "rigid set of rules."

### **Green GDP**

One more important topic of the summit was ensuring that corporate and government accounting reflects environmental profit and loss. The text of the final document recognized the need for "broader measures of progress to complement GDP" to better inform policy decisions. It asked the U.N. Statistical Commission to launch a program of work to build on existing initiatives.

### **India and Rio+20**

India's Prime Minister Manmohan Singh attended the summit. His speech was having a clear reference that countries could do more if additional finance and technology were available. Unfortunately, there is little evidence of support from the industrialised countries in these areas. The ongoing economic crisis has made matters worse.

The reference of India was that West did not pay when it had the money, so now that it doesn't, how will it do so. The speech of Indian PM was reiteration of long established Indian stand — development, social inclusion and environmental sustainability are all equally critical. The draft declaration for the Rio+20 summit, with India's demands of reasserting equity and the principle of common but differentiated responsibilities (CBDR) found place in the text.

### **Chapter 13. Ministry of Environment & Forests**

The broad objectives of MOEF are as follows:

- Conservation and survey of flora, fauna, forests and wildlife,
- Prevention and control of pollution,
- Afforestation and regeneration of degraded areas
- Protection of the environment
- Ensuring the welfare of animals

The University works under the framework of domestic legislations and international agreements.

The MOEF also serves as the nodal agency in the country for cooperation with various international bodies in area of environment.

**Botanical Survey of India (BSI)**

This is the apex research organization under the MOEF for carrying out taxonomic and floristic studies on wild plant resources of the country.

BSI was established on 13th February, 1890 with the basic objective to explore the plant resources of the country and to identify the plants species with economic virtues.

Sir George King, the then Superintendent of the 'Royal Botanic Garden' Calcutta was appointed as First ex-officio Honorary Director of the BSI. After independence, the department was reorganized in 1954 by Government of India as a part of scientific development of the country. Its functional base was further expanded to include various new areas.

There are two important units of BSI viz. Indian Botanic Garden, Howrah and Central National Herbarium, Howrah.

**Indian Botanic Garden, Howrah**

Indian Botanic Garden was established in 1787

by Lieutenant Colonel Robert Kyd. Its 273 acres unique landscape design was initiated by Sir George King in 1872. It is considered to be one of the best in the botanic gardens of the world with undulated land surfaces, artificial lakes and moats interconnected with underground pipes receiving water from the river Hooghly. *It was known as East India Company's Garden or the 'Company Bagan' or Calcutta Garden and later as the Royal Botanic Garden which after independence was renamed as the 'INDIAN BOTANIC GARDEN' in 1950.* It came under the management of the Botanical Survey of India on January 1, 1963.

**Great Banyan Tree**

The 260 years old Great Banyan Tree (*Ficus bengalensis L.*) is located in the Indian Botanic Garden, Howrah. It has 2800 prop roots and spread in 1.5 hectares.

**Central National Herbarium, Howrah**

CNH is one of the oldest and one of the largest herbaria in the world, was established in 1795 by Dr. William Roxburgh. Dr. N. Wallich (1815 – 1846), the successor of William Roxburgh developed this herbarium to a great extent. Central National Herbarium possesses about 2.5 million of herbarium sheets belonging to nearly 350 families of plants, which are arranged according to **Bentham and Hooker's system of classification**. The area under the jurisdiction of Central National Herbarium is confined to the states of West Bengal, Bihar and Jharkhand.

**Botanic Garden of India Republic (BGIR), NOIDA**

Botanic Garden of India Republic (BGIR) was set up in April 2002 by the NDA Government as part of the Botanical Survey of India.

The scheme was identified as a "Green Channel" project under the *National Jai Vigyan Science & Technology Mission* of the Ministry of Science & Technology and approved by the Planning Commission. Its objective was the ex situ conservation and propagation of rare and indigenous plants, to serve as a 'centre of excellence' for research and training, and to build public awareness through environmental education.

**Zoological Survey of India (ZSI)**

With its headquarters in Kolkata, the Zoological Survey of India (ZSI) is the apex institution under MOEF for research in Fauna. It was established in 1916. Apart from the traditional works, recently ZSI also started concentrating on development of ENVIS on Faunal diversity, CITES centres and AICOPTAX Programmes, Chromosomal Mapping, DNA finger printing, Trichotaxonomic and Acoustic studies and Participation in Antarctica Expedition.

**AICOPTAX Programme**

AICOPTAX refers to All India Coordinated Project on Taxonomy. The ministry had launched this programme in 1999-2000 and it envisaged establishment of centres for research in identified priority gap areas (eg. virus, bacteria, microlepidoptera, etc.) in the field of taxonomy, education and training (fellowships, scholarships, chairs, career awards etc.) and strengthening of BSI and ZSI.

**Forest Survey of India**

- The Forest Survey of India is located at Dehradun and its four zonal offices are located at Shimla, Kolkata, Nagpur and Bangalore.
- Precursor to the FSI was "Pre-investment Survey of Forest Resources" (PISFR). The PISFR project was initiated in 1965 by the Government of India with the sponsorship of Food and Agriculture Organization (FAO) and United Nations Development Programme (UNDP).
- On June 1, 1981, PISFR was reorganized and thus was established the Forest Survey of India. The Government redefined the mandate of FSI in 1986 in order to make it more relevant to the rapidly changing needs and aspirations of the country.
- The FSI assesses the forest cover of the country through Remote Sensing technology, analyze the changes and prepare State of Forest Report. The state of Forest Report is published biennially.
- It conducts inventory in forests and no forest areas at national level and develop database on wood volume and also estimates tree cover.
- Forest Survey of India has been bringing out '**State of Forest Reports**' since 1987 based on interpretation of satellite images. Last such report was the India State of Forest Report 2011, 12th in the series.

**ANIFPDCL**

Andaman & Nicobar Islands Forest and Plantation Development Corporation Ltd. was set up in 1977 for development and managing forestry plantations on the Islands. It has a forestry project, a **Red Oil Palm** project and a **Katchal Rubber Project** in operation. It is a loss making enterprise because the forest logging business was curtailed down by the Supreme Court.

**Central Zoo Authority**

In India, the Zoos are regulated as per the provisions of Wild Life (Protection) Act, 1972 and are guided by the National Zoo Policy, 1998.

The Wild Life Protection Act was amended in 1991 and via this amendment; the Central Zoo Authority was established. So **Central Zoo Authority is a statutory body** whose main objective

was to enforce minimum standards and norms for upkeep and health care of animals in India zoos and restrain mushrooming of unplanned and ill-conceived zoos that were cropping up in the country as adjuncts to public parks, industrial complexes and way sides. Central Zoo Authority is headed by Minister of State for Environment & Forests (Forests & Wildlife), Government of India.

The authority has the following functions:

- Recognition of the Zoos.
- Evaluation of the Zoos.
- Coordination in the planned conservation breeding programme for endangered species in Indian zoos.

Approval of the exchange proposals of animals between Indian zoos and between Indian and foreign zoos.

Preparing and maintaining the studbooks

#### **Wildlife Institute of India, Dehradun**

Wildlife Institute of India (WII) was established in 1982, a premier training and research institution in the field of wildlife and protected area management in South Asia, is an autonomous institute of the Ministry of Environment & Forests, with a 49 member WII Society as the apex body. The Society is chaired by the Union Minister for Environment & Forests, Government of India. The Institute conducts various research projects, academic and training programmes.

#### **National River Conservation Directorate**

The National River Conservation Directorate (NRCD), functioning under the Ministry of Environment and Forests is engaged in implementing the River and Lake Action Plans under the National River Conservation Plan (NRCP) and National Lake Conservation Plan (NLCP) by providing financial assistance to the State Governments.

#### **National Ganga River Basin Authority**

The Central Government has given Ganga the status of a 'National River' and has constituted a 'National Ganga River Basin Authority' (NGRBA) on February 20, 2009. The NGRBA has been set up as an empowered planning, financing, monitoring and coordinating authority for the conservation of Ganga River with a holistic approach under the Environment (Protection) Act, 1986.

The Authority is chaired by the Prime Minister and has as its members, the Chief Ministers of the States through which Ganga flows, viz., Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal.

#### **National Afforestation and Eco-Development Board (NAEB)**

National Afforestation and Eco-Development Board (NAEB) was set up in August 1992 for promoting the Afforestation, tree planting, ecological restoration and ecodevelopment activities in the country. It gives special attention to the regeneration of degraded forest areas and lands adjoining forest areas, national

parks, sanctuaries and other protected areas as well as the ecologically fragile areas like the Western Himalayas, Aravallis, Western Ghats etc.

Major function of the NAEB is to evolve mechanisms for ecological restoration of degraded forest areas and adjoining lands through systematic planning and implementation, in a cost effective manner. Another major function is to restore through natural regeneration or appropriate intervention the forest cover in the country for ecological security and to meet the fuel wood, fodder and other needs of the rural communities.

**G.B. Pant Institute of Himalayan Environment and Development, Kosi-Katarmal, Almora**

G.B. Pant Institute of Himalayan Environment and Development (GBPIHED) was established in August 1988 by the Ministry of Environment and Forests, Government of India, as an autonomous Institute, with a mandate of achieving sustainable development and environmental conservation in the Indian Himalayan Region (IHR).

Apart from the headquarters at Kosi-Katarmal, Almora (Uttarakhand), it has four regional Units located at Kullu (Himachal Pradesh), Srinagar-Garhwal Uttarakhand), Pangthang (Sikkim) and Itanagar (Arunachal Pradesh). This institute designs and implements R&D activities on priority environmental problems; develops and demonstrates best practices and delivers technology packages for improved livelihood options for the people of IHR.

**Indian Council of Forestry Research and Education (ICFRE), Dehradun**

Indian Council of Forestry Research and Education (ICFRE) is an apex body in the national forestry research system. It undertakes the holistic promotion of forestry research through need based planning, promoting, conducting and coordinating research, education and extension covering all aspects of forestry.

Its objectives are:

- To undertake, aid, promote and coordinate forestry education, research and their applications.
- To develop and maintain a national library and information centre for forestry and allied sciences.
- To act as a clearing-house for research and general information related to forests and wildlife.
- To develop forestry extension programmes and propagate the same through mass media, audio-visual aids and extension machinery.

The ICFRE has **eight Regional Research Institutes** and four Research Centres located in different bio-geographical regions of the country to cater the forestry research needs of the nation.

The institutes are:

1. Forest Research Institute (FRI), Dehradun
2. Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore
3. Institute of Wood Science and Technology (IWST), Bangalore
4. Tropical Forest Research Institute (TFRI), Jabalpur
5. Rain Forest Research Institute (RFRI), Jorhat
6. Arid Forest Research Institute (AFRI), Jodhpur
7. Himalayan Forest Research Institute (HFRI), Shimla
8. Institute of Forest Productivity (IFP), Ranchi

**Indian Institute of Forest Management (IIFM), Bhopal**

IIFM, as a sectoral management institute, imparts education in forest management, which is a judicious mixture of forestry, social, and management science. The Institute constantly endeavours to keep in touch with the problems of people, especially the forest dwellers and undertakes need-based research.

**Chapter 14. National Environment Policy**

National Environment Policy 2006 is a response to our national commitment to a clean environment, mandated in the Constitution in Articles 48 A (DPSP) and 51 A (g) (Fundamental Duties) strengthened by judicial interpretation of Article 21 (Fundamental Rights).

Note: This is a long document and I did not find anything relevant to reproduce it again here. If you wish to read about it kindly visit this link

<http://www.gktoday.in/national-environment-policy-2006/>

**Chapter 15. Climate Change Concepts & Questions - Compendium-2****What is Carbon Leakage?**

Carbon Leakage is a major issue with the **Clean Development Mechanism**. It is defined as increase in emissions outside a region as a direct result of the policy measures to cap emission in this region. This means that the domestic climate mitigation policy is less effective and more costly in containing emission levels, a legitimate concern for policy-makers. One example of the stringiest policies is **Carbon Tax**, or Carbon Cess applicable in many countries.

How does Carbon Leakage work?

We take an example of two countries A and B.

**Country A** has a very strict emission policy and due to its stringent policy, the costs involved in the production increases.

**Country B** has a less strict and flexible emission policy and due to this flexible policy, the costs involved in the production are less as compared to country A, keeping all other factors constant.

So, a company located in country A faces increased costs due to emissions pricing as a result of the strict climate policy. The company would take some action and as a result may decide to go for reducing, closing or even relocating the production to Country B with less stringent climate policies. This means that the Country A was though able to cut emissions, but now Country B will increase the emissions due to transfer of greenhouse gas intensive industries from Country A to B. The result is more Green House Gases emission and more industrial jobs.

This shift may be from Country to Country, Province to Province, Region to Region or any other way out.

**What was the Bali Action Plan ?**

Bali Action Plan or Bali Roadmap was adopted after the 2007 United Nations Climate Change Conference (COP-13/ MOP-3) on the island Bali in Indonesia in December, 2007. This was a two-year process to finalizing a binding agreement in 2009 in Copenhagen. According to the Bali Road

Map, a framework for climate change mitigation beyond 2012 was to be agreed there in the COP 15 at Copenhagen Summit, in 2009. However, an agreement was not reached in the same conference nor in the COP 16 at Mexico. It was finally given a shape in COP-18.

### **What was Delhi Ministerial Dialogue ?**

Prior to the United Nations Conference on Sustainable Development (UNCSD), or Rio +20, to be held in Rio de Janeiro, Brazil, in June, 2012, the Delhi Ministerial Dialogue will secure renewed political commitment for sustainable development, assess progress on implementation and remaining gaps, and address new and emerging challenges.

The 2 day dialogue began in Delhi recently (November 2011). Representatives of about 54 countries and 12 UN agencies discussed about a green economy in the context of sustainable development and poverty eradication, and the institutional framework for sustainable development. The Dialogue seeks to advance understanding and promote the achievement of consensus on key issues related to green economy and inclusive growth, with a particular focus on how green economy strategies and policies can be integrated with food security and energy security objectives.

### **What is ICIMOD ?**

ICIMOD refers to **International Centre for Integrated Mountain Development**. It works on fragile mountain eco-systems and livelihoods of mountain people in the **Hindu Kush-Himalayan region**. Its members are the *eight countries of the Hindu Kush-Himalayan area* viz. Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan.

ICIMOD is based in Kathmandu and was established in 1983.

The ICIMOD has been facilitating the **Mount Kailash Sacred Landscape Initiative**, involving India, Nepal and China. These countries will collaborate on eco-restoration and bio-diversity management in their parts of the territory. India contributed 5 lakh dollars to the ICIMOD in just three years viz. 2009, 2010 & 2011.

### **National Mission for Sustaining the Himalayan Ecosystem (NMSHE)**

Himalayan ecosystem is vital to the ecological security of the Indian landmass. It provides forest cover, feeds perennial rivers that provide water for drinking, irrigation, and hydropower, and provides a home and a basis for sustainable biodiversity, agriculture, and tourism.

The Himalayan ecosystem is highly vulnerable to the stress caused by increased pressure of population, exploitation of natural resources and other related challenges. Climate change may adversely impact the Himalayan ecosystem through increased temperature, altered precipitation patterns, and episodes of drought.

Considering the fragility and importance of the Himalaya, a **National Mission for Sustaining the Himalayan Ecosystem (NMSHE)** has been included in the eight National Missions of the National Action Plan on Climate Change (NAPCC) with the objectives of conserving and protecting Himalayan glaciers and its ecosystem.

It is the only area specific Mission. Its specific action area is to improve trans-boundary exchange of information through mutually agreed mechanisms and ICIMOD being an independent 'Mountain Learning and Knowledge Centre' can play an important role in strengthening such trans-boundary exchange of information among the eight regional member countries of the Hindu Kush -Himalayas area

The technical document of NMSHE mission document envisages generation of sound scientific knowledge and strengthening the knowledge Institutions in the IHR through six subject wise task forces. Under the capacity building and knowledge sharing program several initiatives are taken by ICIMOD. This can be utilized for increasing collaboration between ICIMOD and Department of Science and Technology and further strengthening the institutions in the regional member countries.

#### **National Ganga River Basin Authority (NGRBA)**

The river Ganga is seriously polluted and under extreme environmental stress. The river suffers from high levels of organic and bacterial pollution, especially in its critical middle stretch. It is primarily as a result of:

- Inadequate municipal wastewater infrastructure and services
- Industrial pollution
- Solid waste
- Inadequate in-stream flows

The Ganga Action Plan (GAP) launched in 1985, focused primarily on urban wastewater and funded a large number of Wastewater Treatment Plants (WWTPs) and related urban wastewater infrastructure. The programme was able to maintain the water quality, in spite of significant increases in pollution. But there were number of weaknesses such as insufficient investments, underutilization of created capacity, little ownership of local bodies, long delays, and poor communications etc.

#### **National Ganga River Basin Authority (NGRBA)**

In 2009, the Government developed a new and more comprehensive vision for clean-up and conservation of the Ganga, by the establishment of the National Ganga River Basin Authority (NGRBA). The NGRBA has been given a mandate to develop a multi-sector program ("the NGRBA Program") for ensuring pollution abatement in the Ganga.

#### **Structural and Legal basis**

The NGRBA is a collaborative institution of central and state governments, chaired by the Prime Minister, with membership comprising of key GoI ministers, the Chief Ministers of the five basin states and nine members representing civil society.

In order to coordinate and implement the NGRBA Program at the state level, each of the five states has also constituted a State Ganga River Conservation Authority (SGRCA). The central Ministry of Environment and Forests (MoEF) is the nodal agency for the program.

The NGRBA is constituted under the Environment Protection Act of 1986, which gives it a strong regulatory and enforcement powers.

### **Functions and Powers**

The programme aims to address multiple sources of pollution, including wastewater, solid waste and non-point sources. The Authority will take measures for effective abatement of pollution and conservation of the river Ganga in keeping with sustainable development needs. These include;

- Development of a river basin management plan;
- Regulation of activities aimed at prevention, control and abatement of pollution in Ganga to maintain its water quality, and to take measures relevant to river ecology and management in the Ganga basin states;
- Maintenance of minimum ecological flows in the river Ganga;
- Measures necessary for planning, financing and execution of programmes for abatement of pollution in the river Ganga including augmentation of sewerage infrastructure, catchment area treatment, protection of flood plains, creating public awareness;
- Investigations and research regarding problems of environmental pollution and conservation of the river Ganga;
- Promotion of water conservation practices including recycling and reuse, rain water harvesting, and decentralised sewage treatment systems;
- Monitoring and review of the implementation of various programmes or activities taken up for prevention, control and abatement of pollution in the river Ganga;

### **Approach**

- A comprehensive, basin-level, and multi-sectoral approach, with support for investments in wastewater, solid waste and river front management, and efforts to address nonpoint source pollution and ecological flows
- To develop strong and dedicated operational-level institutions for planning, managing and implementing the program with singlepoint accountability
- Upgrading the knowledge-base for the Ganga system to ensure that planning and investments are based on adequate and sound information
- Public participation through strategic and broad-based communications and community participation components

### **Finance and Expenditure**

The costs of the NGRBA Program will be shared in 70:30 ratio between the central and state governments. Investments worth \$ 600 million were approved in 2010-11 and an estimated \$ 4 billion is expected to be mobilised to meet the declared objective of NGRBA of ensuring zero discharge of untreated wastewater into the mainstem of the river by 2020.

The World Bank intends to support the NGRBA initiative in the long term through provision of substantial financing, knowledge support, and assistance in building a consortium of financiers.

**Project components**

The project has two main components: institutional development and priority infrastructure investments. The first component seeks to build the institutional capacity to effectively implement the overall NGRBA Program, including infrastructure investments funded by the second component.

**1. Institutional Development**

It seeks to build the institutional capacity to effectively implement the overall NGRBA Program.

It has three sub components:

- a) NGRBA Operationalization and Program Management
- b) Technical Assistance for ULB Service Providers
- c) Technical Assistance for Environmental Regulators

**2. Priority Infrastructure Investments**

This component supports demonstrative investments in four sectors.

- a) wastewater sector, particularly in treatment plants and sewerage networks
- b) industrial pollution control and prevention (common effluent treatment plants)
- c) solid waste management (collection, transport and disposal systems)
- d) river front management (improvement of the built environment along river stretches, improvement of small ghats and crematoria, and the conservation and preservation of ecologically sensitive sites)

**Implementation**

The NGRBA has constituted a Standing Committee, headed by the Union Finance Minister, to frequently review implementation; and an Empowered Steering Committee, headed by the Union Secretary of Environment and Forests, for investment clearances and program coordination.

The MoEF, being the nodal Ministry, has the overall responsibility for the NGRBA Program, including the World Bank-supported project. It is establishing the Program Management Group (PMG), a dedicated entity with suitable structure, staffing, powers and leadership, charged with effective implementation of the overall NGRBA Program.

The implementing agencies at the state level are the SGRCA Program Management Groups (SPMGs). Each infrastructure investment will be executed by the Executing Agency (EA) selected specifically for that investment.

**Yamuna Action Plan (YAP)**

To supplement the efforts of State Governments in addressing the problem of pollution of river Yamuna, Government of India is implementing Yamuna Action Plan (YAP) with assistance from Japan International Cooperation Agency, Government of Japan in a phased manner.

A total of 276 schemes including 38 sewage treatment plants have been completed in 21 towns of Uttar Pradesh, Haryana and Delhi and 753.25 million litres per day of sewage treatment capacity has been created of which 401.25 mld in Uttar Pradesh, 322 mld in Haryana and 30 mld in Delhi. No private players have been involved by this Ministry in the cleaning up of river Yamuna under the plan.

**What is the role of Paddy Fields in Global Warming?**

Paddy Fields contribute in Global warming. We should know that Paddy fields full of rice are among the world's biggest producers of methane, contributing around 10% of global emissions.

Methane, a compound of carbon and hydrogen, is produced by bacteria in the soil.

Methane is the second most important greenhouse gas, responsible for about 20% of global warming. Rice absorbs carbon from the atmosphere, but if the plant cannot utilize it efficiently, the carbon is dispersed into the soil from the roots of the rice plants. Methane is produced from carbon and hydrogen by bacteria in the soil.

New varieties of rice are being developed which channel carbon into making flowers and grain putting less of it into the soil. Further, production of methane can be significantly reduced through midseason drainage and alternate wetting and drying irrigation, without reducing the rice yield (as practiced in Japan).

Please also note that Livestock, and in particular ruminants are one of the important sources of methane emission on a global scale. There are two sources of methane emission from live stock viz. from digestive process of ruminants and from animal wastes.

**What are Eco-sensitive Zones?**

The Environment Protection Act, 1986 does not mention the word "Eco-sensitive Zones".

- The section 3(2)(v) of the Act, says that Central Government can restrict areas in which any industries, operations or processes or class of industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguards
- Besides the section 5 (1) of this act says that central government can prohibit or restrict the location of industries and carrying on certain operations or processes on the basis of considerations like the biological diversity of an area, maximum allowable limits of concentration of pollutants for an area, environmentally compatible land use, and proximity to protected areas.

The above two clauses have been effectively used by the government to declare Eco-Sensitive Zones or Ecologically Fragile Areas (EFA). The same criteria have been used by the government to declare No Development Zones.

India has the largest paddy output in the world and is also the second largest exporter of rice in the world.

Paddy fields are a common sight throughout India from northern gangetic plains to southern peninsular plateaus.

Paddy is cultivated at least twice a year in most parts of India, the two seasons being known as Rabi and Kharif respectively. Rabi is dependent on irrigation, while the Kharif depends on Monsoon.

Many festivals such as Onam in Kerala, Bihu in Assam, Sankranthi in Andhra Pradesh Thai Pongal In Tamil Nadu, Makara Sankranthi in Karnataka, Nabanna in West Bengal celebrates harvest of Paddy.

Andhra Pradesh is historically known as the "Rice Bowl of India", while Thanjavur is historically known as the "Granary of South India" and the Rice bowl of Tamil Nadu.

Nanchinadu was known as the rice bowl of the former Kingdom of Travancore.

In Kerala, Kuttanadu is famous for paddy cultivation. Kuttanadu is called the rice bowl of Kerala. (wikipedia)

The MoEF (Ministry of Environment & Forests) has approved a comprehensive set of guidelines laying down parameters and criteria for declaring ESAs. A committee constituted by MoEF put this together. The guidelines lay out the criteria based on which areas can be declared as ESAs. These include Species Based (Endemism, Rarity etc), Ecosystem Based (sacred groves, frontier forests etc) and Geomorphologic feature based (uninhabited islands, origins of rivers etc).

#### List of India's Eco Sensitive Zones

- Sultanpur , Haryana declared on 27/01/2010
- Mount Abu, Rajasthan declared on 25/06/2009
- Khaparwas Wildlife Sanctuary, Jhajjar District of Haryana as Eco- Sensitive Zone declared on 03/06/2009 on the same date Bhindawas Wildlife Sanctuary was also declared.
- Abubshaher Wildlife Sanctuary situated in Sirsa District of Haryana declared on 03/06/2009
- Chhilchhila Wildlife Sanctuary, Haryana declared ecosenstive zone on 03/06/2009
- Nahar Wildlife Sanctuary Rewari district of Haryana declared on 03/06/2009
- Bir Shikargarh Wildlife Sanctuary, Panchkula distircit Haryana as Eco- Sensitive Zone declared on 03/06/2009
- Khol hi Raitan Wildlife Sanctuary also known as Morni Sanctuary in panchkula District of haryana declared on 03/06/2009
- Kalesar Wildlife Sanctuary , Yamuna Nagar District of Haryana declared on 3.6.09
- Matheran and surrounding region in Maharashtra declared as Eco-sensitive Zone 4/2/2003
- Mahabaleswar Panchgani Region in Maharashtra as an Eco-sensitive region 17/1/2001
- Pachmarhi Region in Hoshangabad, Chhindwara and Betul districts of Madhya Pradesh declared as as an Eco-sensitive Zone on 17/9/1998
- Dahanu Taluka, Maharashtra Environment Protection Authority in 1996
- No Development Zone at Numaligarh, East of Kaziranga in assam was declared in 1996
- Restricting certain activities causing Environmental Degradation at Aravalli Range was carried out in 1992.
- Restricting location of industries, mining & other activities in Doon Valley in 1989
- Prohibiting Industries in Murud-Janjira, Raigadh District, Maharashtra in 1989. (This was the first zone to be declared as Eco Sensitive Zone)
- Please note that Boundaries of the Ecosensitive zones are approximately 5 kms surrounding a sanctuary and they are fixed by legislation / notification.

#### Protection of Olive Ridley Turtles

**Astaranga coast and Gahirmatha Marine Sanctuary** are home to Olive Ridley Turtles In India, both located in Odisha.

The coastal waters of Gahirmatha has been designated as a Marine Sanctuary and steps taken for patrolling and other protection measures. Gahirmatha Marine Sanctuary is the only marine wildlife

sanctuary of Orissa. This sanctuary boasts of possessing the world's largest known rookery of Olive Ridley sea turtles.

Olive Ridley is classified as Vulnerable according to the International Union for Conservation of Nature And Natural Resources (IUCN), and is listed in Appendix I of CITES.

Olive Ridley turtles are best known for their behavior of synchronized nesting in mass numbers, termed arribadas. The winter seasons is the mating and breeding season of these turtles.

So accordingly, the fishing activities inside the Gahirmatha Marine Sanctuary and 20 kms off the shore has been banned from November 1 to May 31, 2011. The ban is enforced under the Orissa Marine Fishing Regulation Act, 1982 and Orissa Marine Fishing Rules, 1983 to protect the endangered Olive Ridley Sea turtles. However, since the area is vast (above 1408 sq.kms) and there is heavy fishing pressure which involves local vessels as well as vessels from the neighbouring states like West Bengal and Andhra Pradesh and vessels from the neighbouring countries like Sri Lanka, Bangladesh and Thailand, etc, often there are violations of the laws but these are being dealt with to the extent possible with available manpower and resources. Despite a ban continual illegal fishing using mechanized trawlers on Astaranga coast and Gahirmatha beaches, is posing serious threat to the endangered Olive Ridley turtles visiting Orissa every year for mass nesting. The Government of Orissa has been undertaking protection activities along the Orissa coast.

The Government says that coastal waters of Astaranga are not a Marine sanctuary. Mechanized fishing in this area is only seasonally prohibited from November to May next year within a distance of 10 km coast line under the State Fisheries Act such as Orissa Marine Fishing Regulation Act (OMFRA), 1982 and Orissa Marine Fishing Regulation Rules, 1983. There is no restriction on the movement of fishing vessels, as per the above Act and Rules, beyond the above restricted period and distance.

#### **Protection of Kachuga dhonkoga**

Kachuga dhonkoga is the Three-striped Roofed Turtle, also known as Batagur dhongoka and is a species of turtle mostly found in Nepal and North East India.

This turtle has been classified in the IUCN Red List of Threatened Species. It is under threat because of the consumption for subsistence by the local population, degradation of the reverine habitat and disturbance of the breeding sites. In order to augment the population of species, head start and captive breeding programmes have been taken up at the following places:

- Kukrail Centre Lucknow, Uttar Pradesh
- Deori Crocodile and Turtle Rearing Centre, Madhya Pradesh
- Freshwater Turtle Conservation and Education Centre in National Chambal Sanctuary, Garhaita, Itawah, Uttar Pradesh.

#### **Great Indian one-horned Rhinoceros Census**

As per the latest census, the Great Indian one-horned Rhinoceros' population in the Kaziranga National Park (KNP) - world heritage site has seen a rise. There number rose by 39 from previous

2,290 to 2329 at present. In 1999, the figure was 1,672, which increased to 2,048 in 2009. (Noted from The Hindu March 26, 2013)

### 2013 as Year of Water Cooperation

Subsequent to a proposal initiated by Tajikistan, in 2010 UN General Assembly (UNGA) declared 2013 as the UN International Year of Water Cooperation . In assigning 2013 as the UN International Year of Water Cooperation, the UNGA has actually made out that cooperation is necessary to attain a balance between the various needs and priorities and share this valued resource equitably, using water as an instrument of peace.

### New Pashmina Development Scheme

The Union Government will provide a financial assistance of Rs 41.21 crore to protect Pashmina goat which produces world-famous fine luxury fibre. This was government's response over the recent deaths of thousands of Pashmina goats in the Ladakh region.



As per the assistance, there is plan which envisages a new Pashmina Wool Development Scheme with a special package and a financial allocation of Rs 41.21 crore.

### Issue of the Dongria Kondh tribe and Vedanta

The Dongria Kondh, a primitive tribal group has been protecting more than 7 sq. km. of the sacred undisturbed forests on top of the mountain, where the proposed mining lease area of the **Lanjigarh bauxite mining** (Odisha) is located. They consider the land and forests sacred to their deity.

This tribe has been the major force behind the cancellation of the environmental clearance to Vedanta for the Lanjigarh Bauxite mining project in Odisha.

As per MoEF, the diversion of forest land on the proposed mining site of the Lanjigarh bauxite mining lease is violative of the fundamental rights of the Dongria Kondh tribals as well as the spirit of Forest Rights Act especially for the vulnerable tribal groups such as the Dongria Kondh and thus cannot be allowed for this reason alone.

The ministry gave reference of the constitution and said that the Lanjigarh bauxite mining lease is located in Scheduled Areas as referred to in Clause (1) of Article 244 of the Constitution. Circumscribing or extinguishing of forest rights in such areas shall not be in conformity with the provisions of the clause-5 of the Fifth Schedule to the Constitution.

### Vinod Rishi Panel to study legal cover for elephant habitats

Ministry of Environment and Forests (MoEF) has set up the Vinod Rishi panel to review how elephant reserves and corridors across the country can get a higher level of legal protection under existing green laws. This was the response of the ministry after National Board for Wildlife raised concerns about lack of legal cover for elephant reserves and corridors against changes in the vast landscapes that pachyderms occupy in the country.

*Unlike in the case of national parks, tiger reserves and sanctuaries, the government faces peculiar difficulties in protecting elephant habitats. Elephants can traverse hundreds of kilometres annually, running through cities, villages and forest land that are contested by many stakeholders holding or wanting rights to the lands for varying activities ranging from mining to sustenance of tribals.*

The new panel will look into that the existing network of elephant reserves and corridors sufficiently cover the animal's habitat and what kind of legal cover can be introduced to these lands under existing green laws as recommended by the Elephant Task Force. The committee will assess the impact of wildlife protection regulations on people living or utilizing the land falling under elephant reserves and corridors.

### **NAPCC and its 8 missions**

National Action Plan on Climate Change (NAPCC) is a comprehensive action plan which outlines measures on climate change related adaptation and mitigation while simultaneously advancing development. The 8 Missions form the core of the Plan, representing multi-pronged, long termed and integrated strategies for achieving goals in the context of climate change. The Eight Missions are:

#### **1. National Solar Mission**

- Make solar energy competitive with fossil-based energy options.
- Launch an R&D programme facilitating international co-operation to enable the creation of affordable, more convenient solar energy systems.
- Promote innovations for sustained, long-term storage and use of solar power.

#### **2. National Mission for Enhanced Energy Efficiency**

- The Energy Conservation Act of 2001 provides a legal mandate for the implementation of energy efficiency measures through the mechanisms of The Bureau of Energy Efficiency (BEE) in the designated agencies in the country.
- A number of schemes and programmes have been initiated which aim to save about 10,000 MW by the end of the 11th Five-Year Plan in 2012.

#### **3. National Mission on Sustainable Habitats**

- Make habitats sustainable through improvements in energy efficiency in buildings, management of solid waste and a modal shift to public transport.
- Promote energy efficiency as an integral component of urban planning and urban renewal through its initiatives.

#### **4. National Water Mission**

- Conserving water, minimizing wastage, and ensuring more equitable distribution and management of water resources.
- Optimizing water use efficiency by 20% by developing a framework of regulatory mechanisms.

#### **5. National Mission for Sustaining the Himalayan Ecosystem**

- Empowering local communities especially Panchayats to play a greater role in managing ecological resources.

- Reaffirm the measures mentioned in the National Environment Policy, 2006.

**6. National Mission for a Green India**

- To increase ecosystem services including carbon sinks.
- To increase forest and tree cover in India to 33% from current 23%.

**7. National Mission for Sustainable Agriculture**

- Make Indian agriculture more resilient to climate change by identifying new varieties of crops (example: thermally resistant crops) and alternative cropping patterns.
- Make suggestions for safeguarding farmers from climate change like introducing new credit and insurance mechanisms and greater access to information.

**8. National Mission on Strategic Knowledge on Climate Change**

- Work with the global community in research and technology development by collaboration through different mechanisms. It also has its own research agenda supported by climate change related institutions and a Climate Research Fund.
- Encourage initiatives from the private sector for developing innovative technologies for mitigation and adaptation.

**Planning Commission's Environment Performance Index**

Uttarakhand (scored 0.8123) topped the list of best-performing States and Union territories in terms of environmental performance. As per the Environmental Performance Index (EPI) released by Planning Commission:

- Uttarakhand is followed by Himachal Pradesh (0.7316), Chandigarh (0.7270), Sikkim (0.7149), and Andhra Pradesh (0.7147).
- Best states in terms of air quality: Mizoram, Kerala, Goa, Sikkim, Tripura, Puducherry and Andaman and Nicobar (all with average score of 1)
- Paradoxically, except for Uttarakhand, all the States meet the prescribed national ambient air quality standard in respect of the sulphur dioxide of 20 micrograms per cubic metre.
- More than 10 States do not meet the national standard of 30 microgram per cubic metre for Nitrogen dioxide.
- Except for Goa, Kerala, and Mizoram, no State meets the 60 microgram per cubic metre national standard for particulate matter.
- Himachal Pradesh is the only state with 100 % sewage treatment capacity, in the remaining States it ranges from 0 (13 States) to less than 20 % (8 States) and more than 50 per cent in 4 States.
- Total fecal coliform count is as much as 92 % in most of the States.
- States leading in forest conservation and expansion of green cover are Chandigarh, Sikkim, Arunachal Pradesh, Uttarakhand and Madhya Pradesh.

Here we note that Environmental well-being is one of the considerations for transfer of funds to the States under the Gadgil formula.

**Impact of Walker circulation on Indian Monsoon**

Walker circulation is a conceptual model of the air flow in the tropics. It is caused by the pressure gradient force that results from a high pressure system over the eastern Pacific ocean, and a low pressure system over Indonesia, that is why also called Pacific Walker Circulation. When the Walker circulation weakens or reverses, an El Niño results, causing the ocean surface to be warmer than average, as upwelling of cold water occurs less or not at all. An especially strong Walker circulation causes a La Niña, resulting in cooler ocean temperatures due to increased upwelling.

**Impact on India Monsoon:**

*The researchers in the Potsdam Institute for Climate Impact Research and Potsdam University concluded that Walker circulation, on average, brings more high pressure over India and suppressing the monsoon, especially in spring when the monsoon begins to develop.*

The recent studies find that the increasing temperatures and a change in strength of the Pacific Walker circulation in spring could cause more frequent and severe changes in monsoon rainfall.

**Fluoride water and Tridax procumbens**

The common name of the plant Tridax procumbens in Hindi is **Ghamra** and in Kannada is Jayanthi. It is called Bishalya karani in Odiya, Kambarmodi in Marathi, Gaddi Chemanthi in Telugu, Vettukaaya poondu in Tamil. This plant has been known for several therapeutic roles such as antiviral, anti oxidant antibiotic efficacies, wound healing activity, insecticidal and anti-inflammatory activity.

In recent times, this plant has been used to create a water filter system, which can quickly and easily remove "fluoride" from drinking water. The technology was described in the March 2013 issue of the International Journal of Environmental Engineering. The system uses parts of the plant Tridax procumbens as a biocarbon filter for the ion. Previously, the plant has been tested in the extraction of toxic heavy metals from water. The trials done by Malairajan Singanan of the Presidency College, Chennai show that it takes just three hours to remove 98% of fluoride with just 2 grams of the biocarbon filter ☺

**Some more notes:**

- WHO guidelines suggest that a safe level of fluoride is 1.5 milligrams per liter.
- Various techniques to reduce fluoride content have been tried including coagulation, adsorption, precipitation, ion exchange, reverse osmosis, and electrodialysis.