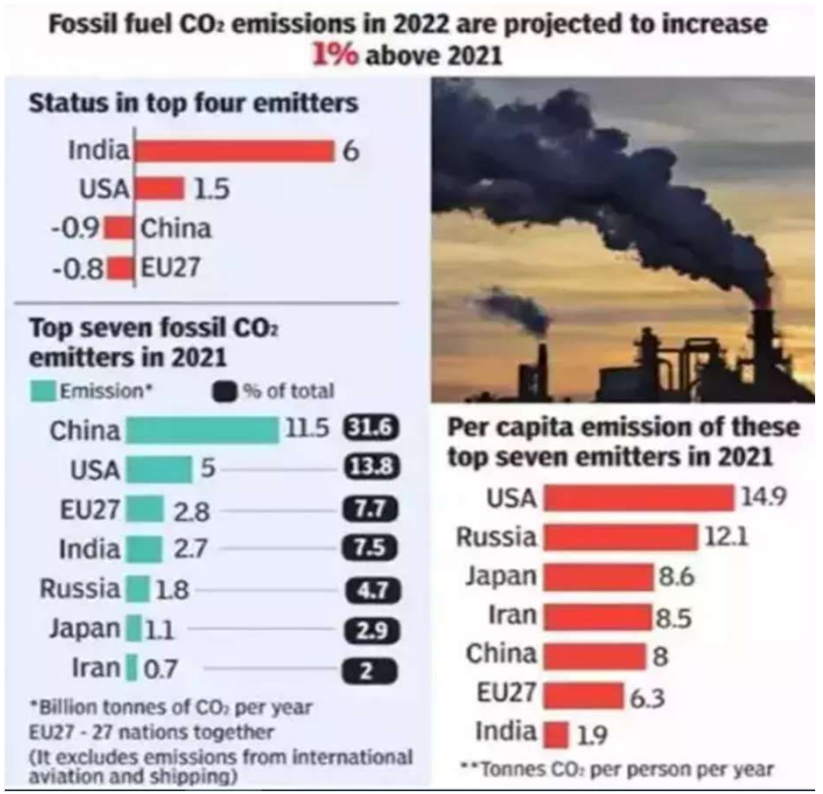
Biofuels for sustainable Future

Sangeeta Srivastava
Godavari Biorefineries Limited
16th February 2023

India Challenge: GHG Emissions

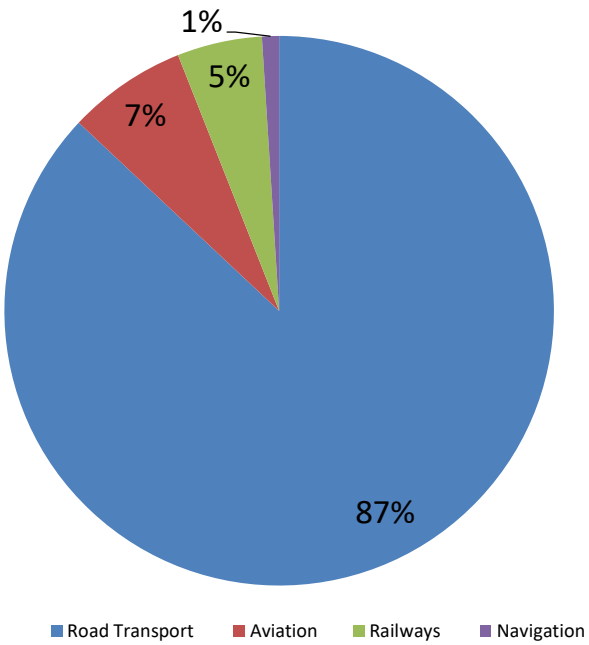
The iconic India Gate in Delhi, shrouded in smog, barely visible. Air pollution caused by transportation & Industries is rising rapidly in India



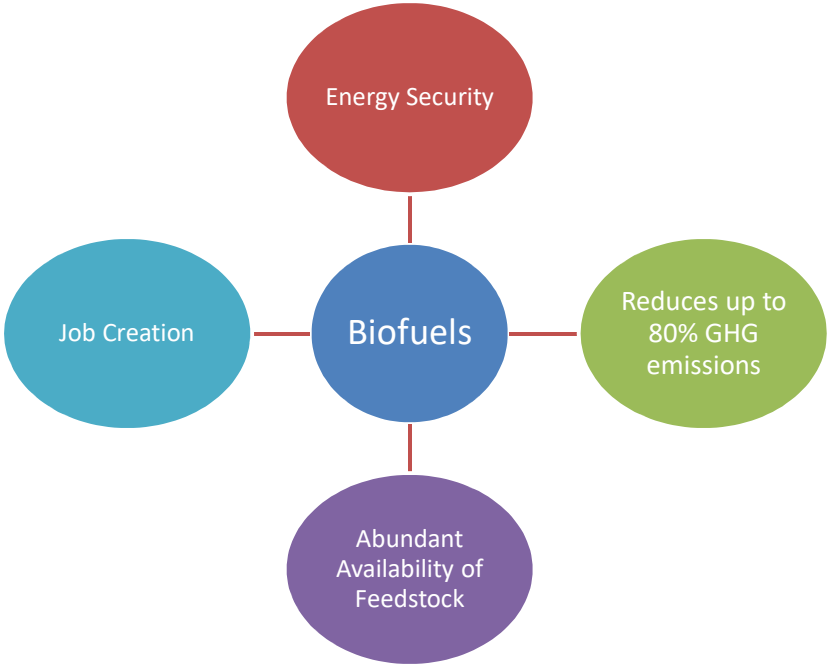
India is 4th Largest emitter of CO2 across Globe

India Challenge: GHG Emissions – Contd.

GHG emission Transport sector – India



Biofuels – Advantages



Use of Biofuels helps in fighting Climate Change & lower GHG emissions

Key Drivers for Biofuels & Bio-based Chemicals

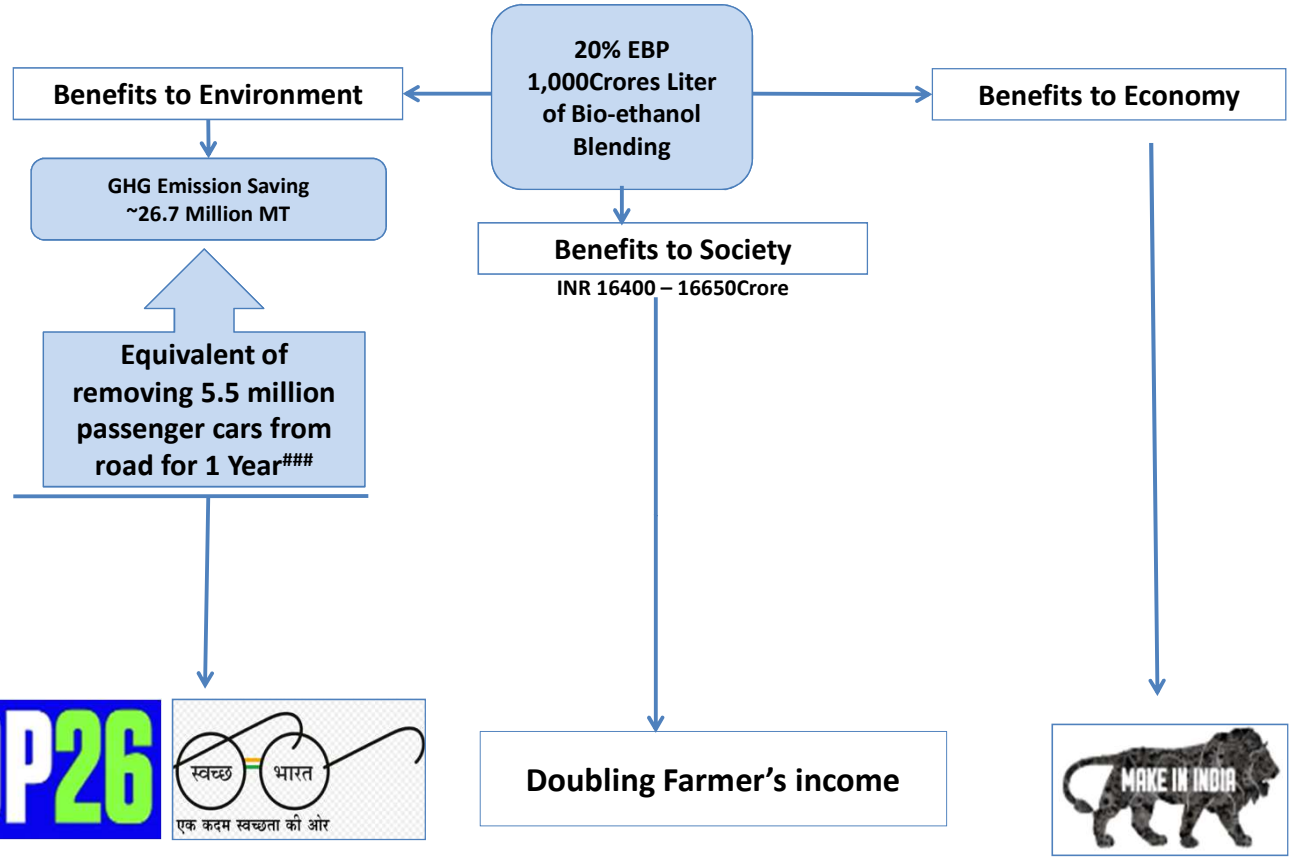
Key Drivers

- **Growing demand for natural products**
  - All industrial segments
- **Growing Consumer awareness is leading to use of ingredients with higher Bio-renewable Carbon index (BCI)**
- **Sustainable sourcing**
- **Government initiative**
  - In tightening the Regulations on use of hazardous chemicals will drive the journey of Bio based chemicals
- **Favorable governmental policies across globe**
  - Government promoting higher use of renewable and green energy sources for industries

Opportunities

- **Reducing Import dependence for Fossil Fuels as Key raw materials & platform chemicals**
  - R&D in Bio Chemicals space
  - Technology development for low cost production of Biofuels, Specialty Chem. & Bio based platform Chemicals
- **Capacity addition for Biofuels, Specialty Chemicals & Bio based Chemicals**
- **Investment in Supply Chain & Logistic infrastructure**

Biofuels for Sustainable - Bio based Economy



###Passenger car emission calculations done as per US EPA guidelines – Assuming one passenger car emits 4.5 MT of CO2 / Year

Indian Ethanol Blending Program – Update

- National Policy on Biofuels - 2018 under the Ethanol Blended Petrol (EBP) Programme.
- Target of 20% blending of ethanol in petrol by 2030 advanced to 2025
- Some of the key measures includes –
  - Additional excise duty on unblended fuel
  - Financial assistance in form of interest subvention provided
  - Inclusion of different feedstock for ethanol production
  - Remunerative price for ethanol produced from different feedstock
  - Long term off-take arrangement for ethanol – with one time registration

India achieved 10% Ethanol blending program 5 months ahead of Nov-22 target

- **Forex savings ~ 41,500 Crore**
- **GHG emission reduction ~ 2.7 million MT**
- **Payment of over 40,600 Crore to farmers**

Ethanol Blending Program – Key levers to increase ethanol production

Key Levers

Excess Sugar for Ethanol

- Juice/syrup/ B-Heavy molasses to ethanol with preferential pricing approved by DFPD# & OMCs – included in tender from 2018-19

~ 3 Bln Ltrs By 2023

Biomass to 2G Ethanol

- CCEA* approves ethanol production from biomass
- Fiscal benefits through **Pradhan Mantri JI-VAN yojana** (Scheme of GOI)

~ 0.04 Bln Ltrs By 2025

Damage Grains to Ethanol

- Damage food grains to ethanol – to avoid food Vs fuel debate

~ 1.5 Bln Ltrs By 2025

Key Drivers for Growth

- **Reduced Goods & Service Tax (GST) on ethanol from 18% to 5%**
- **Environmental Clearance procedures simplified by the MOEF***
- **Notification for direct sale of E100 by OMCs**
- **E20 engine compatible vehicles being launched from April 2025**
- **Flexi-fuel engine & components included under Production Linked Incentive (PLI) scheme**

Advance Biofuels

- **The 2018 National Biofuels Policy indicates a 120-160 MMT annual surplus of available biomass, which, if converted, could produce 30 billion liters of cellulosic ethanol.**
- **OMC to set up 12 demo/commercial cellulosic ethanol project across country under PM-JIVAN yojana**
- **Technologies to convert Other waste into biofuels & Bio-chemicals at nascent level**
- **MoPNG has signed MoU with Oil Companies to establish 5000 Bio-CNG Plants across India with capacity of 15 MMT with financial outlay of US$ 27 billion under SATAT program**

List of Advance Biofuels Projects in India

Company	Status	Scale/ Technology	Annual Production Capacity (Million Liters)
Numaligarh Refinery Ltd	Planned	Commercial/ Cellulosic Ethanol	60
Indian Glycols Kashipur	Operational	Demo/Cellulosic ethanol	0.75
Praj Industries	Operational	Demo/Cellulosic ethanol	1
Shell Bengaluru	Operational	Demo/Drop-in fuels	0.6
IOCL Panipat	Planned	Commercial/Cellulosic ethanol	30
BPCL Bargarh	Planned	Commercial/Cellulosic ethanol	30
HPCL Bhatinda	Planned	Commercial/Cellulosic ethanol	30

Transition to Sustainable Bio based Economy

Problem Statement

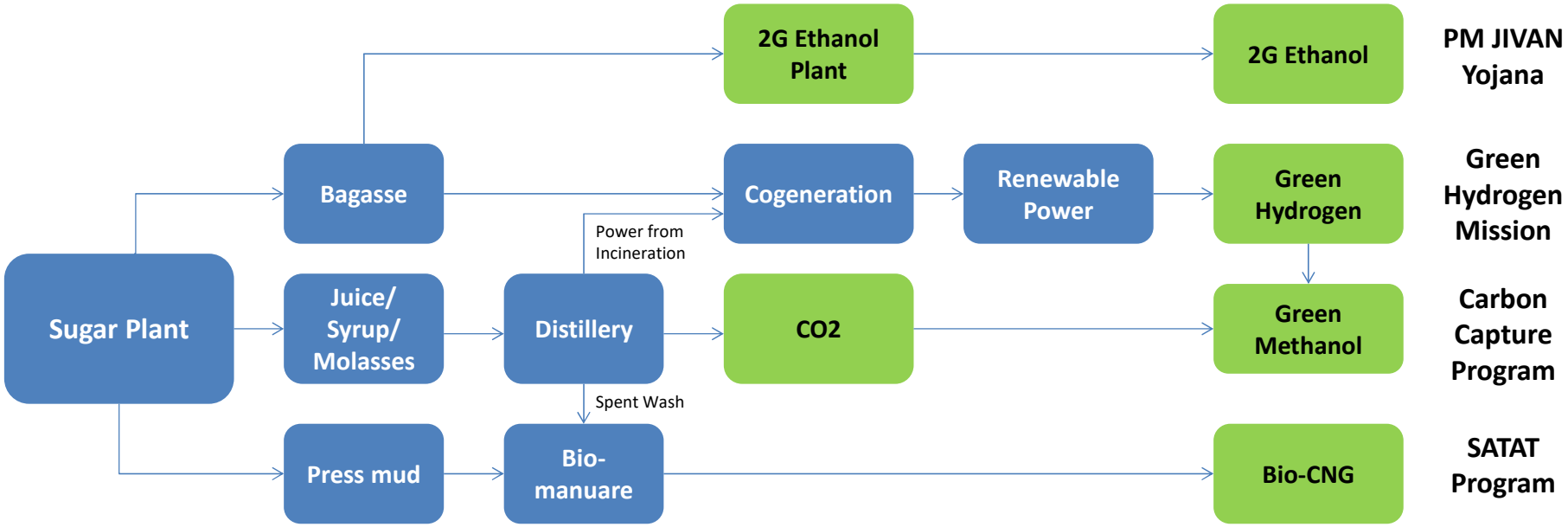
- **Abundant agricultural and forest resources**
  - Largest producer of milk, pulses, jute
  - 2nd largest producer of sugarcane, rice, wheat, cotton
- **Unused cropland and favourable climates**
  - Tropical in the south to temperate alpine in the north
- **Remarkable talent to develop new technologies**

Potential Opportunity

- **What was "waste" yesterday can be "tomorrow's wealth"**
  - Subject to how it is managed & utilized.
- **Circular economy**
  - Materials recycled back through the value chain
  - Resulting in less energy and resource consumption
- **Biorefinery – Waste valorization**
  - Waste to Chemicals
  - Waste to Energy

- **Bio-refinery is a facility that integrates processes & equipment to produce fuels, power, and chemicals from biomass**
- **Bio-refinery concept is analogous to today's petroleum refineries**
- **Industrial Biorefineries is one of the most promising route to the creation of a new domestic bio based industry**

Integrated Bio-refinery Model – For sustainable growth



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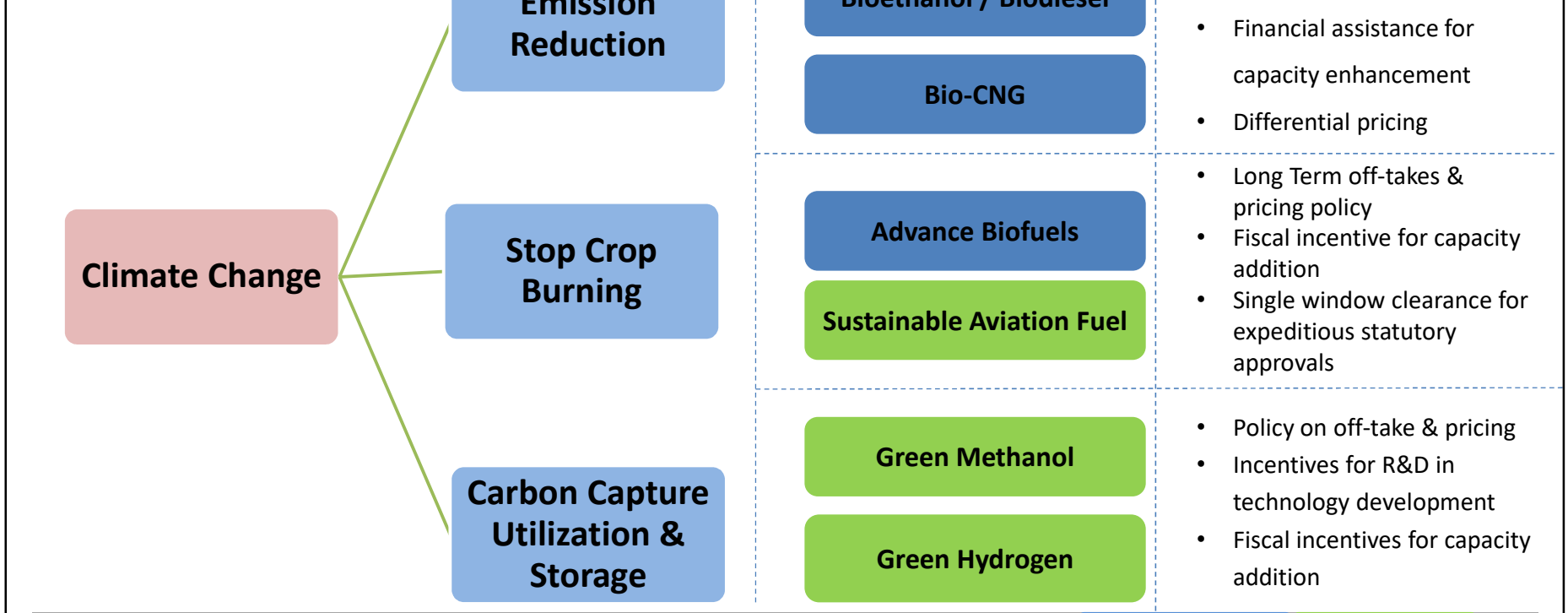
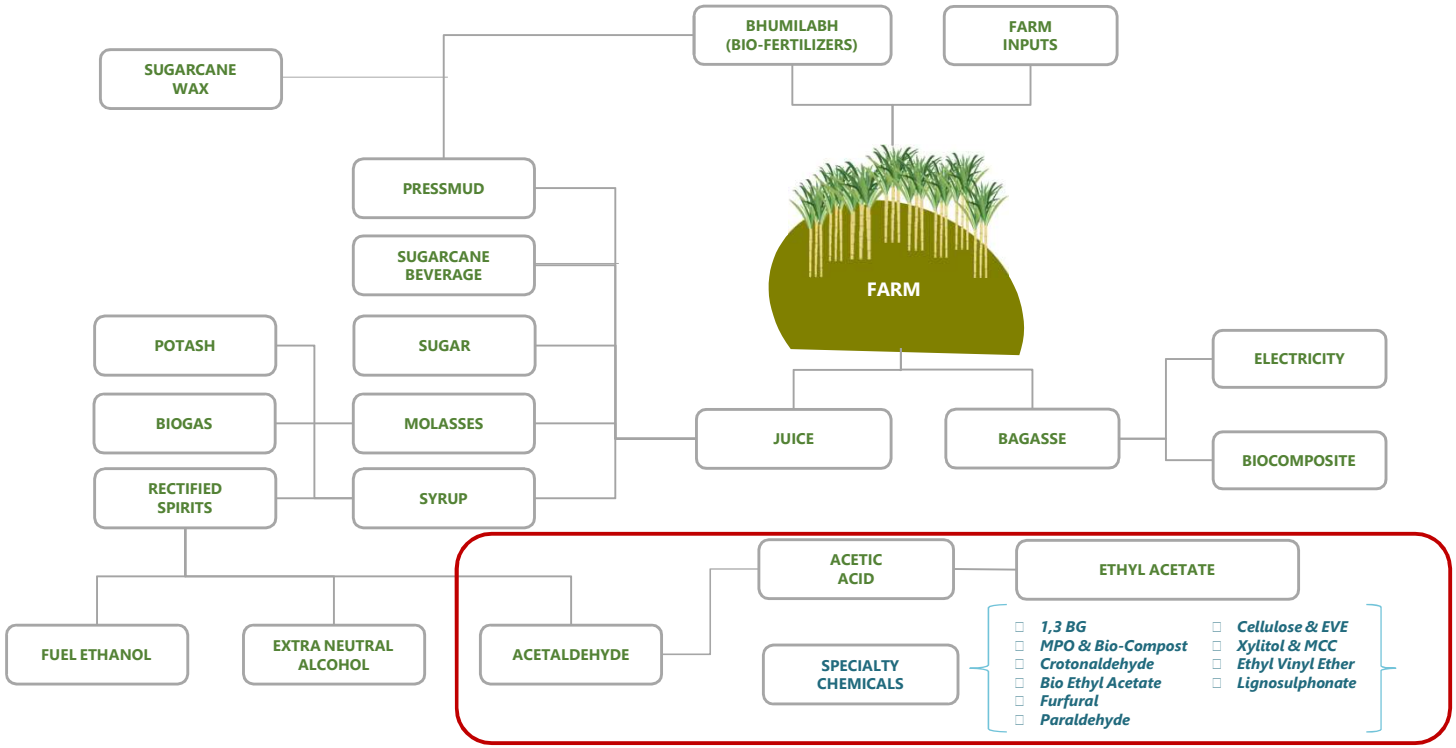
Existing Technology | New Technology

Opportunities for Green Technologies



GBL - Value Chain



Manufacturing facilities which offer flexibility in product mix…

Sameerwadi Manufacturing Facility – Integrated facility for Rectified Spirits, Ethanol, Sugar & Power

Distillery with integrated ethanol plant

Co-Generation Plant

Particular	Installed Capacity (As on Jan 31st 2023)
Sugarcane	18,000 TCD
Ethanol	570 KLPD
Rectified Spirits	600 KLPD
Power Plants	49.56 MWH

Sakarwadi Manufacturing Facility – *Bio-based chemicals*

MPO Plant

Ethyl Acetate Plant

Particular	Installed Capacity (As on Jan 31st 2023)
Bio-based chemicals	>101,000 MTPA

*GBL manufactures a range of bio-based chemicals at the Sakarwadi Manufacturing facility and intends to set up **India's first manufacturing plant of EVE at the facility** [1] & has obtained Environmental clearance for manufacturing more bio-based chemicals*

Key certifications & Awards

BONSUCRO Certificate

BioPreffered Certificate

Responsible Care

ISO 9001:2015

ISO 14001:2015

Indian Chemical Council Award for Water Resource Management 2016 (In chemical industry)

Indian federation of green energy

First prize in "Best Safe Industrial Boiler", the Karnataka State Safety Institute, Government of Karnataka in 2016

Total manpower strength

(As on 30th June 2021)

1517 *Permanent employees*

327 *Contractual employees*

Source: [1]Frost & Sullivan Report

Godavari Biorefineries Ltd

Thank you