



Presentation Content



1 Introducing ONGC

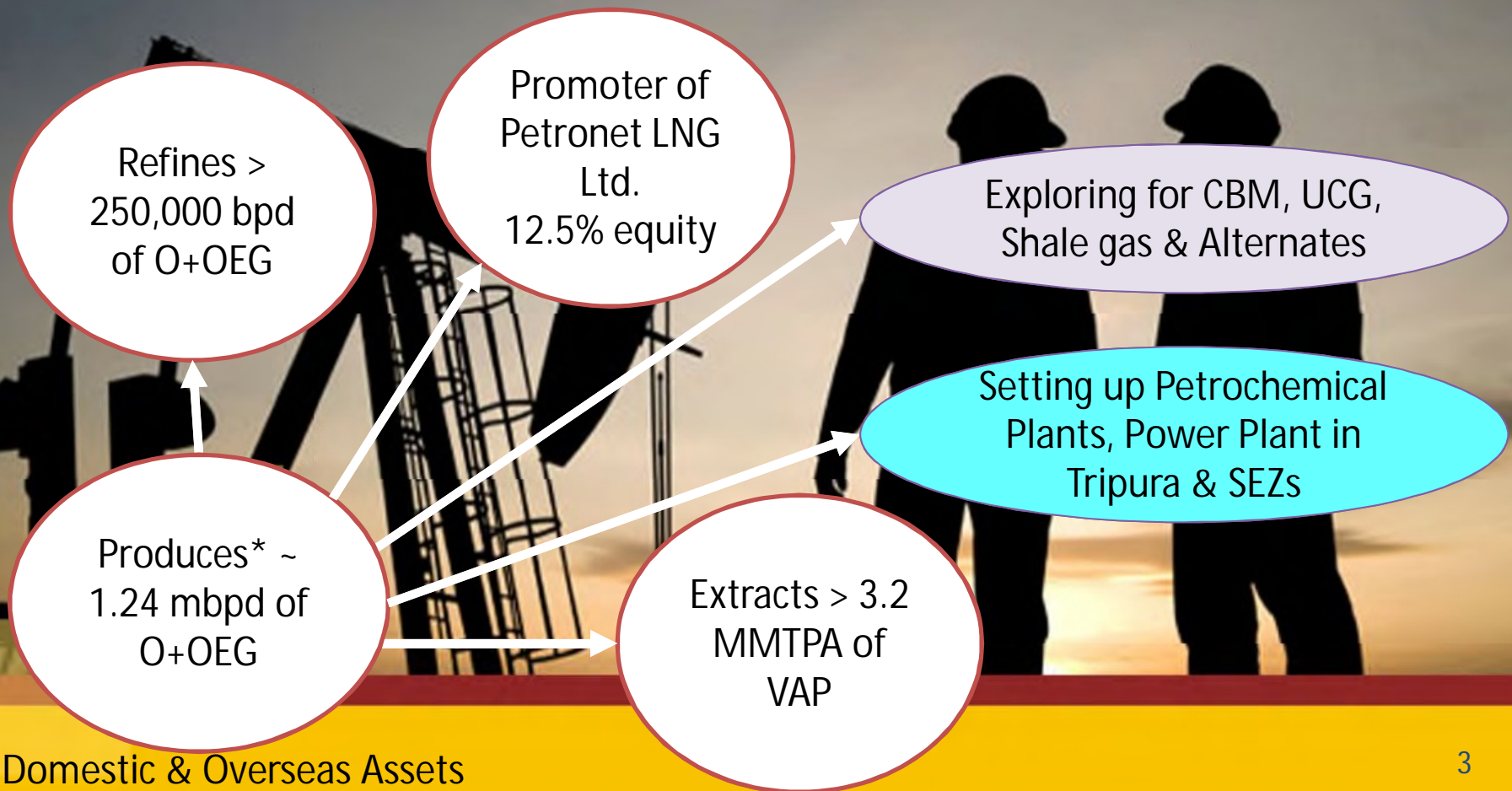
2 Bio Energy Technologies for Sustainable Future

3 Platform for Carbon Sequestration –Hazira Plant

4 Project status and results-Hazira Plant, KDMIPE & CM&SG

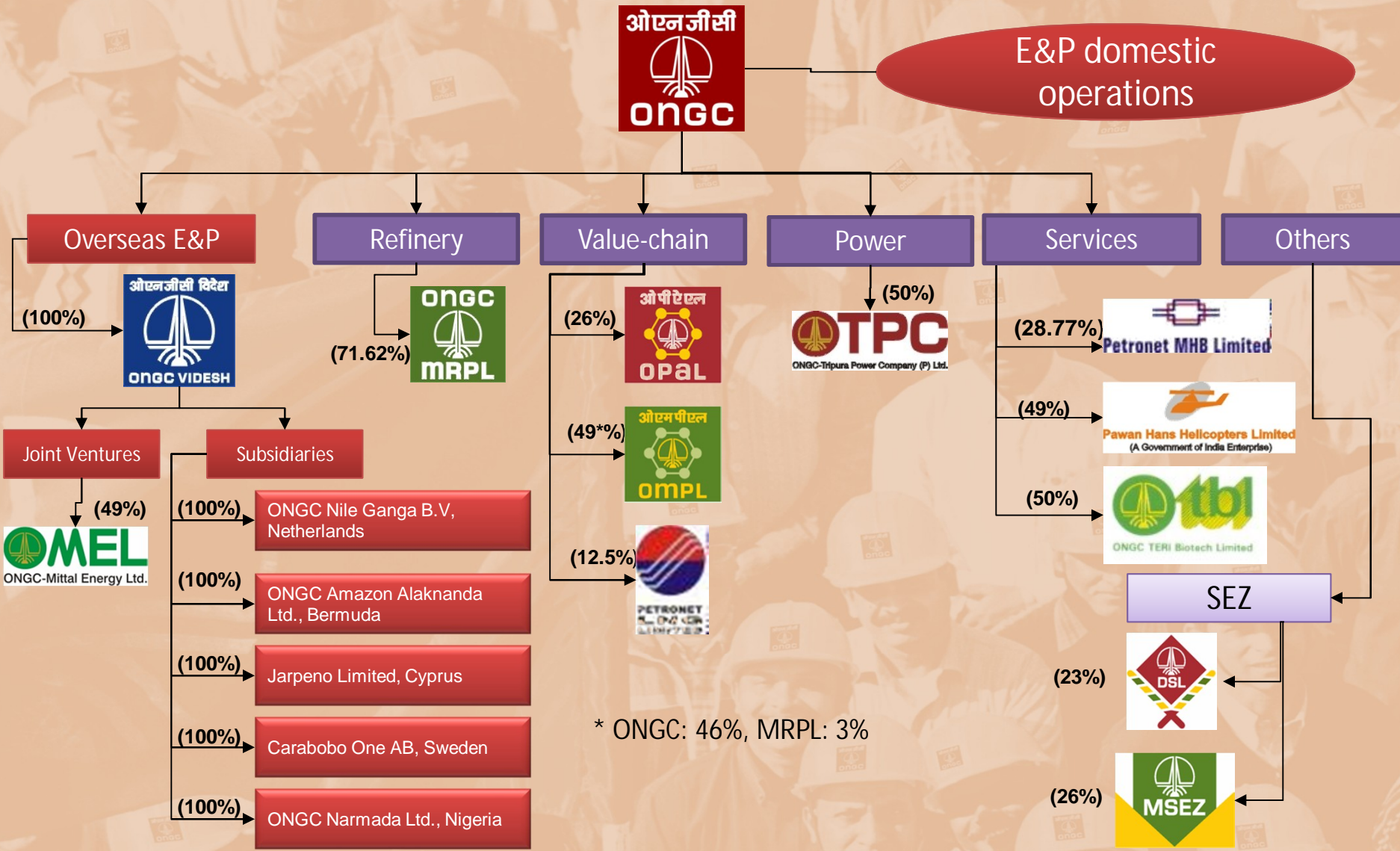
Flagship National Oil Company

ONGC is the flagship National Oil Company of India with interests in E&P, Refining, LNG, Power, Petrochemicals & New sources of energy.



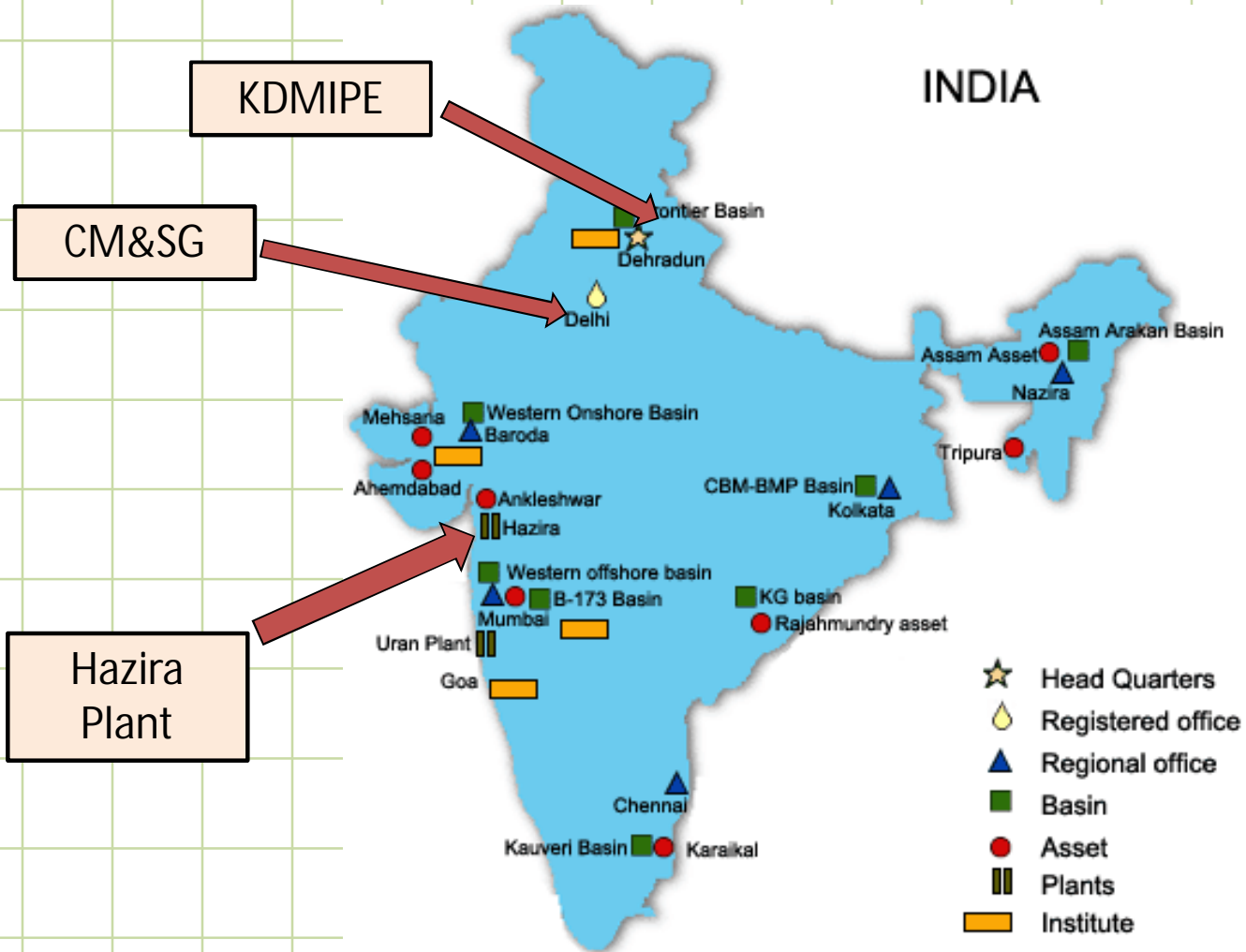
* Domestic & Overseas Assets

ONGC Group

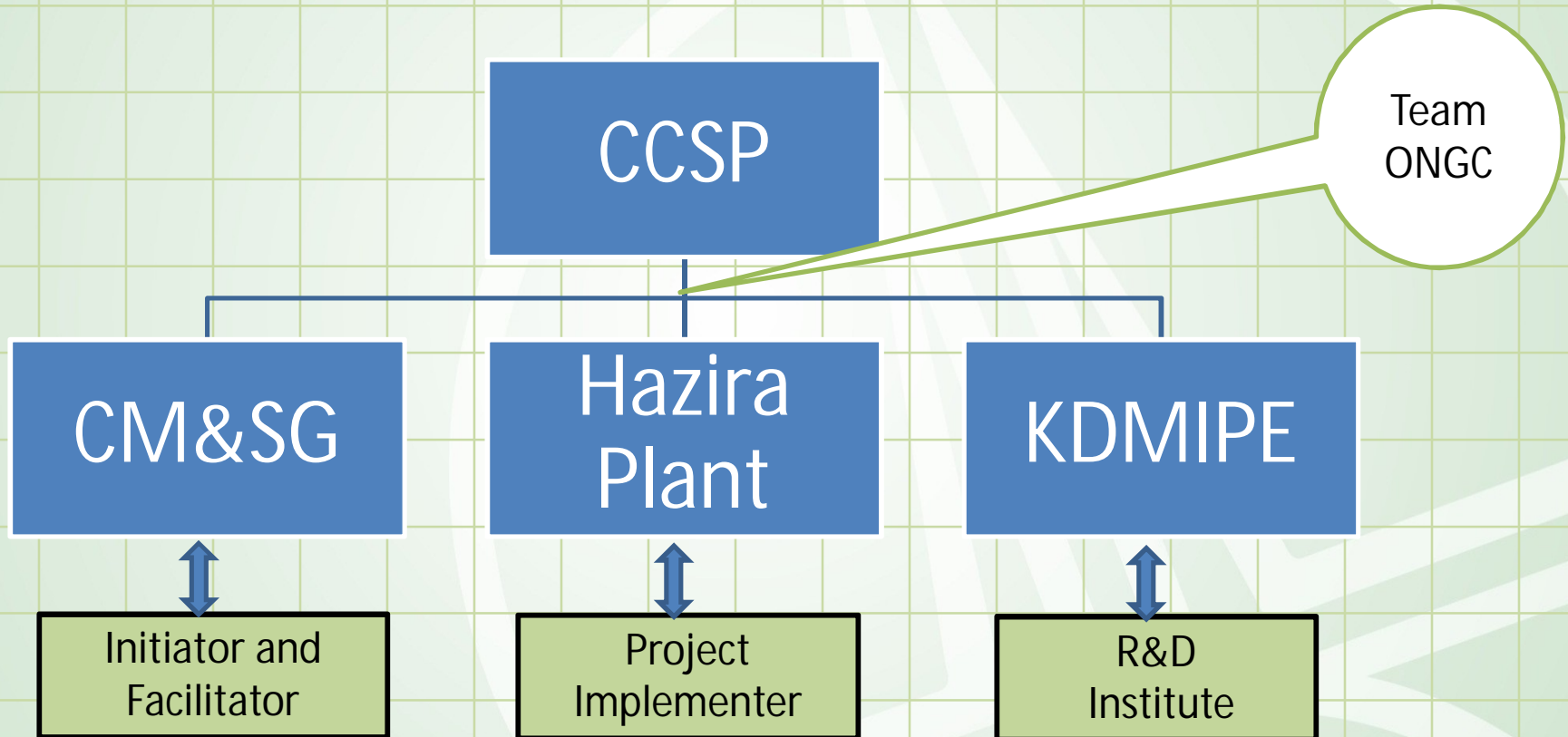


* ONGC: 46%, MRPL: 3%

Pan India -ONGC Map



Who we are and relation to CCSP



- ❖ Nodal agency for Sustainability .
- ❖ Sustainable Growth is organically linked to our overall growth
- ❖ Our Vision: Sustainable Growth
- ❖ Our focus: Triple bottom-line growth
- ❖ Our Policies on SD:
 - ❖ Corporate policy on SD
 - ❖ Policy on sustainable water management
 - ❖ Policy on greening supply chain
 - ❖ We subscribe to Green buildings

Carbon Management & Sustainability Group(CM&SG)



Working Areas

- Carbon & Energy Management
- Clean Development Mechanism(CDM)
- Sustainable Water Management
- Low carbon and renewables
- R&D on CO2 reformation
- Waste Management
- SD Reporting

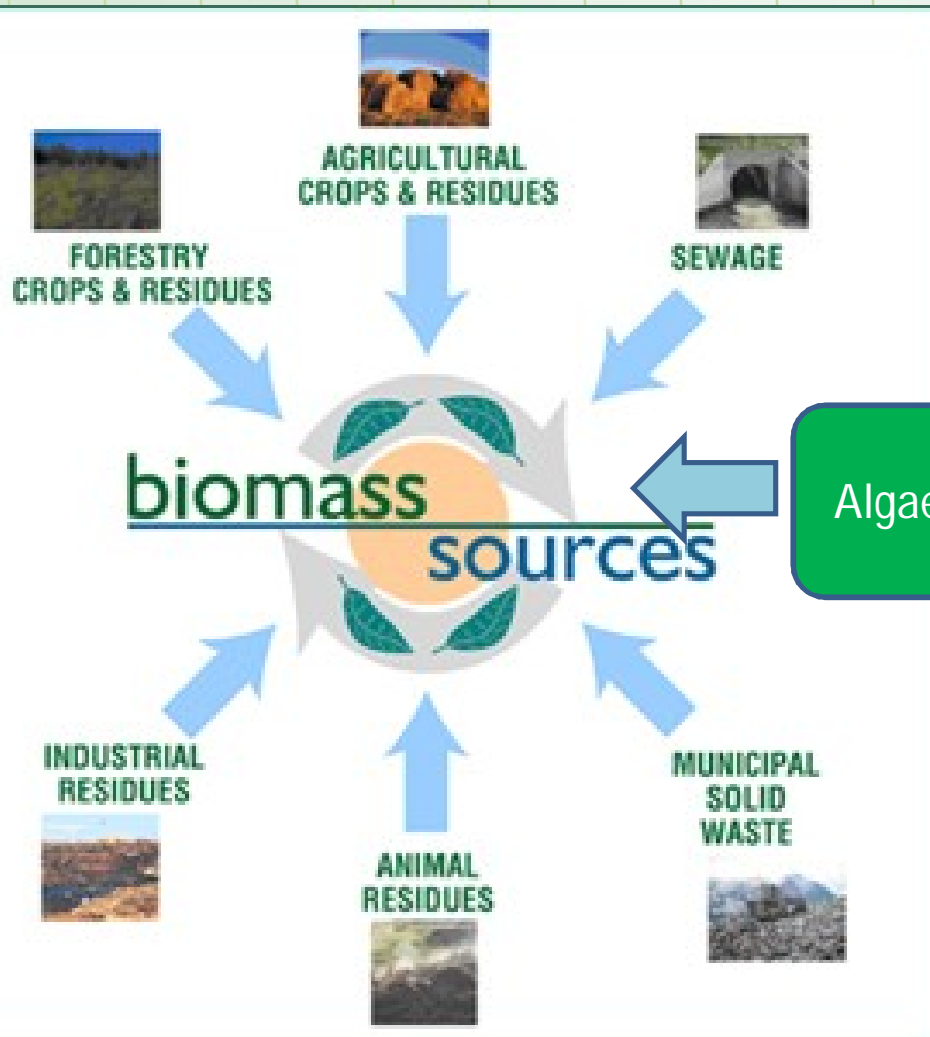
Future areas

- Supply chain
- Biodiversity

Carbon Capture Technology for Sustainable Development

Planning of Bio Energy project

Biomass – a Sustainable Option



- Biomass – Non food surplus biomass resources
- Biomass availability in India : **500 million T**
- Surplus biomass: **120-150 million T**
- Can generate **30-40 million T** of ethanol
- India needs **66 million T** of transportation fuels (Diesel +Petrol)
- Will this be sufficient to meet India's energy needs in future?
- What are the alternative biomass feedstock sources available?

Why Algae?



Sunlight



Seawater,
wastewater
Freshwater,
CO₂

Lipids,
Carbs,
Proteins

Algae

6



Biodiesel, bioethanol, biomethane,
biocrude, green diesel, biojet fuels

Algae- Applications



BIODIESEL/EtOH



BIOFERTILIZER



**CHEMICALS
PHARMACEUTICALS**



**WASTEWATER
TREATMENT**



ELECTRICITY

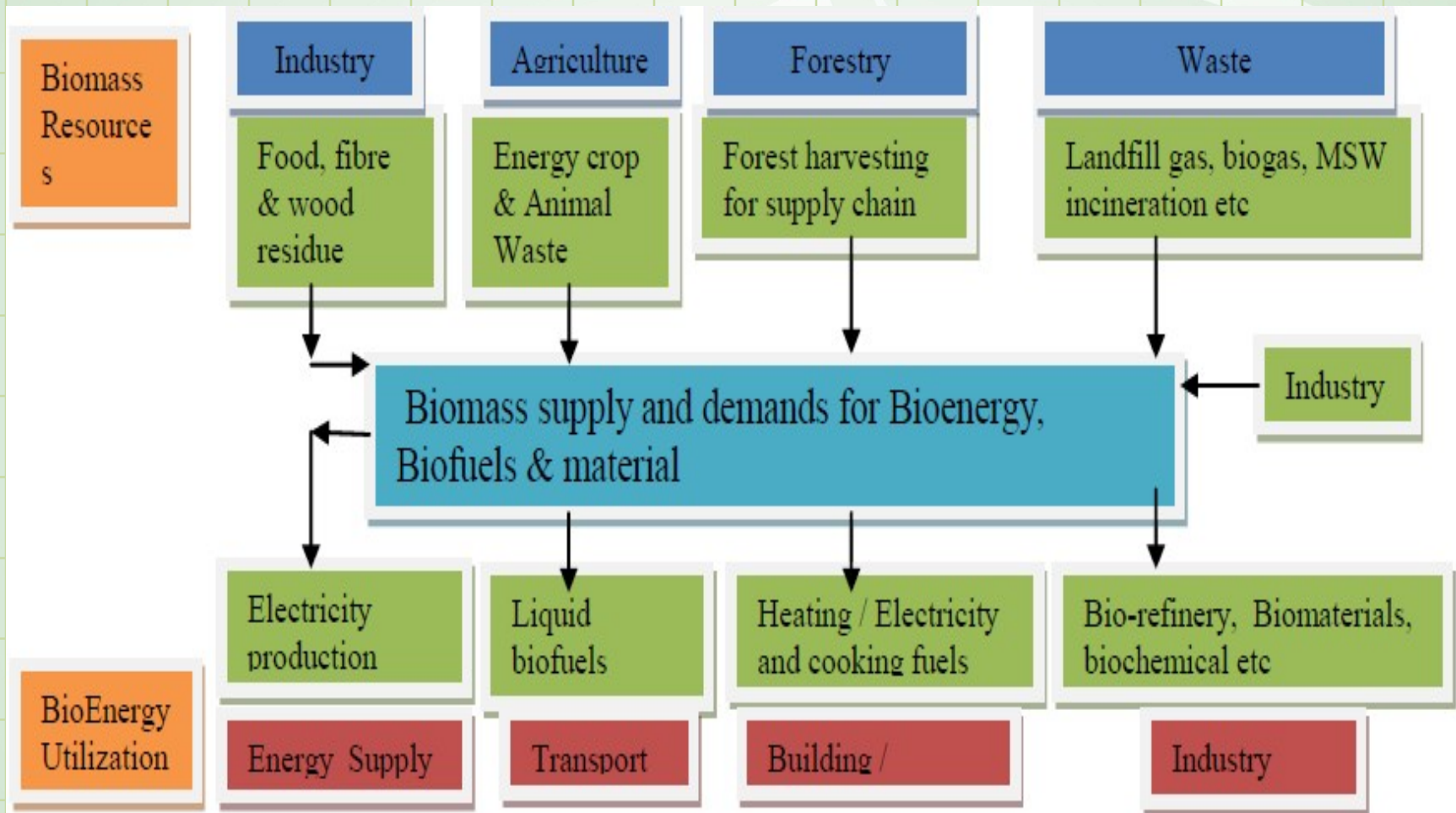


**FEED ADDITIVES &
Protein Supplements**

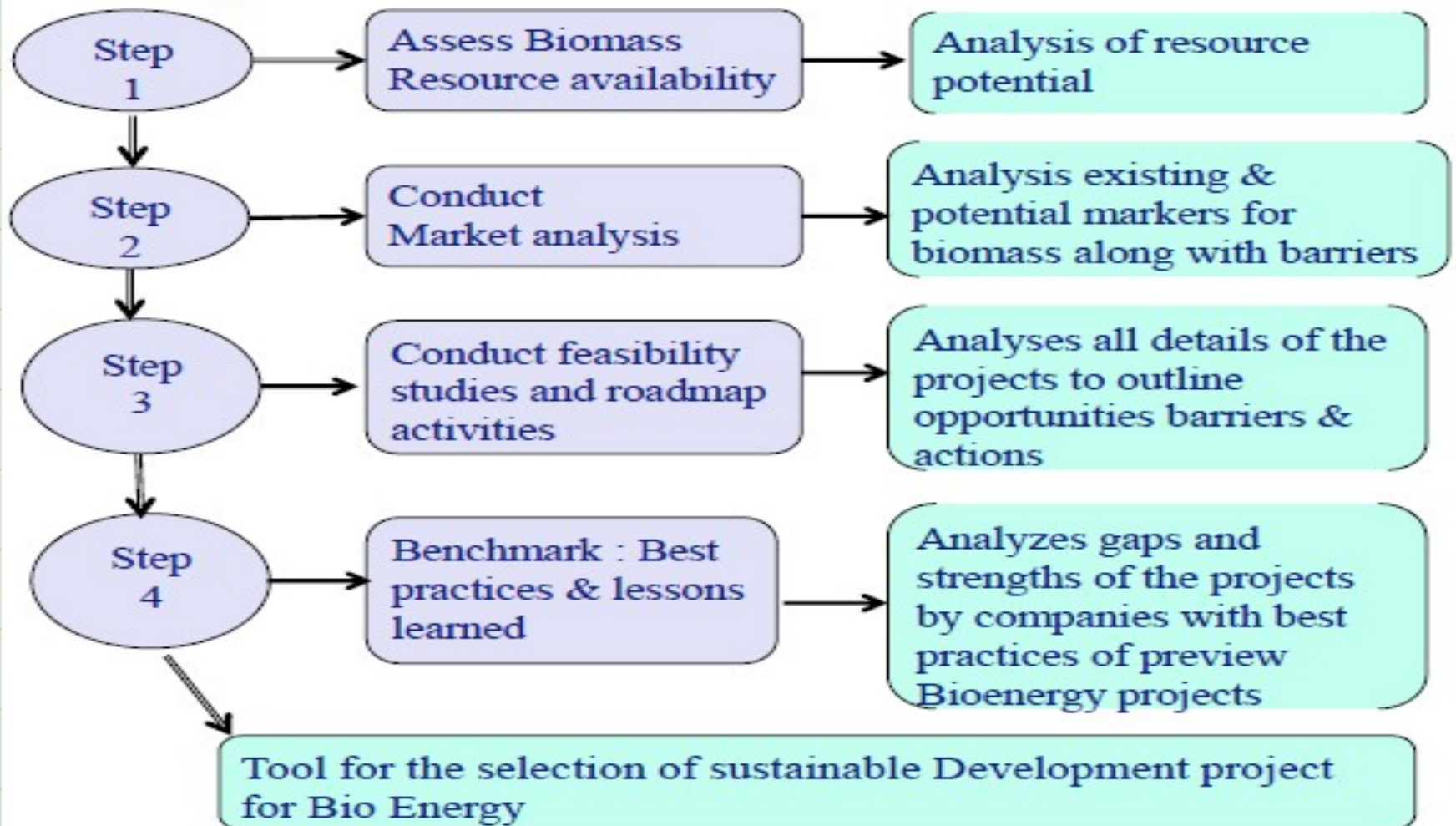


CO₂ ABATEMENT

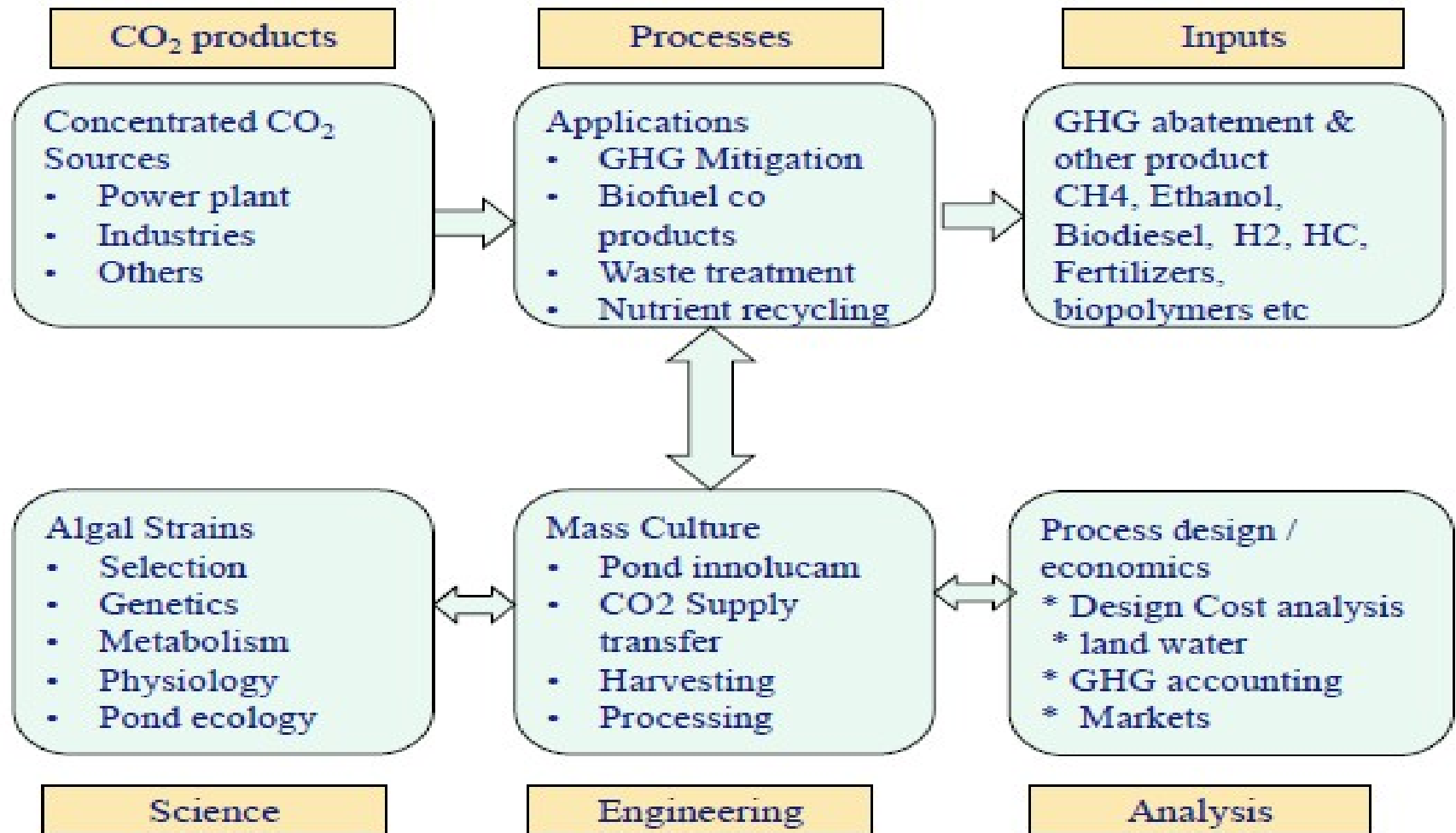
Biomass Resources Vs. Bio energy Utilization chart



Four step assessment tool for the identification of Bioenergy project



Schematic of Microalgae Bio fixation of CO₂ Technology



Hazira Plant – A Background



You would be
glad to know

Hazira Plant is the one of the largest Sour Gas processing plant in India

- Installed Capacity: 52.5 MMSCMD
 - Designed Capacity: 46.9 MMSCMD
 - Processing :
 - 37-40 Million M³ Gas/Day
 - 6000 M³ Condensate /Day
-

Hazira Plant – A Fact Sheet

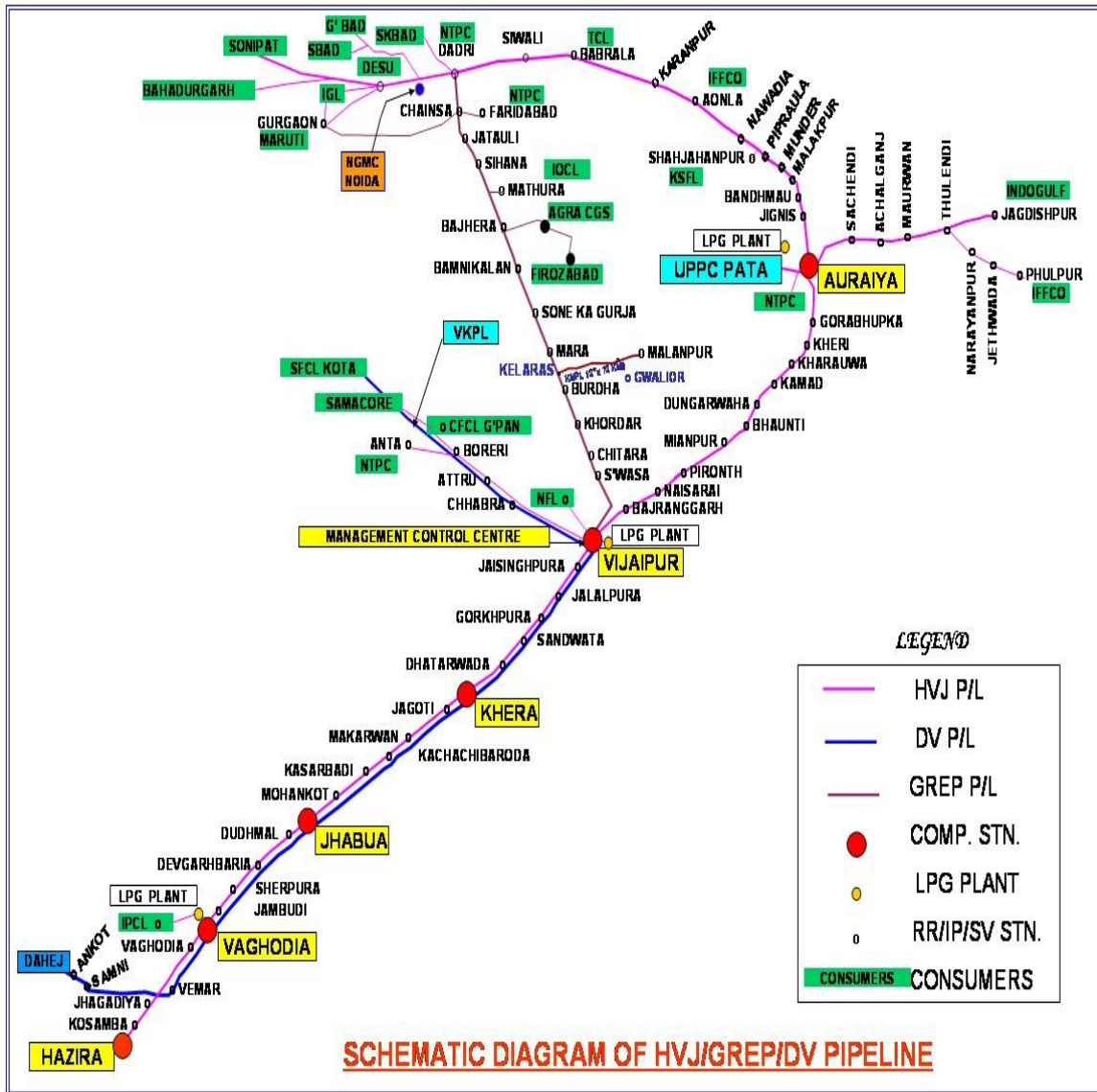


Area	638 Hectare (6.38 sq km)
Boundary Wall	19 Kms
Employees	800
Initial Investment- CAPEX	Rs 1300 Crore (210 Million US\$)
Commissioned In	Sept' 1985

Offshore to Onshore



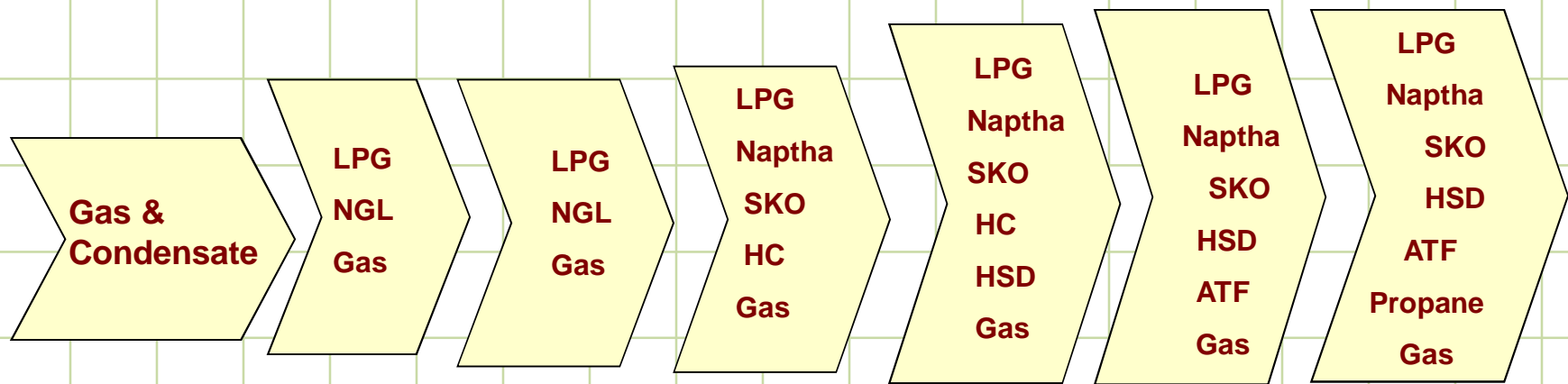
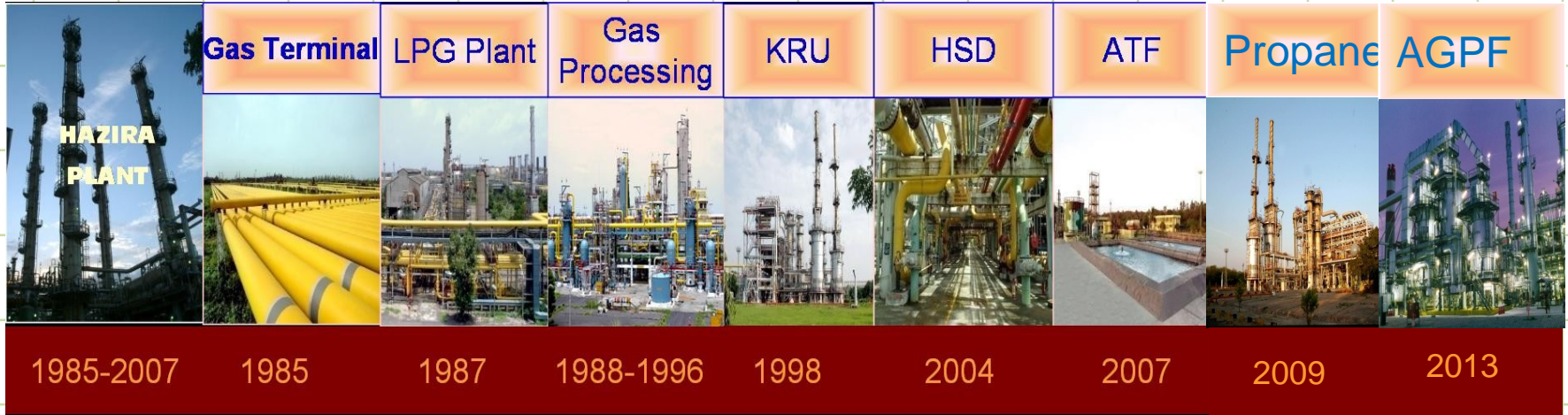
Hazira Plant -Energy Life line of North West India



HVJ Pipeline Energizes

- Gujarat
- Madhya Pradesh
- Rajasthan
- Uttar Pradesh
- Delhi
- Haryana

Milestones at Hazira Plant



Process Flow

CCSP



SULPHUR

Gas Sweetening Unit

Removal of H₂S by Selective Absorption in Methyl Di-Ethanol Amine.

HBJ



Removal of carbon to transportation

through 2800 Km. long line.

Caustic Wash Unit
Removal of H₂S from LPG

Naptha, SKO/ATF & HSD

Gas

Liquid



Gas Terminal

To 1 Source Condensate

Removal of H₂S by Absorption in Glycol



GSU



C



KRU



Project Objective(s) -CCSP-WP6



Development of the Process for Mass Cultivation of Selected Microalgae for Hydrocarbon Production At Hazira Plant

- Screening of microalgae
- Correlation between maximum methane potential and microalgae
- Lab scale demonstration of carbon dioxide sequestration



Development of the Process for Mass Cultivation of Selected Microalgae for Hydrocarbon Production By KDMIPE

- Laboratory culturing and identification of suitable microalgal strains
- Cultivation / Harvesting of microalgae for hydrocarbon production



Use of Mehsana flue gas for the cultivation of green algae By CM&SG

Bio Fixation of CO₂ by Microalgae



- Acid Gas Quantity : 0.5 MMSCMD
 - Acid Gas Composition
 - 98 mole% CO₂
 - 2 mole% H₂S
 - Vent Gas Composition : CO₂ - 23%, O₂ -15% and N₂ - 60%.
 - Experimental Study : CO₂ Sequestration using Algae
 - Tasks
 - Reactor construction and algal strain selection
 - Installation of reactor and pre test
 - Experimental CO₂ Sequestration studies
 - Biomethanation potential of algae and pilot scale studies of bio gas production
-

Bio Fixation of CO₂ by Microalgae



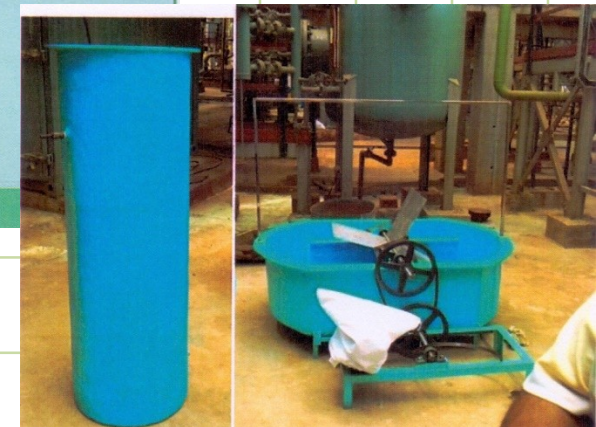
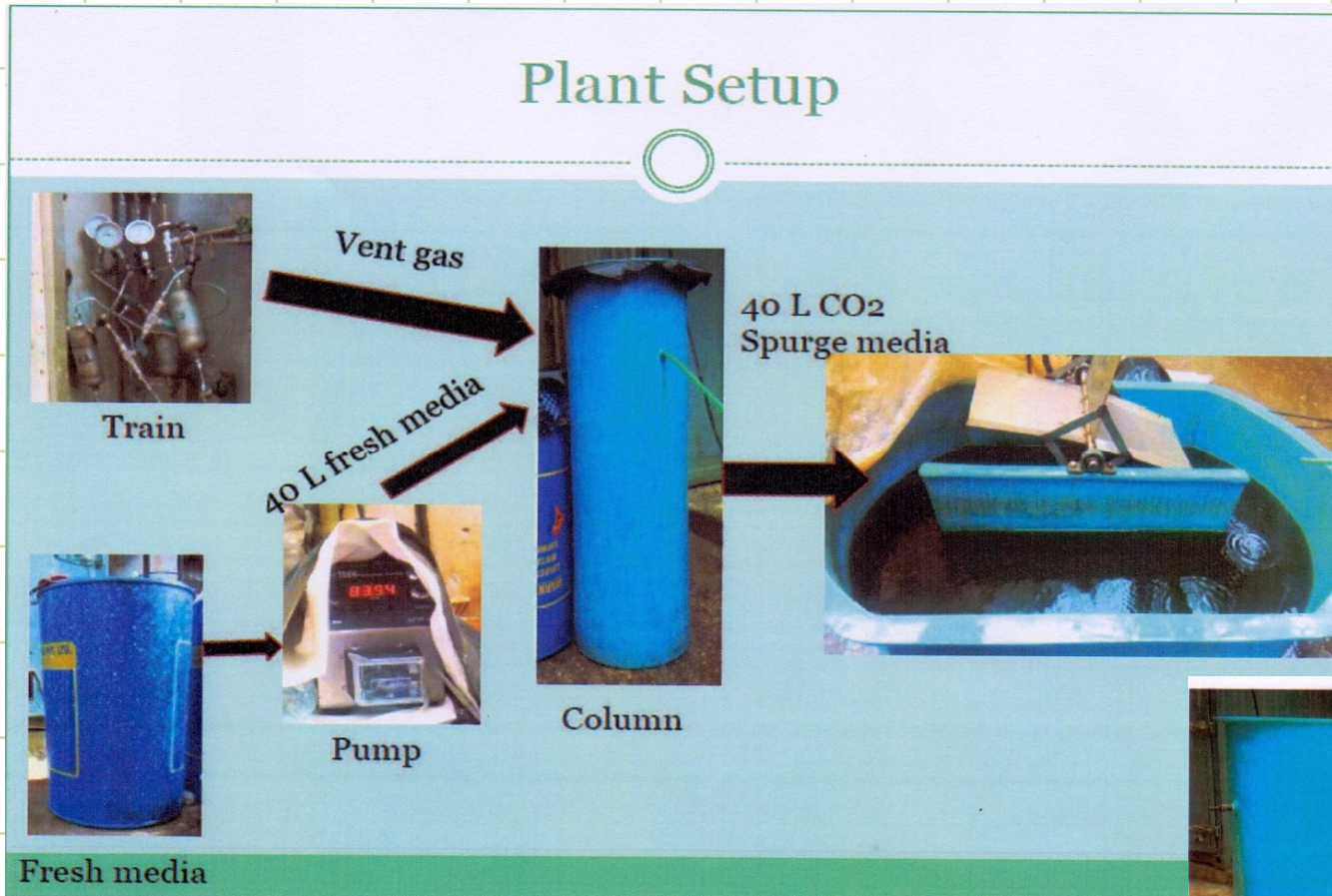
Project Objective(s):

1. Reactor construction and algal strain/strains selection
2. Installation of reactor and pre test
3. Establishing the protocol and experimental CO₂ sequestration studies
4. Biomethanation potential of algae and pilot scale studies of biogas production from algae

Conclusion:

1. The pilot carbonation column is able to bring down 33% initial CO₂ concentration to an average of 15% CO₂ concentration. The whole 33% CO₂ present in vent gas can be sequestered in liquid by employing pressurized water scrubbing system and the carbonated liquid can be transported to algal ponds / photobioreactors set up. The advantage of the transport of carbonate liquid is its cost effectiveness if land available for the algal growth is limited.
 2. Chlorella sp. yield is about 18g/m²/day which on anaerobic digestion yields about 386 L CH₄/g VS fed.
-

Bio Fixation of CO₂ by Microalgae



- *High rate pond reactor for algal growth constructed along with CO₂ absorption Column*

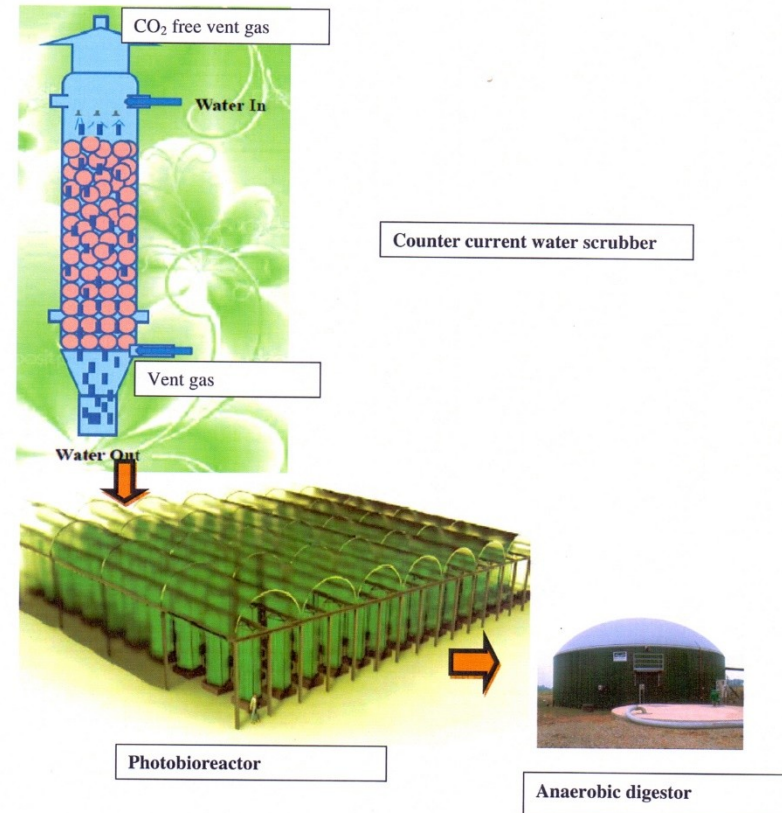
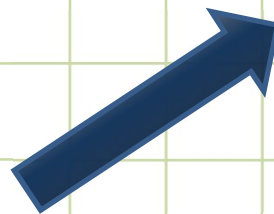
Bio Fixation of CO₂ by Microalgae

Outcome of Pilot Study

- Reduction of CO₂ in vent gas from 33 mol% to 15 mol%.
 - 4 m³ water to treat 20 m³ of vent gas.
 - Biomass production: 18000 kg.
 - Methane production: 1136 m³

**Deatiled report shared on
CCSP portal**

Proposed Future Set Up



KDMIPE

The Premier R&D Institute of ONGC



India's Most Attractive Employer : *Ma Foi Randstad*

Sample details

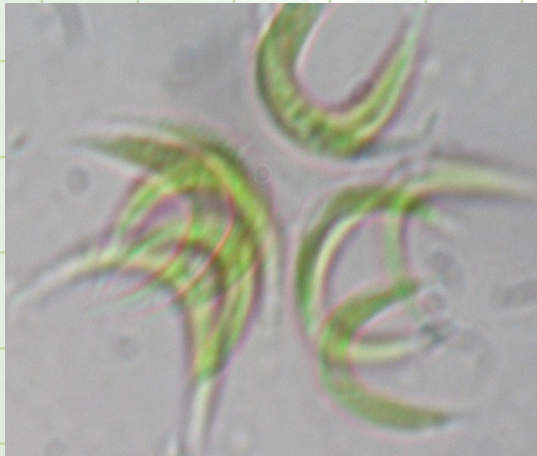
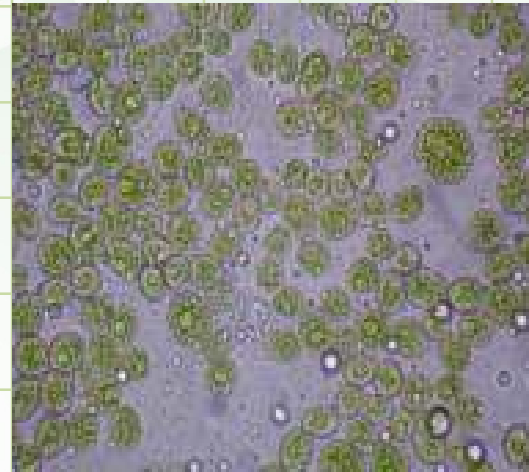
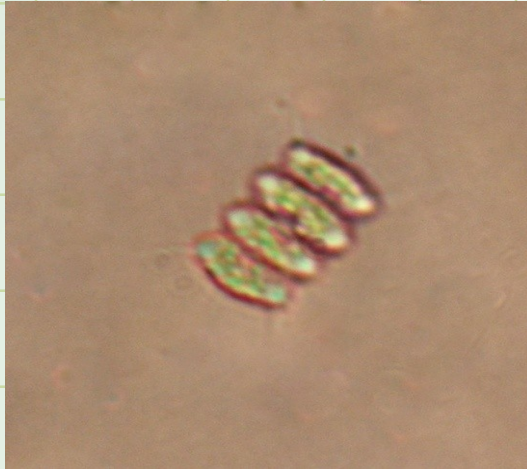
- **178 Water Samples from different water bodies of 10 states of India were collected and 40 numbers of micro algae Strains have been isolated and identified.**
- ***Scenedesmus, Pyramimonas, Chlorococcum, Westella, Chlorella, Ankistrodesmus, Quadrigula. Kirchneriella, Coelastrum, Oocystis* are the main genera isolated and identified.**

Lab study



- **Morphological and growth characterization of microalgal isolates**
- **Optical and Fluorescent staining done using Nile red**
- **Lipid content analysis of microalgal isolates and analysis of fatty acid profile. 21 algal isolates showed to contain significant lipid content.**
- **Studies on enhancement in lipid accumulation in microalgal isolates.**
- **Hydrocarbon content analysis of microalgal isolates. 14 algal isolates showed to contain significant hydrocarbon content.**

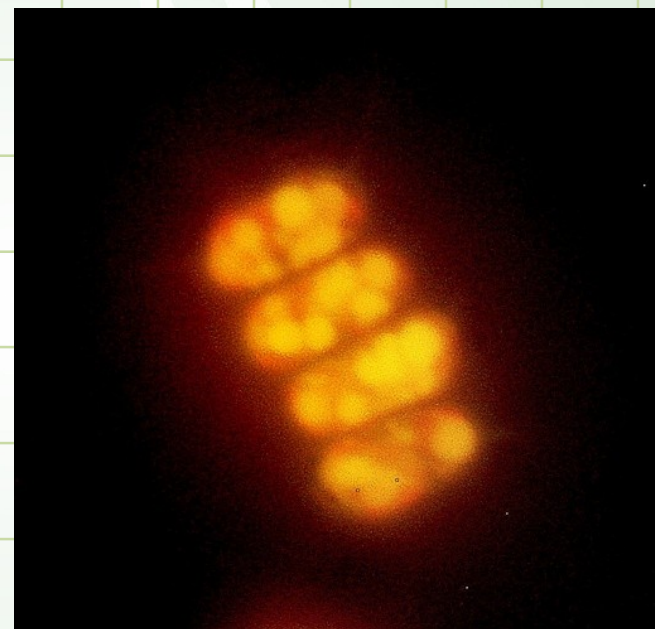
Photomicrographs of isolated Algal Strains



Scenedesmus sp. after Fluorescent Staining

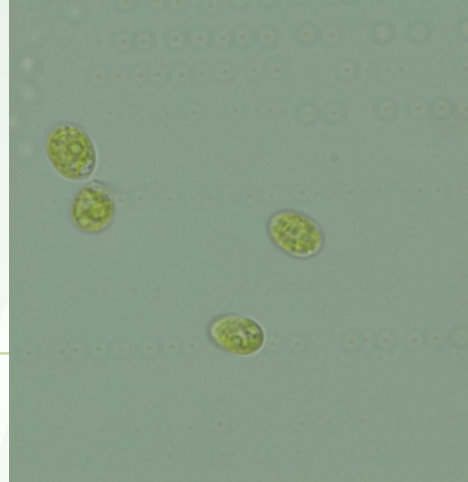


Without Staining



After Nile Red fluorescent Staining

Lab study



Field Study



- **Out of 40 micro algal isolates the following 7 micro algae were identified for outdoor cultivation showing the higher Lipid and higher hydrocarbon content**

Field Study



1000 L Raceway pond

Field Study



- **CFTRI-1, shortlisted strain for lipid content studied to maximize the biomass and lipid content in outdoor conditions reached up to 3000 liter pond.**
- **Second strain KA 7 RC reached up to 95 liters in two ponds each out side to maximize the biomass. Further study is in progress.**
- **Hydrocarbon producing algal isolate HT-BG 11 has shown improvement in growth and is now expanded to 45 liters in each of the two ponds to adapt the culture in outdoor conditions.**

Project finding



For Lipid Production

Sr.No.	Isolate Code	Microalgal species	% (W/W)
1	CFTRI-1	<i>Scenedesmus sp.</i>	63.00
2	KA7-1	<i>Unidentified sp.</i>	57.23
3	KA7-2	<i>Scenedesmus sp.</i>	50.80
4	KA7RC	<i>Scenedesmus sp.</i>	48.00
5	KA5	<i>Pyramimonas grossii</i>	36.33

For Hydrocarbon Production

1.	MYS-BH	<i>Selenastrum gracile</i>	46.75%
2.	HTBG-II	<i>Kirchneriella contorta</i>	> 40%

Thank You.....

Team ONGC

1. Mr. S K Pathak, ED-Plant Manager Hazira Plant (45437@ongc.co.in)
2. Mr. Piyush Choudhary, Project Coordinator, CCSP(95603@ongc.co.in)
3. Dr. N K Kapoor, DGM-Chemistry, KDMIPE(52433@ongc.co.in)
4. Mr. Sudhir Kumar Singh, CM&SG (95606@ongc.co.in)