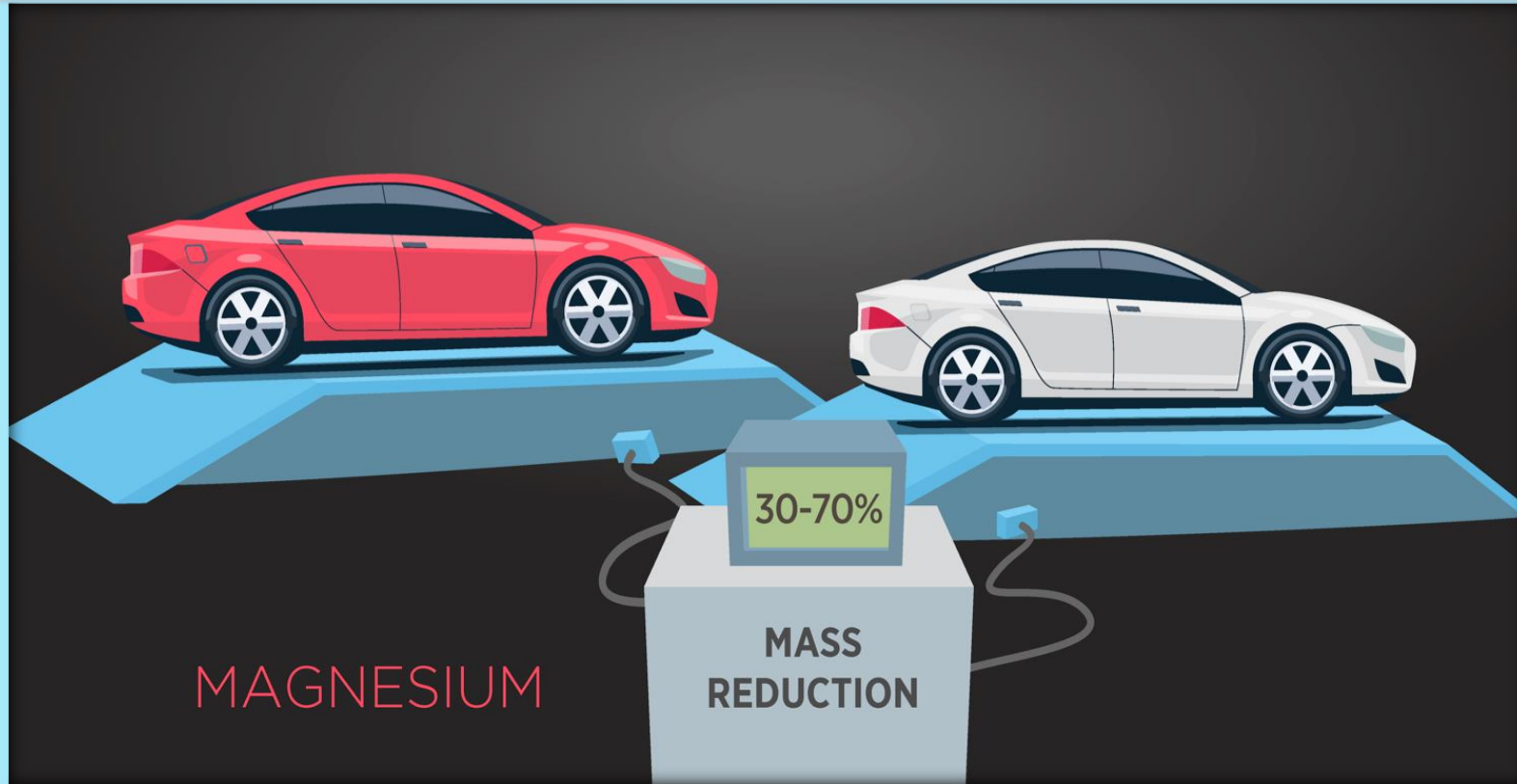


# SUSTAINABLE DEVELOPMENT AND LIGHT WEIGHTING: INDIAN PERSPECTIVE



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**Lovely Professional University,**  
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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  
2/3<sup>rd</sup> Climate-  
Sensitive Sectors**

# Developments In India

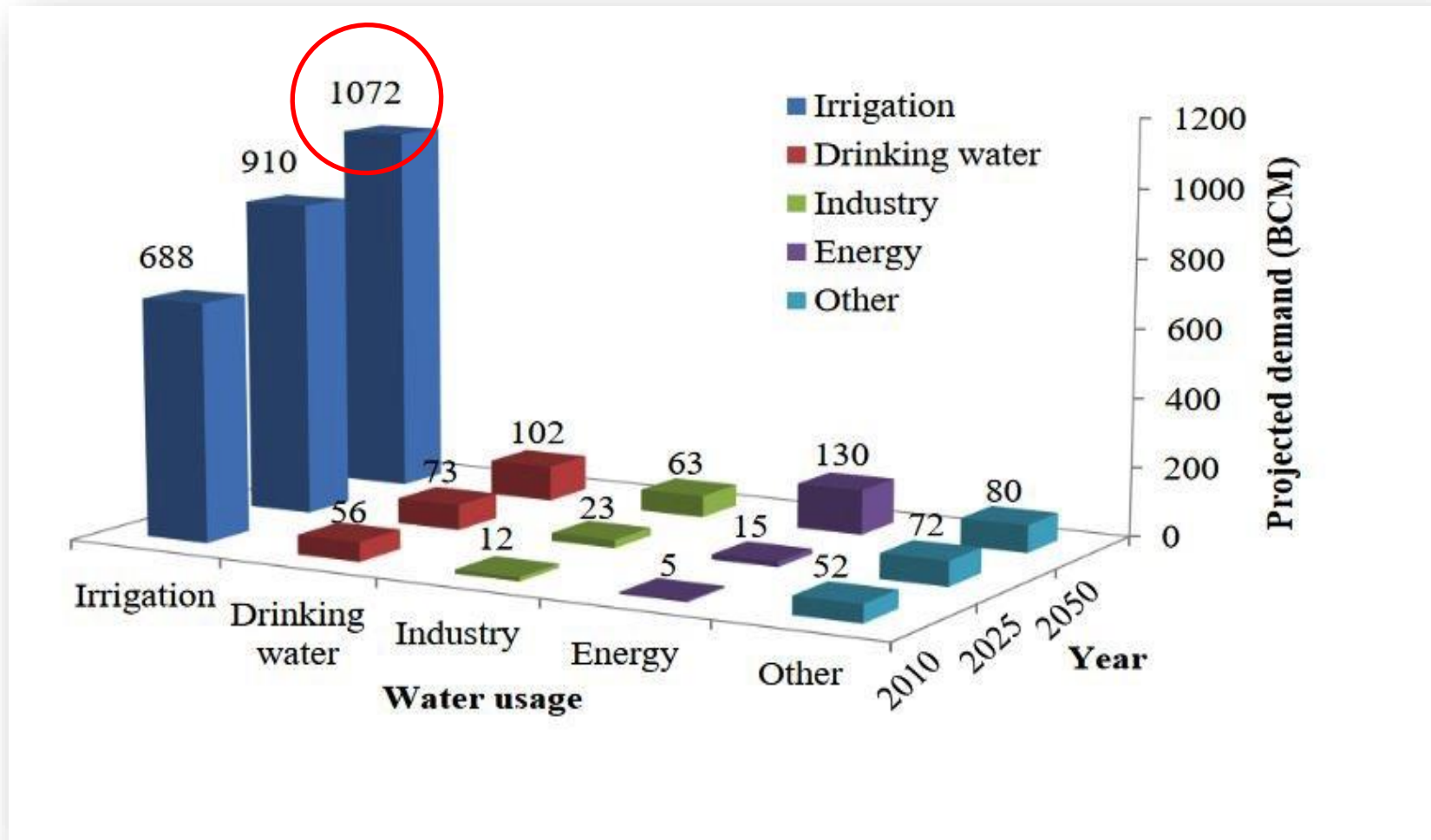
- 1. Indian Economy: 6<sup>th</sup>-Largest in the world**
- 2. Purchasing Power Parity: 3<sup>rd</sup> in the world**
- 3. India's consumer market: 11<sup>th</sup> largest**
- 4. Smartphone market: 2<sup>nd</sup> largest**
- 5. Automotive industry: 2<sup>nd</sup> -fastest growing**
- 6. Only the 3<sup>rd</sup> 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

Reclamation



# 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...

**Why Endosulfan?**

Endosulfan is an organochlorine insecticide that is widely used in agriculture. It is a highly toxic, environmental pollutant, causing long-term harm to humans and wildlife. The United Nations Environment Programme (UNEP) recognizes it as a Persistent Toxic Substance.

Endosulfan is recognized as unacceptably hazardous to human health and the environment in many regions of the world. Its continued use in many regions jeopardizes wildlife populations, environmental integrity and human health everywhere because of its volatility (which enables it to spread around the globe), and its persistence.

It is a leading cause of poisonings from pesticides, and in some communities has left a legacy of deformity and malnutrition. It is a pesticide that is no longer needed for food and socioeconomic alternatives for all current uses.

**BAN end**

**Threats to Human Health**

**Acute Toxicity** - Endosulfan is readily absorbed by the stomach, lungs and through the skin. All levels of exposure pose a hazard. It acts primarily on the nervous system. Many poisoning cases, including fatalities, have been reported in Brazil, Columbia, Costa Rica, Cuba, Guatemala, India, Indonesia, Malaysia, Philippines, South Africa, Sri Lanka, Sudan, Turkey, and USA.

**Endocrine Disruption** - Endosulfan is known to interfere with hormonal mechanisms even at low concentrations. Endosulfan can mimic hormones in the human body, increasing the risk of cancer in reproductive organs, such as breast and testicular cancers, impacts on male reproductive health, includes reduced sperm quality and count, testicular atrophy, delayed sexual maturity.

**Chronic Effects** - Endosulfan damages red blood cells, thyroid, kidneys and the developing foetus. It is a tumour promoter, and inhibits immune functions. Behavioural and neurological changes have been observed.

Endosulfan has resulted in congenital birth defects, reproductive health problems, cancers, loss of immunity, neurological and neurobehavioral problems amongst exposed villagers in Kerala, India.

**ANAR**

Pesticide Action Network (PAN) Asia and the Pacific  
PO Box 1176, 20002 Prunag, Hanoi  
Tel: +84 4 261 0271 / 043 481 / 043 481 041  
Email: pan@pan.org.vn | Web: www.pan.org.vn

# ECOLOGIST

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### Revealed: the child victims of pesticide poison

Peter Caton and Beatriz Lopez | 4th January 2012

**Author(s):** Manpreet Naur and Dr. NS Neria

**Abstract:** The present study was planned with an objective of House Crow from agrifield areas of district Ludhiana and heavy metals were detected through ICAP-AES, out of which Arsenic, Mn were essential elements. The concentration of all metals was found to be higher than the permissible limit.



# Sustainability Challenges in India: Air



22  
MT



PM10  
268  
ug/m3



12/6/2018

# Sustainability Challenges in India: Air



## Air Pollution due to excessive usage of vehicles

**60% of  
GHG**

*(TEDDY, 2006).  
(Patankar, 1991).*



# 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 & 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



Ford GT



Ford F150



# 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.



Electrochemistry Communications

Volume 34, September 2013, Pages 295-298



Short communication

## Poisoning the corrosion of magnesium

N. Birbilis <sup>a</sup>  , G. Williams <sup>b</sup>, K. Gusieva <sup>a</sup>, A. Samaniego <sup>a, c</sup>, M.A. Gibson <sup>a, d</sup>, H.N. McMurray <sup>b</sup>

 Show more

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

12/6/2018

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# 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