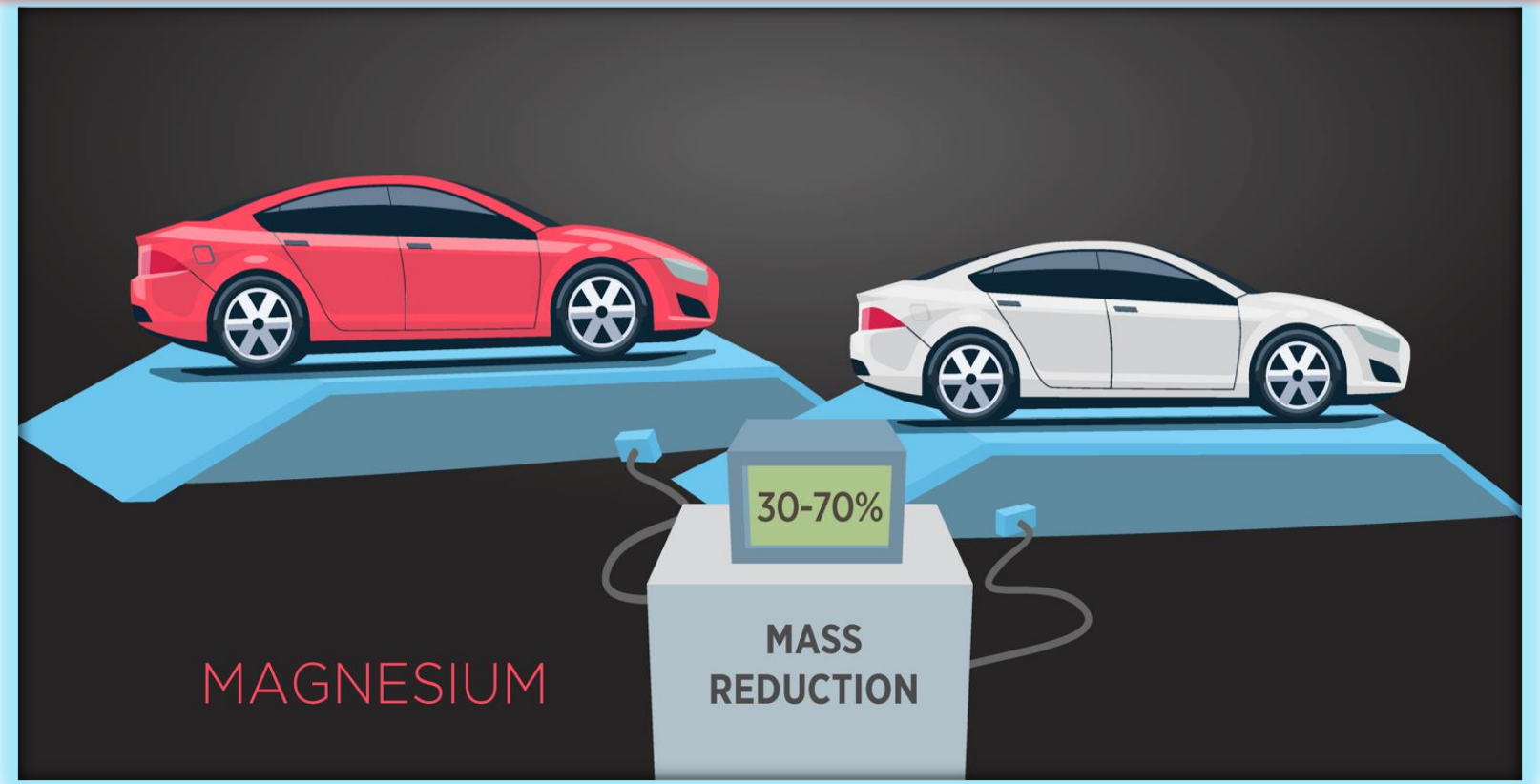
SUSTAINABLE DEVELOPMENT AND LIGHT WEIGHTING: INDIAN PERSPECTIVE



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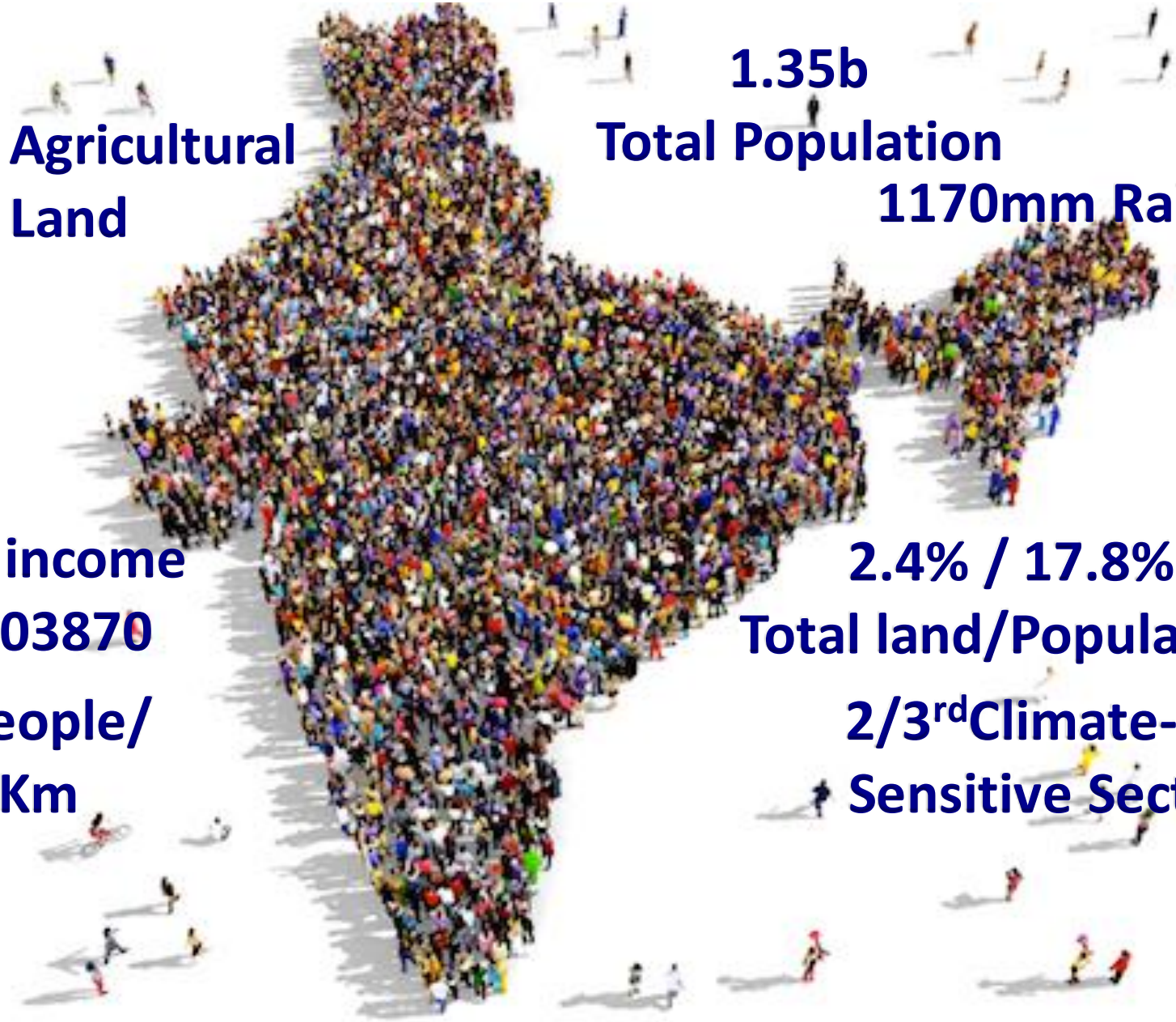
India: The Larger Picture



60.8% Agricultural Land

1.35b Total Population

1170mm Rainfall

Per Cap income INR. 103870

412 people/ Sq Km

2.4% / 17.8% Total land/Population

2/3rd Climate-Sensitive Sectors

Developments In India

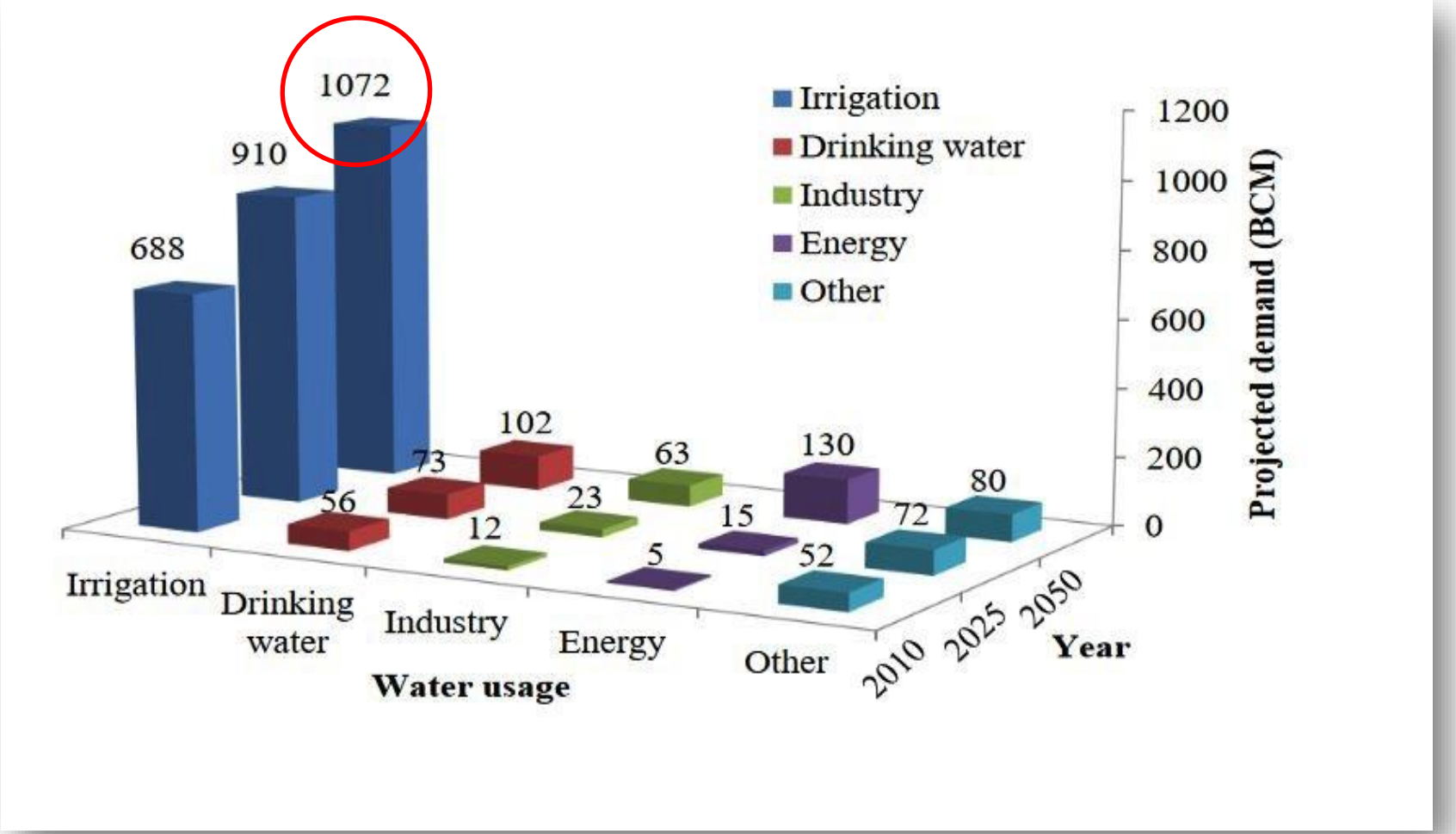
1. Indian Economy: 6th-Largest in the world
2. Purchasing Power Parity: 3rd in the world
3. India's consumer market: 11th largest
4. Smartphone market: 2nd largest
5. Automotive industry: 2nd -fastest growing
6. Only the 3rd country to establish Green Tribunal (NGT, 2010)

Sustainability Development

- Development vs Damage
- Key Components: Water, Land, Air
- 2030 Agenda for Sustainability Development
- Three Prongs: Economic, Environment, Social

Sustainability Challenges in India

Water



Projected water demand – *CWC, 2010*

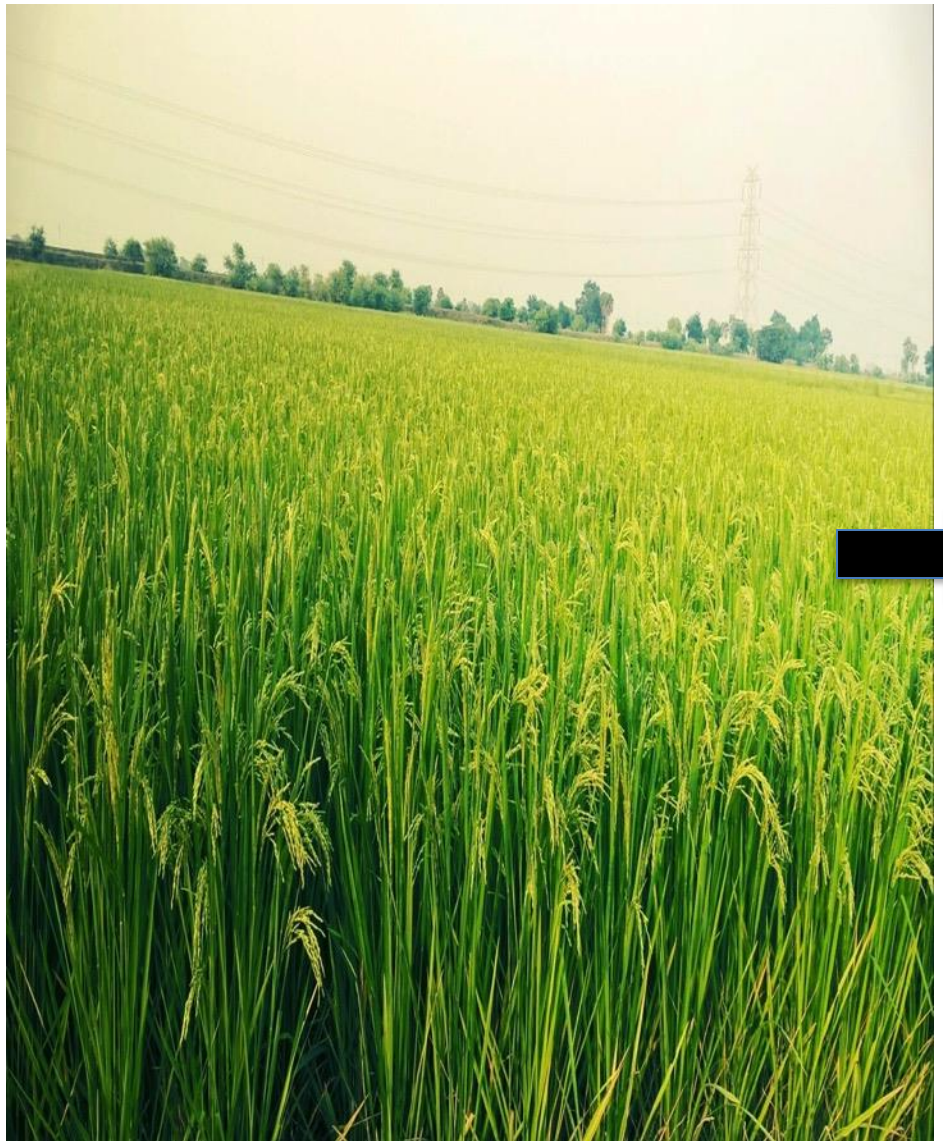
Sustainability Challenges in India: Water

Sustainability Challenges in India: Water

Remediation

Sustainability Challenges in India: Land

Ideal Land



Current Scenario: It's a DUMP

Sustainability Challenges: Usage of Pesticides

20%
/51%

The story across…

Sustainability Challenges in India: Air

22 MT

PM10 268 ug/m3

Sustainability Challenges in India: Air

Air Pollution due to excessive usage of vehicles

Government of India: Initiatives

Environmental Agencies: MoEF; CPCB; NGT

Establishment of 'NGT' (2010)

Government of India: Initiatives

- **Implementation of average fuel consumption standards**
- **Promotion of EVs and providing subsidies**

Government of India: Initiatives

Initiative of Solar Alliance with 121 countries

‘Champions of the Earth Award’ by UN Secretary General

Government of India: Initiatives

NITI Aayog
(National Institution for Transforming India)
Government of India

- NITI Aayog: **National Institution for Transforming India** & **Ministry of Statistics and Program Implementation**)

- Decentralised Adaptive Management strategies for grass-root work rather than Top to Bottom Interventions

Automotive Sector in India

- Young Population (64% in working age group)
- Middle class population
- Disposable income

Growing interest of companies in exploring the rural markets

Current Scenario of Light-Weighting in India

- **Light weighting has been a thrust area in Automotive sector in India**

- **In the next 20 years, 380 million vehicles are expected to be on Indian roads. This makes it critical to address challenges related to**
  - **Fuel economy,**
  - **Improved performance**
  - **Safety**
  - **Reduction in emissions (the Corporate Average Fuel Efficiency; CAFE standards)**

source: Environment and Energy Sustainability Report, Mckinsey & Company

Current Scenario of Light-Weighting in India

In India the trend in light-weighting is towards the use of novel materials:

- **Plastics**
- **Carbon Fibers**
- **AHSS**
- **Al**
- **Nanosteel**

The Trajectory to Light-Weighting

Emerging Trends and Innovations in Light-Weighting

Tata Industries & IIT Madras, India

Lightweight technologies using carbon-based materials

Emerging Trends and Innovations in Light-Weighting

- **Hyundai Motors** in its 6th generation Elantra, launched in India recently, uses **AHSS** for lightweight.

- Pune-based **Bright AutoPlast** has taken a number of new technology initiatives designed to produce lightweight parts.

- **DuPont** : Invested in Collaboration centres in **India, Korea and China** to complement the existing technologies and knowledge

Challenges in Manufacturing and Durability of New Materials

- Availability & Formability of Materials
- Manufacturing Process Optimization
- Life Cycle Analysis of the materials & Composites
- Environmental Issues: Waste Recycling
- Safety Issues: Inflammable Characteristics

Magnesium as a Light-Weighting Material: India

Usage is Limited

Resources of magnesium in India:

- **Sea Water**
- **High Grade Mineral deposits**

Magnesium Resources and Raw Material

The chief minerals

- Dolomite (7730 million tonnes)
- Magnesite (335 million tonnes)
- Brucite & Carnallite (42 million tonnes and 293 million tonnes)

Metal Extraction Plants in India

Magnesium Resources and Raw Material

- The present Indian scenario continues to be worse if we consider the metal extraction methods and metal alloy castings in a commercial point of view.

- Low volume of production is affecting the metal cost which makes importing a better choice right now

Source: Indian Foundry Journal Vol 61 • No. 2 • February 2015

Magnesium Resources and Raw Material

Sundaram Clayton Limited, (India)

- Largest supplier of die-castings in automobile sector has started trial production of magnesium die-casting in 2011 with initial production capacity of 1000 tonnes per annum.
- Indian Companies Tata Motors, Ashok Leyland, Mahindra & Mahindra expressed their initiative in using magnesium alloys.

Research on Magnesium

- **A recent research conducted by Monash University in Melbourne, after testing more than 400 different alloy compositions of Magnesium, have found that, adding small amount of arsenic, dramatically reduces rates of corrosion in magnesium.**

ELSEVIER

Electrochemistry Communications

Volume 34, September 2013, Pages 295-298

Short communication

Poisoning the corrosion of magnesium

N. Birbilis [a], G. Williams [b], K. Gusieva [a], A. Samaniego [a, c], M.A. Gibson [a, d], H.N. McMurray [b]

Show more

https://doi.org/10.1016/j.elecom.2013.07.021

Research on Magnesium in India

Laboratories/Institutes/Industries in India	
Institute/R&D Division	**Research Area**
Defense Metallurgical Research Laboratory Hyderabad	Complex Mg Alloy Castings to DRDO for Missile Programmes
Hindustan Aeronautics Limited , Bangalore and Koraput	Developed fluxless melting technique, Mg alloy gear casings
Central Electro Chemical Research Institute, Karaikudi	Sacrificial Electrodes for Marine Electrodes

Research on Magnesium in India

Laboratories/Institutes/Industries in India	
Institute/R&D Division	**Research Area**
Indian Institute of Technology Bombay	Development of Corrosion Resistant Implants using Rare Earth Elements
Indian Space Research Organization	Development of Protective Coatings on Magnesium Alloys using Polymers
Indian Institute of Science Bangalore	Studies on the Mechanical property correlation of magnesium alloys and use of magnesium in rechargeable batteries
National Institute for Interdisciplinary Science and Technology, Trivandrum	Development of high-temperature Mg alloy, magnesium metal matrix composites, software for processing of Mg cast components

Magnesium: Knowledge Gap

- India's booming industries such as iron and steel, aluminium are the main consumers of magnesium.

- Majority of the magnesium foundries produce magnesium ingots only.

- Since the automobile as well as aviation Industry in India largely depends on imports, industry of the die cast as well as wrought magnesium products are not well- developed.

Magnesium: Knowledge Gap

Need of Collaboration and Knowledge Dissemination

Thank You