

Environmental Friendly Energies & Carbon Sequestration Potential

For Andhra Pradesh

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ENERGY AND ENVIRONMENT

- WHY? Energy has become so important to Environment????
- Which one is Important?
 - Energy
 - Health
 - Economy
- How sustainable are our energy consumption levels?

India: State of Power Generation

Producer

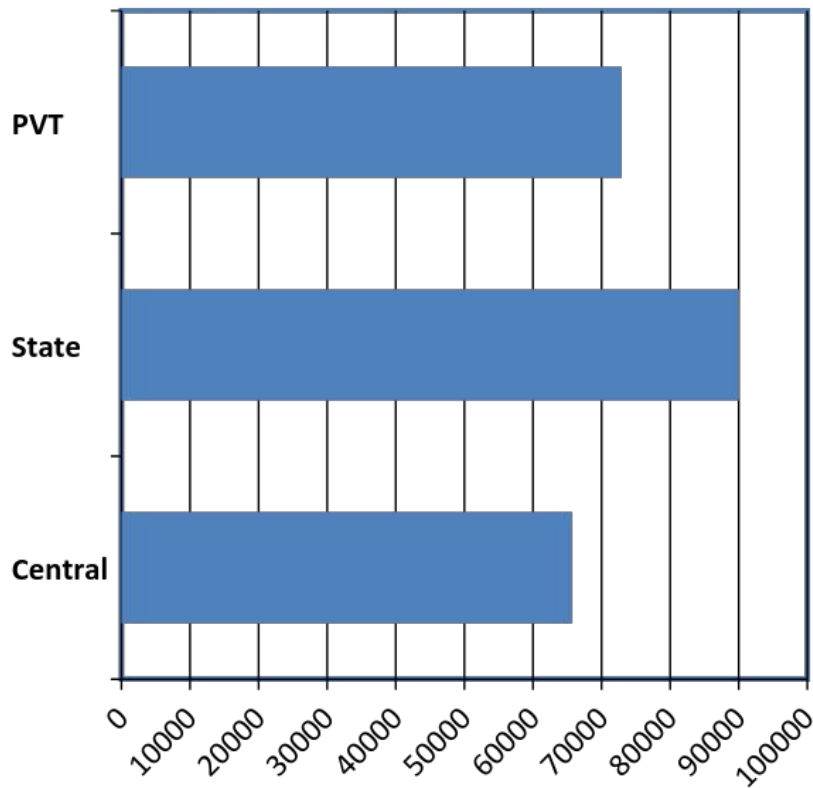
Owned	Installed Capacity (MW)
Central Govt.	65733
State Govt.	90062
Private	72927
TOTAL	228722

Generation type

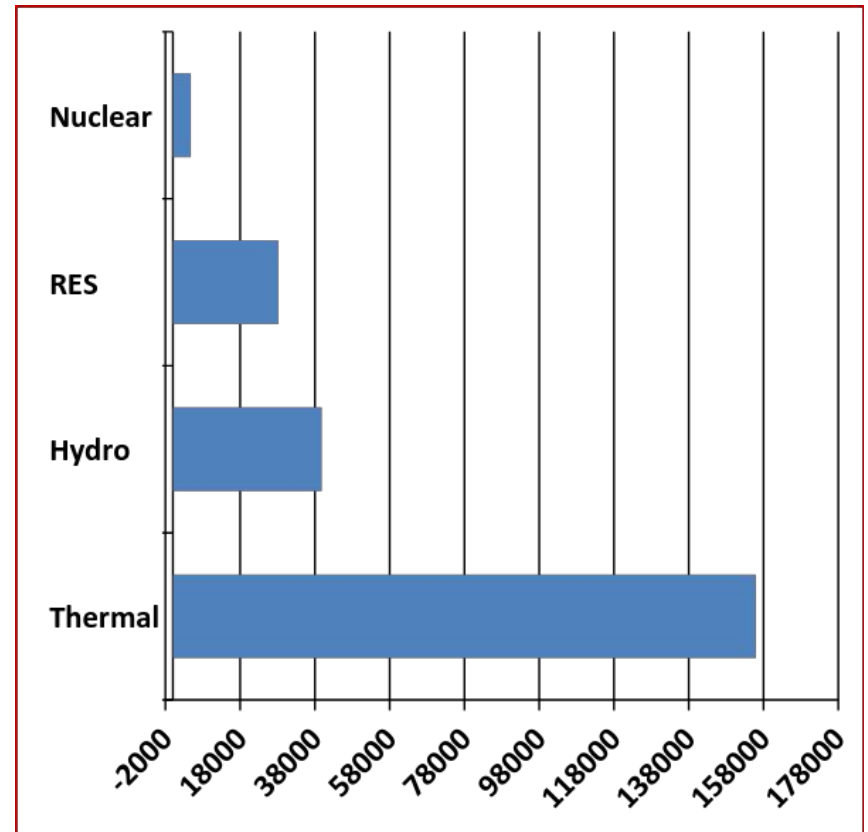
Type	Installed Capacity (MW)
Thermal	155969
Hydro	39788
RES	28184
Nuclear	4780
TOTAL	228722

State of Power Production, India: 2016

PRODUCERS



GENERATION TYPE

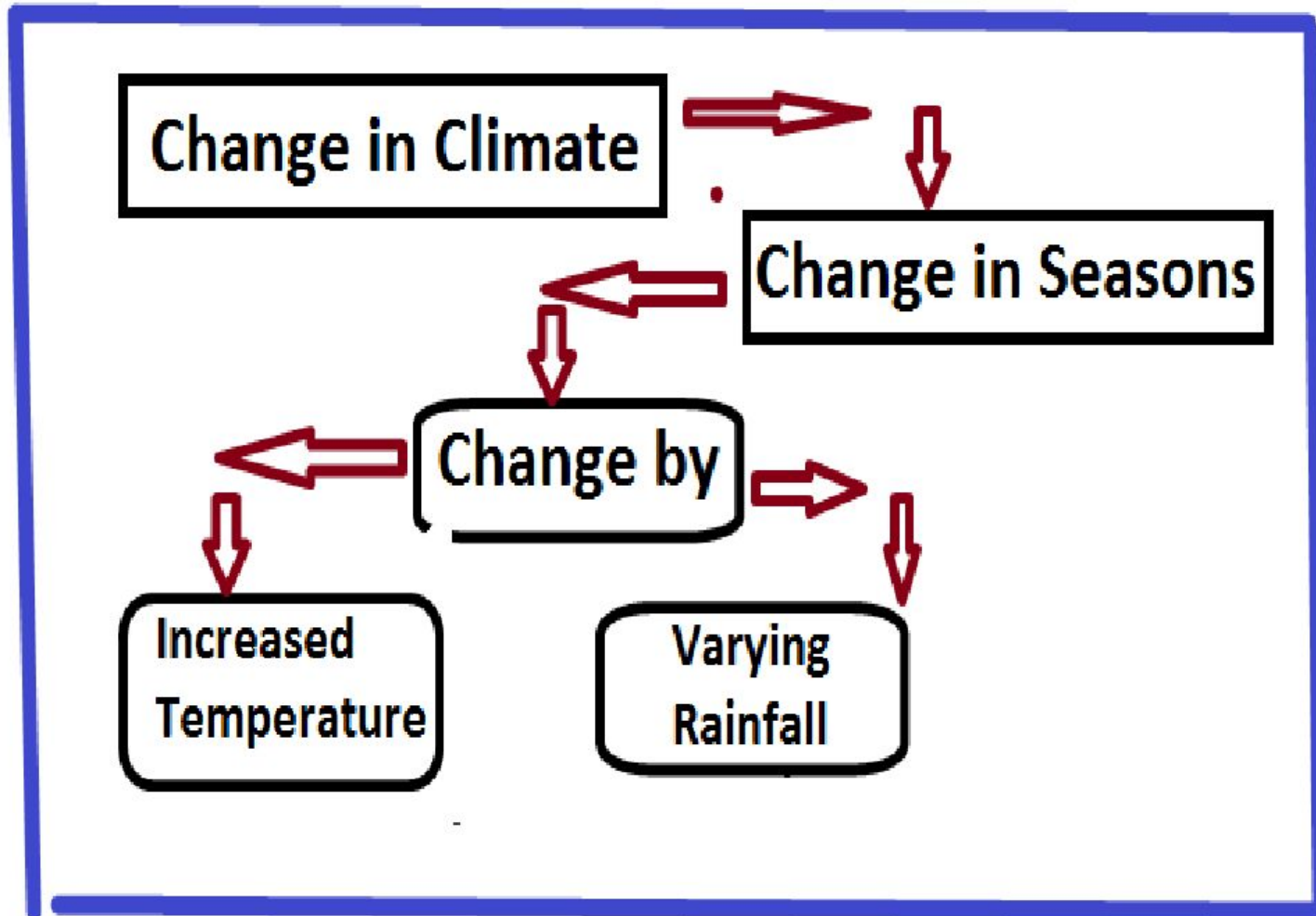


GLOBAL WARMING

Global warming refers to an average increase in the Earth's temperature, which in turn causes changes in climate.

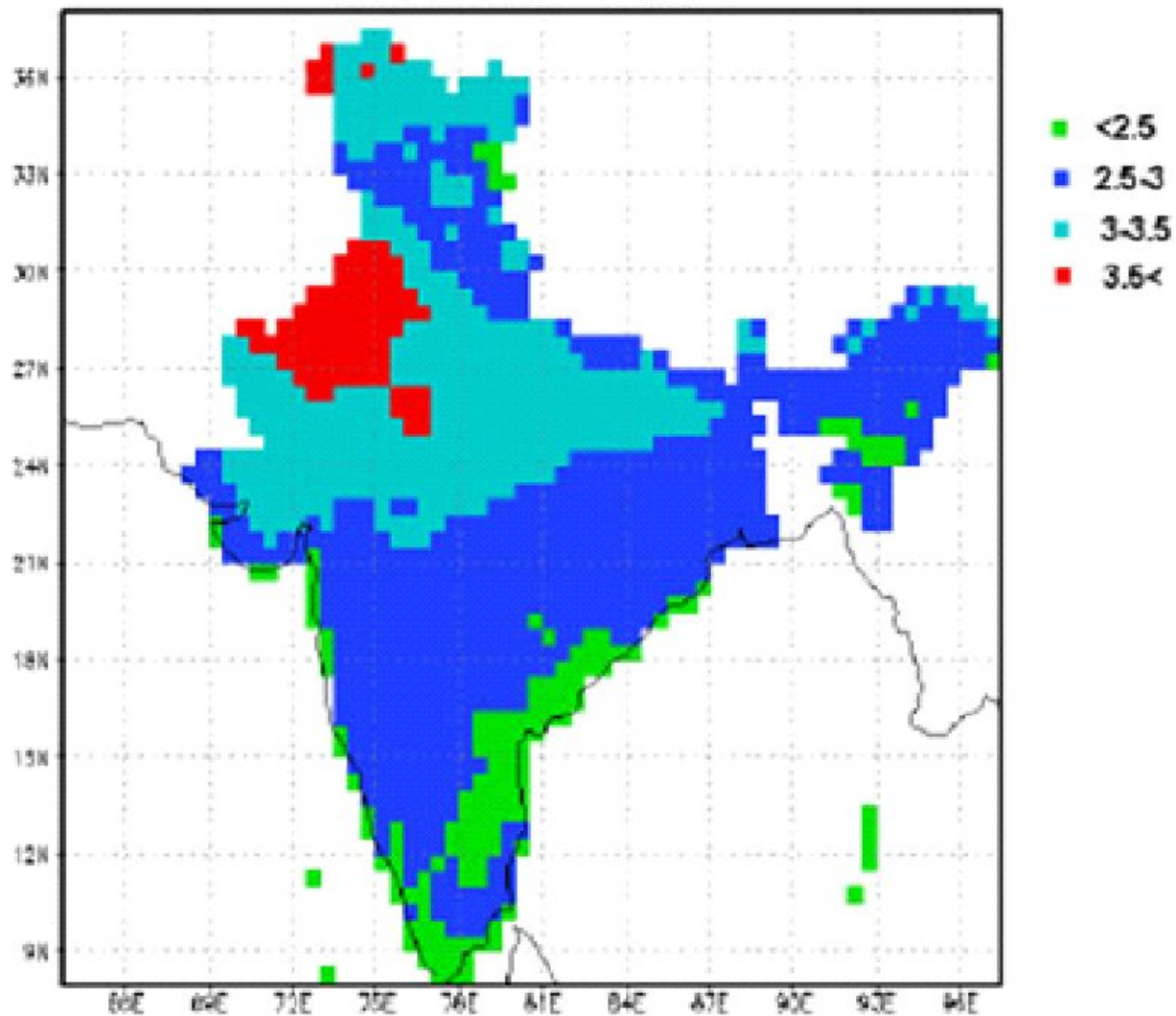
A warmer Earth may lead to changes in rainfall patterns, a rise in sea level, and a wide range of impacts on plants, wildlife, and humans.

What is Climate Change??



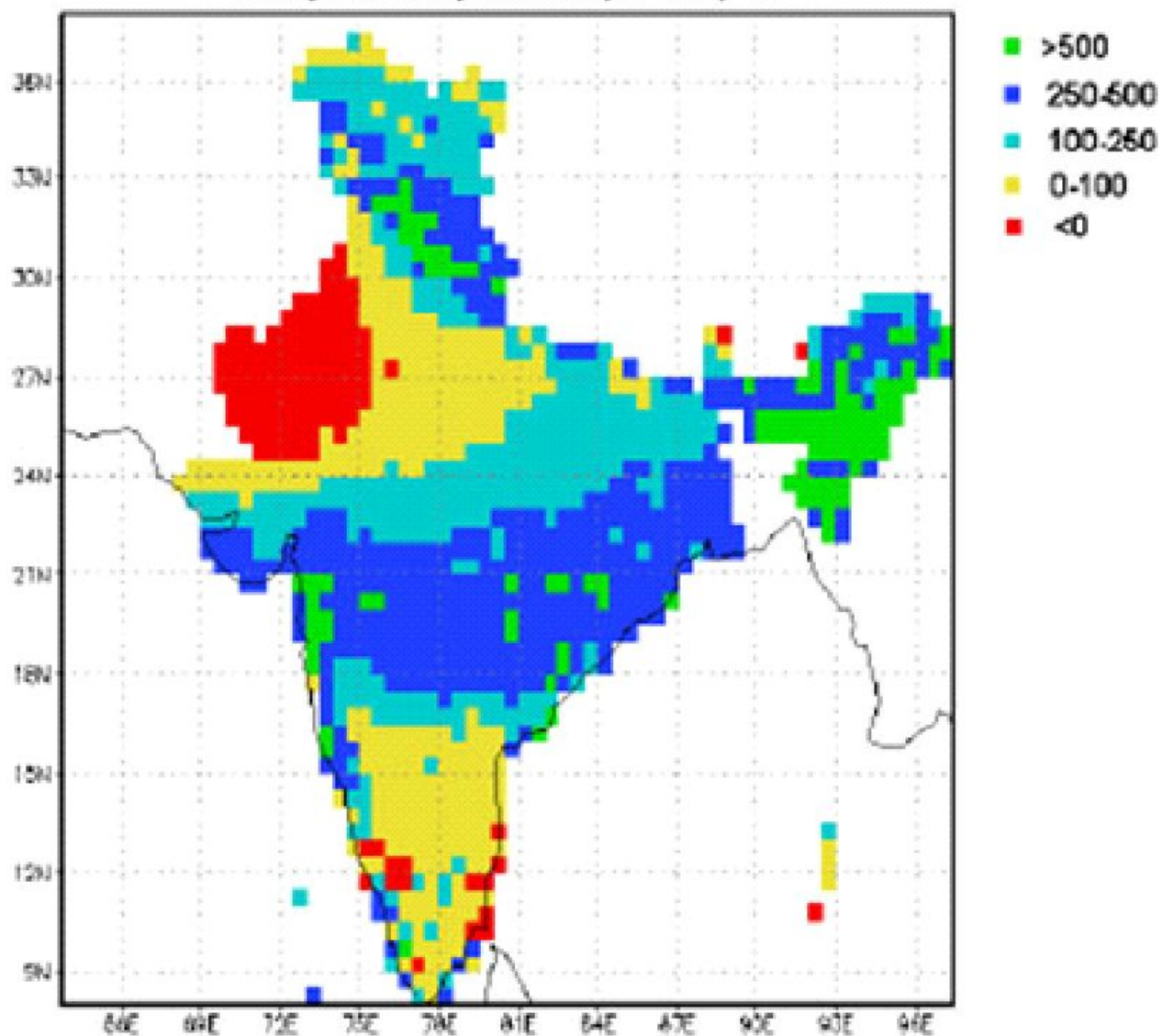
a

Predicted change in Temp (degrees C) by 2085, B2 Scenario
green, dark blue, light blue, red
<2.5, 2.5-3, 3-3.5, 3.5<



b

Predicted change in Rainfall (mm) by 2085, B2 Scenario
green, dark blue, light blue, yellow red
>500, 250-500, 100-250, 0-100, <0



Vulnerability of Andhra Pradesh

- All the 1000 km long coastal zone is vulnerable;
- All the Forests (particularly of Eastern Ghats) are vulnerable;
- Agriculture is adversely affected by change in seasons and increased pest threats;
- Health is affected by more vector borne and water borne diseases.

The Climate Change Phenomenon warrants

- Reduce Carbon emissions which are mostly resultant from energy generation;
- Use energy efficiently: WISE USE
- Move towards Carbon emission free energies
- Move towards low carbon foot print products.

The National Missions that can guide
the frame work

ENERGY REFORMS

and combat

Climate Change

NATIONAL MISSIONS

under India's Climate Change Action Plan

- 1. National Solar Mission**
- 2. National Mission for Enhanced Energy Efficiency**
3. National Mission on Sustainable Habitat
4. National Water Mission
5. National Mission for Sustaining Himalayan Ecosystems
- 6. National Mission for Green India**
7. National Mission for Sustainable Agriculture
8. National Mission on Strategic Knowledge for Climate Change.

National Solar Mission

- The Mission Target set in 2007, for achieving 20000 MW by the year 2021-22 was revised to 100000 MW (100 GW) by 2022, which comprises of **40 GW from Roof top** and 60 GW through Large and Medium Scale Grid connected Solar Power Projects. The envisaged investment is Rs. 6,00,000 Crores of which the Govt. would subsidise by Rs. 15,050 crores.

Mission for Enhanced Energy Efficiency

Perform, Achieve & Trade (PAT) Mechanism

- **Specific Energy Consumption (SEC) reduction targets for the 685 energy-intensive units which are designated consumers under the Energy Conservation Act**
- Targets would be percentage reduction of current SEC
 - Percentage reduction requirement based on:
 - Current SEC as a ratio of the best in the sector
 - Mix of fuels used
 - Target setting for the power generation and fertilizer sectors through the existing tariff-setting processes
 - SEC measurement and verification by BEE through accredited auditors

Industry Sector	No. of Identified DCs
Aluminum	11
Cement	92
Chlor-Alkali	21
Fertilizer	22
Pulp & Paper	70
Power	154
Iron & Steel	110
Textiles	197
Railways	8

NMEEE

Energy Efficiency Financing Platform (EEFP)

- Ensuring availability of finance at reasonable rates for energy efficiency project implementation- Expansion of EEFP to include other FIs and public and private sector banks
- Create demand for energy efficiency products, goods and services- awareness, public policy, facilitation/ stimulation by preparation of bankable projects and markets
- Promotion of ESCOs – accreditation by CRISIL/ ICRA
- Credible monitoring and verification protocols to capture energy savings
- Capacity building of banks and FIs

The Green India Mission :

1. to improve quality of the canopy cover in 5 m ha of Forests;
2. to add another 5 m ha of new areas with canopy cover;

and thereby to achieve an enhanced annual CO₂ sequestration of 50-60 m t and provide livelihood opportunities to 3 million forest dependent communities by the year 2020 with a budget of Rs. 46,000 crores.

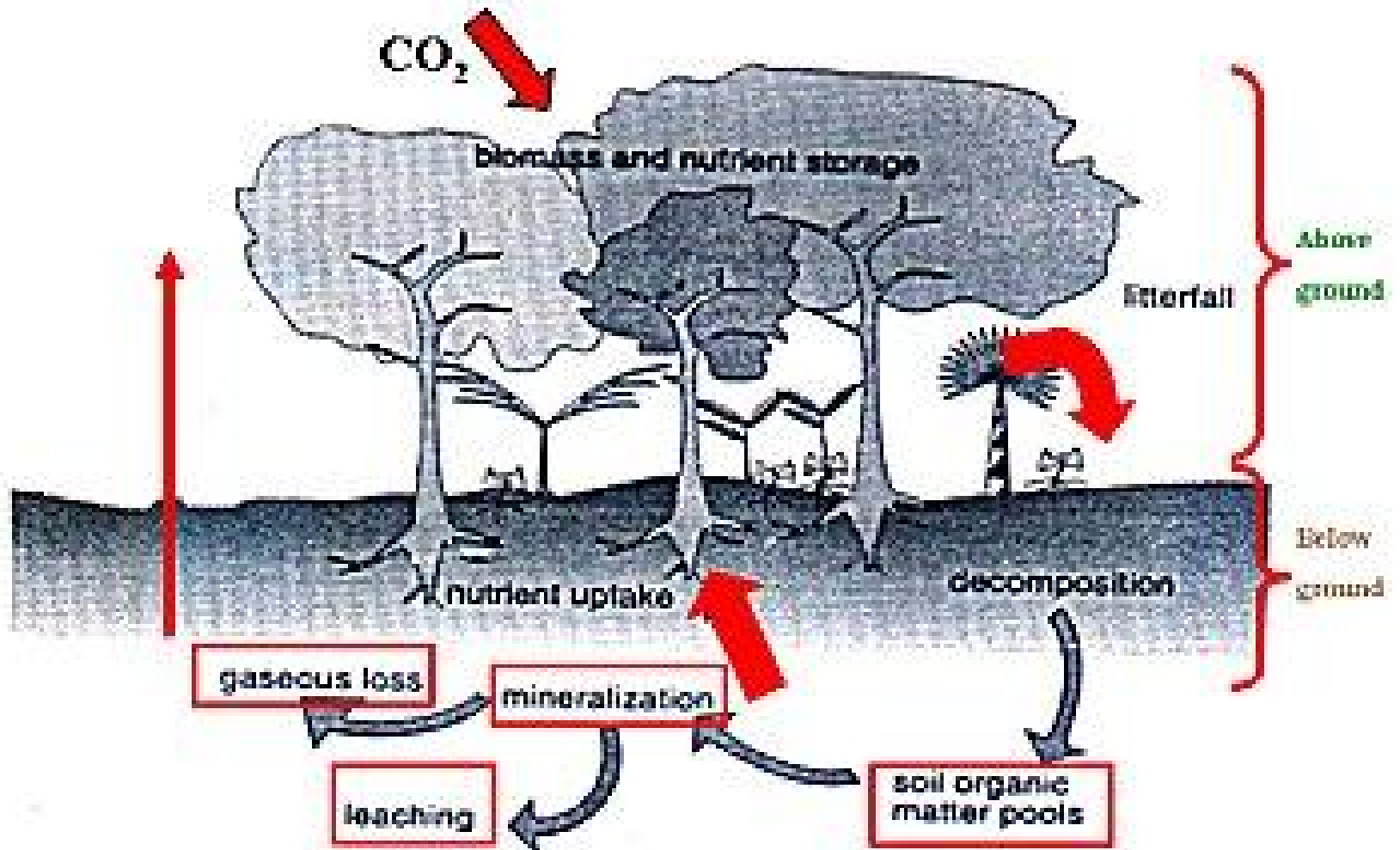
Offset Greenhouse Gas Emissions?

- At the global level, the IPCC Third Assessment Report estimates that ~100 billion metric tons of carbon over the next 50 years could be sequestered through forest preservation, tree planting and improved agricultural management.
 - Offset 10-20% of estimated fossil fuel emissions

Terrestrial Carbon Sequestration

- The process through which CO₂ from the atmosphere is absorbed naturally through photosynthesis & stored as carbon in biomass & soils.
- Tropical deforestation is responsible for 20% of world's annual CO₂ emissions, though offset by uptake of atmospheric CO₂ by forests and agriculture
- Ways to reduce greenhouse gases:
 - avoiding emissions by maintaining existing carbon storage in trees and soils
 - increasing carbon storage by tree planting or conversion from conventional to conservation tillage practices on agricultural lands

Plant / Soil / Atmosphere Carbon Cycle



Terrestrial Carbon Sequestration

- Carbon seq. rates differ based on the species of tree, type of soil, regional climate, topography & management practice
 - Hardwood plantations in peninsular India can accumulate almost 100 metric tons of carbon per acre after 90 years (~ 1 metric ton : 1 year)
- Carbon accumulation eventually reaches saturation point where additional sequestration is no longer possible (when trees reach maturity, or when the organic matter in soils builds back up to original levels before losses occurred)
- After saturation, the trees or agricultural practices still need to be sustained to maintain the accumulated carbon and prevent subsequent

SCOPE FOR **ANDHRA PRADESH**

Andhra Pradesh is one of the most vulnerable states in India for Climate Change and also is more dependant on ever increasing energy needs for its development.

Andhra Pradesh Status (2015)

Among the first 5

Installed Capacity (MW)	State	Per capita IC
31934	Maharashtra	0.00028
26126	Gujarat	0.00043
20112	Tamil Nadu	0.00028
17175	Andhra Pradesh	0.00023
14079	Uttar Pradesh	0.00007

AP Generation (2014 Sept.)

Owned	Power Generated
Central Govt.	3157
State Govt.	9050
Private	4968
TOTAL	17175
Generation Source	
Thermal	11981
Nuclear	276
Hydro	3735
RES	1184
TOTAL	17175

The Expected Demand

- **AP Population which is now (2011 Census) 4,93,86,800 with an annual growth rate of 1.35%, is projected to be at 5,65,25, 800 by the end of 2025.**
- **To this, the new capital immigrating population need to be taken in to account, which is projected to be 38 lakhs by the end of 2025, based on the parameters delineated in the released master plan. Thus, the total population may exceed 6 crores.**
- **Assuming the enhancement in the per capita consumption from 1050 to 2000 units, AP requires 120 thousands MW, against the current generation of 17 thousands.**

OPTION AVAILABLE

COAL-SOLAR OPTION

No	Present Status	Expected Demand	Gap
1	18000 MW	120000 MW	102000 MW

Considering the present status of the resources,
90% of this gap can be filled
only by the
THERMAL and SOLAR sources only.

NEED AND CHALLENGES FOR THE COAL-SOLAR OPTION

NO.	PARTICULARS	THERMAL	SOLAR
1	Future Demand (MW)	67000	32000
2	Land required (ha/district)	28600	65000
3	Investment (INR Crores)	502500	192000
4	Projects required (no./district)	12	65
5	Coal required (t/day)	938000	0
6	Water required (m3/day)	200000	85000
7	Carbon emissions (t/day)*	64400	0
8	Fly Ash (t/day)	9000	0
9	SO ₂ emissions (t/day)	26800	0
10	NO _x emissions (t/day)	9380	0

**From the additional coal C emissions are 23.5 M tons/annum*

APPROACH

- To promote more investment from the Private sector, the programme should be made investor friendly with complete support to ensure Env. Protection through ***Strategic Environmental Impact Assessments*** (SEIA) by identifying the lands suitable for establishing the power generation plants.
- SEIA includes mechanisms for safe disposal of wastes and other pollution control strategies.

Enabling Environment

Recent experiences reveal that public are against the thermal power plants, and therefore, **public awareness on the clean and safer technologies is vital to ensure their support.** Thus, separate District wise programmes on the development zonation need to be implemented after identifying the sites in different districts.

Compliance to the Laws of the Land

The framework to be developed
Shall comply with the Laws of the Land and also
Enable **Andhra Pradesh** as a

LEADER

Among all States in India in realizing the Nation's
targets related to

1. **National Solar Mission**
2. **National Mission for Green India**
3. **National Mission for Enhanced Energy Efficiency**

Identification of Land Parcels

- A total of 94000 ha (29000 ha for thermal and 65000 ha for solar) is required;
- This land shall be identified in all the 13 districts and separately for thermal and solar.
- The land parcel for an ideal thermal shall be 100 to 200 ha; and for solar 15 to 50 ha.
- For every district around 12 sites for Thermal and 65 sites for solar are needed.
- The identified sites shall generally be on least dislocation principle, and after carrying out site suitability criterion.

Rapid EIA Studies for Land Parcels

- Rapid EIA studies for the identified land parcels shall be made, with adequate description of the Environmental Setting; Public Awareness programmes; and using Model TORs and adopting best technologies.
- The costs of these EIA studies can be realized later from the interested proponents;

Documenting BMPs

BMPs related to

- Raw Material Conservation;
- Water use efficiency;
- Technologies with least pollution;
- Fly ash disposal;
- Water treatment; etc.
- Waste Minimization

Will be studied by visiting existing industries in the state and other places, so as to explore the possibility of their replication.

Review of Stakeholders In puts

In puts from the Stakeholders shall be invited through a National Level seminar inviting representatives from:

- thermal power plants;
- Coal companies;
- PCBs and SEIAA/SEAC;
- Engineers and Scientists;
- Other Govt. Line departments

Forest areas availability for CSn

#	Forest Areas	Very Dense (ha)	Moder. Dense (ha)	Open Forests (ha)	Total (ha)
1	Total Forest Area	65125	1181022	1093854	3691478
2	Areas under JFM	6508	225981	244787	477276
3	Areas under FRA	0	0	0	100000
	Area Available for Carbon Sequestration assuming only 20 % of the Moderately Dense and Open forests.				94153

Carbon Sequestration Potential for Andhra Pradesh

#	Aspect	With present Mgmt	With Scientific Mgmt.
1	Forest with Moderate/Low Cover Density	2.7 t/ha/a	7.0 t/ha/a
2	Barren & Underused Lands	0.7 t/ha/a	4.5 t/ha/a
3	Coastal Shelter belts	2.0 t/ha/a	5.0 t/ha/a
4	Institutional Green Belts	1.5 t/ha/a	7.0 t/ha/a
5	Tank-foreshores & Other wetlands	0.5 t/ha/a	7.0 t/ha/a

Case Study of Khurnool District

A case study on the

Carbon Sequestration Potential

of

Khurnool district was made and

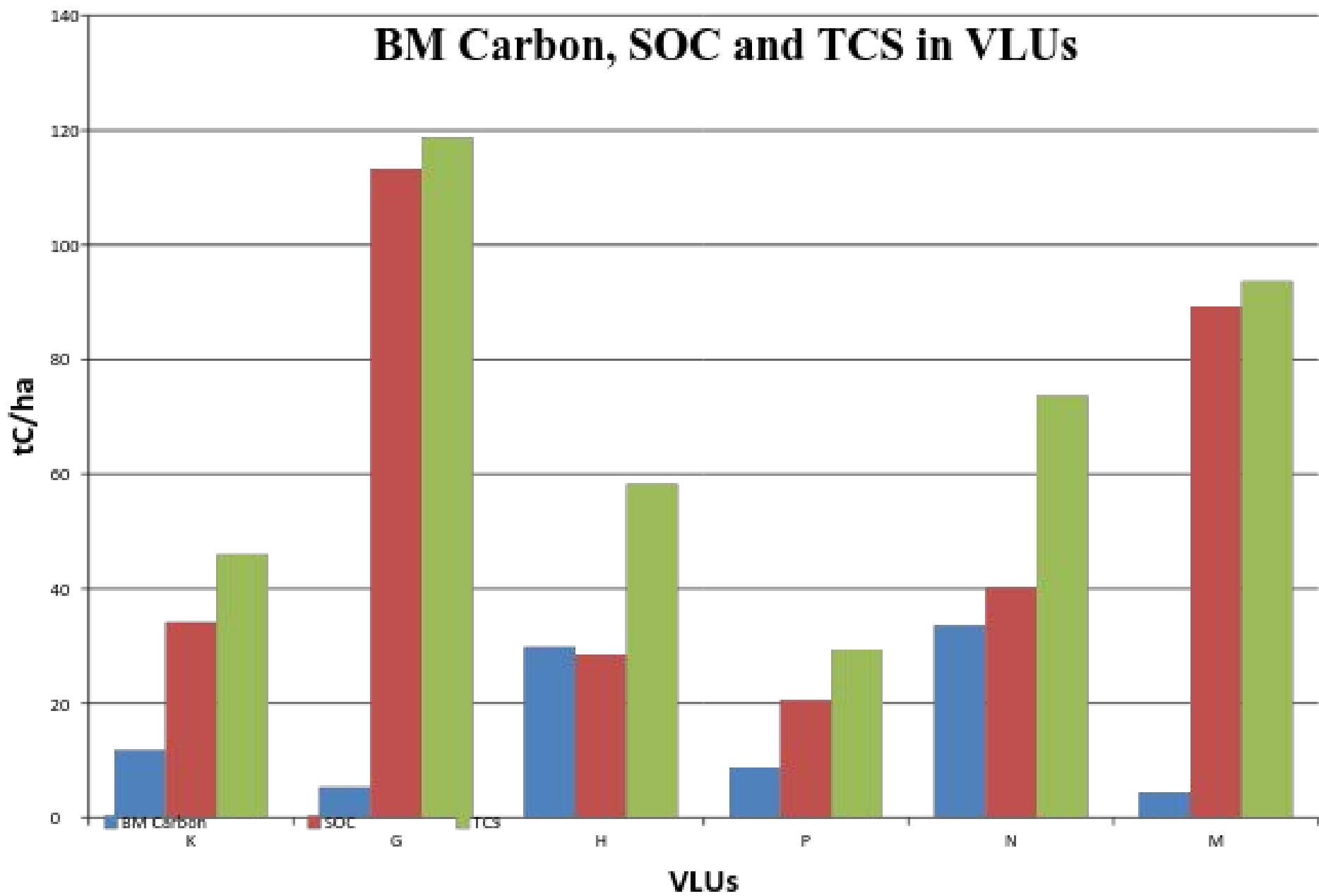
revealed vast potential of for

CS in AP region.

Khurnool CS Strategy

1	Total Geographical Area	1765800 ha
2	Area proposed for CS	38000 ha (2%)
3	Plantation scheme	80% Hardwood + 20% NTF Produce
4	Cost of the CS plant. And mgmt (10 years)	120 Crores

BM Carbon, SOC and TCS in VLUs



Proposed areas in Kurnool district

#	LUC	LUC Extent (ha)	LUC land as % of TGA	Extent proposed for Plantation	Extent of plantation as % of LUC
1	Tank Foreshores	6787	0.38	1360	15
2	Barren & Uncultivable	127313	7.21	19097	15
3	CFM Forests	101998	5.78	18000	17.65
TOTAL		236098	13.37	38457	16.29

Species and Annual Income generated by the matured Trees

No.	Common Name	Scientific Name	Age at Maturity (Years)	Useful Product	Minimum Yield/tree	Plantation density recommended (Trees/ha)	Market Price of the yield (Rs.)	Expected Minimum Gross price/ha (Rs.)	Net* Income/ha (Rs.)
1	Tamarind	Tamrindusindica	5	fruit	40 kg	10	12/kg	4800	3600
2	Amla	Emblica	5	Fruit	40 kg	8	6/kg	1920	1440
3	Black berry	Syziziumcumini	7	Fruit	60 kg	8	8/kg	3840	2880
4	Custard Apple	Annonasquamosa	4	Fruit	100 no.	5	20/dozen	800	600
5	Sapota	Manilkarazapota	7	Fruit	80 no.	8	30/dozen	1440	1080
6	Neem	Azadirachtaindica	7	Fruit & leaves	5 kg (F) 2 kg (L)	8	10/kg 5/kg	480	360
7	Elephant Apple	Limoniaelephantum	10	Fruit	70 no.	5	30/dozen	900	675
8	Sweet berry	Ziziphusmauritian	5	Fruit	5 kg	5	10/kg	250	185
9	Pongamia	Pongamiapinnata	5	Seeds	10 kg	10	12/kg	1200	900

Generation of Mandays in Various activities of plantation

#	Activity	Plantation years										Total	
		1	2	3	4	5	6	7	8	9	10		
1	Plants Cost (20/plant)	3											3
2	Land Preparation	20	0	0	0	0	0	0	0	0	0	0	20
3	Plantation of seedlings	15	0	0	0	0	0	0	0	0	0	0	15
4	Watering	61	0	0	0	0	0	0	0	0	0	0	61
5	gap filling	0	3	2	0	0	0	0	0	0	0	0	5
6	Thinning	0	0	0	10	0	0	0	10	0	0	0	20
	Total	99	3	2	10	0	0	0	10	0	0	0	124

EGS platform to avoid new allocations

1	Regd. Job Card Holders	713406
2	Man days requirement	71340600
3	Works issued and jobs performed (Man days)	19204126
4	Man days could not be availed	52135474
5	Man days required for CS Programme	471200

Benefits of the CS programme

- Generates 4.12 Million Man Days in 10 years
- NTFP Income generated is > Rs. 19 Crore/annum
- Offsets C emissions by 152000 t/annum and enable to use equal coal power generation, and thereby saves land @ 1.25 ha/MW.
- Ecological and Health benefits.

**Green Suggestions
Are WELCOME**

Thank You

Please mail your suggestions to
apseac2014@gmail.com

