

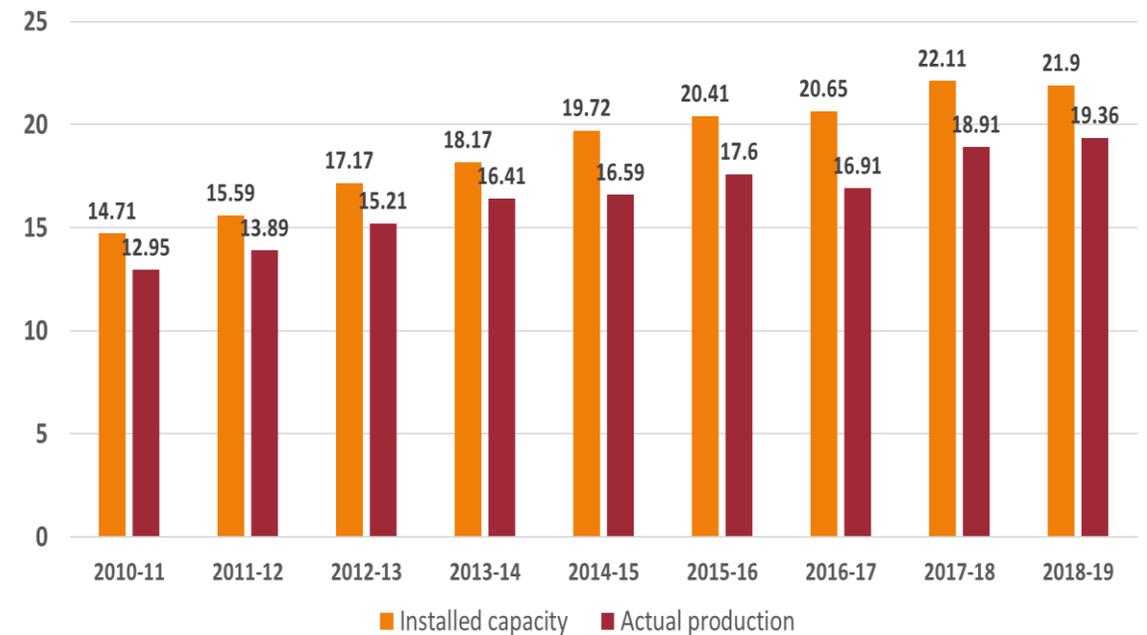
# Decarbonization in Indian Pulp & Paper sector

- IPPTA Seminar 2023
- 17-18 March 2023, Hyderabad

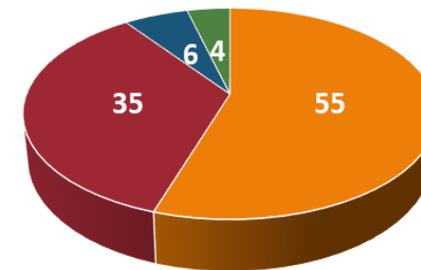


# Indian Paper industry – Capacity

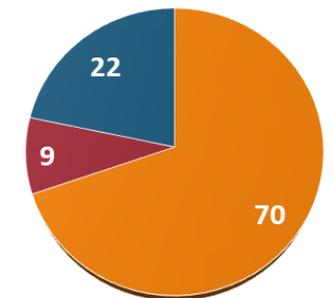
- **5<sup>th</sup> largest producer & consumer of paper** in the world, with **21.9 million tons of installed paper capacity** in FY 19
  - ~4% of world's paper production
- Total operational mills – **500 nos.**
- The Indian paper industry consists of **four basic segment** of product category
  - **Writing & Printing, Packaging Paper & Board, Newsprint & Specialty papers**
- The pulp & paper industry is also categorized on the basis of raw materials usage
  - **Wood based, Agro based and Recycle fibre based**



Variety wise share in total production



Raw material share

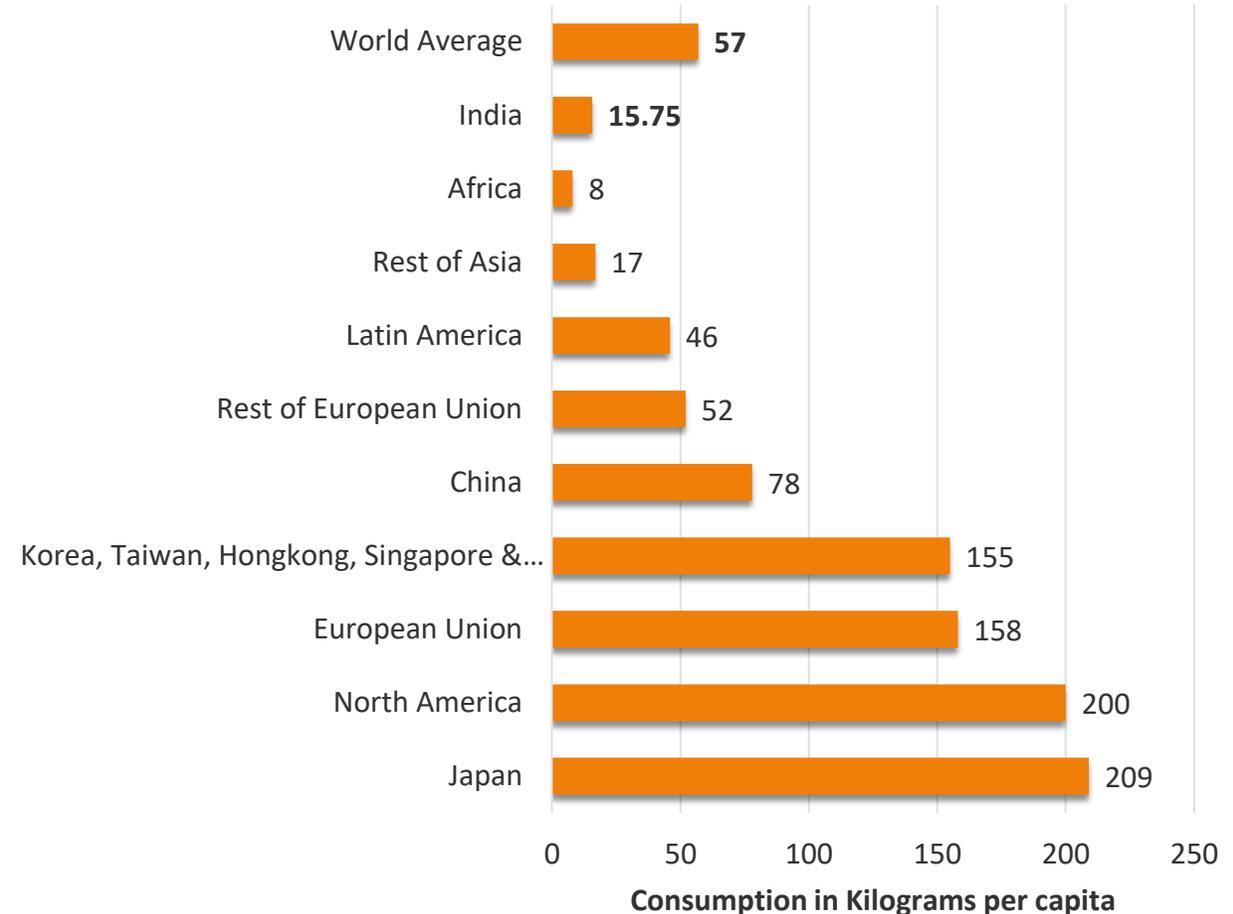


- Packaging grade
- Writing & printing
- RCF
- Agro residue
- Wood based
- Newsprint
- Others

# Indian Paper industry – Per capita consumption

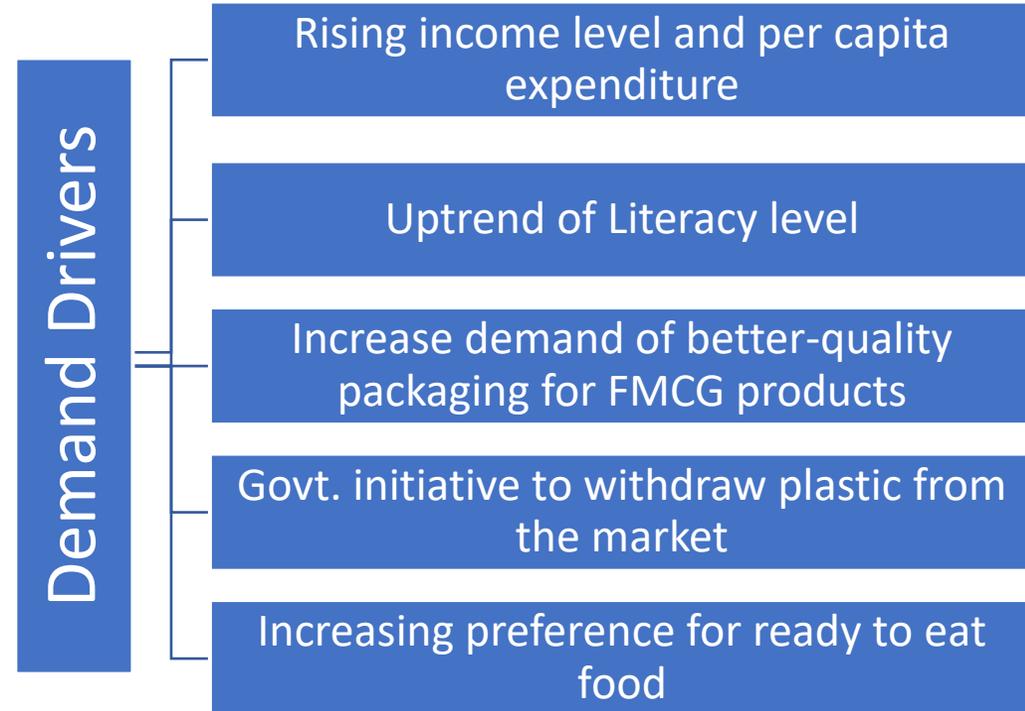
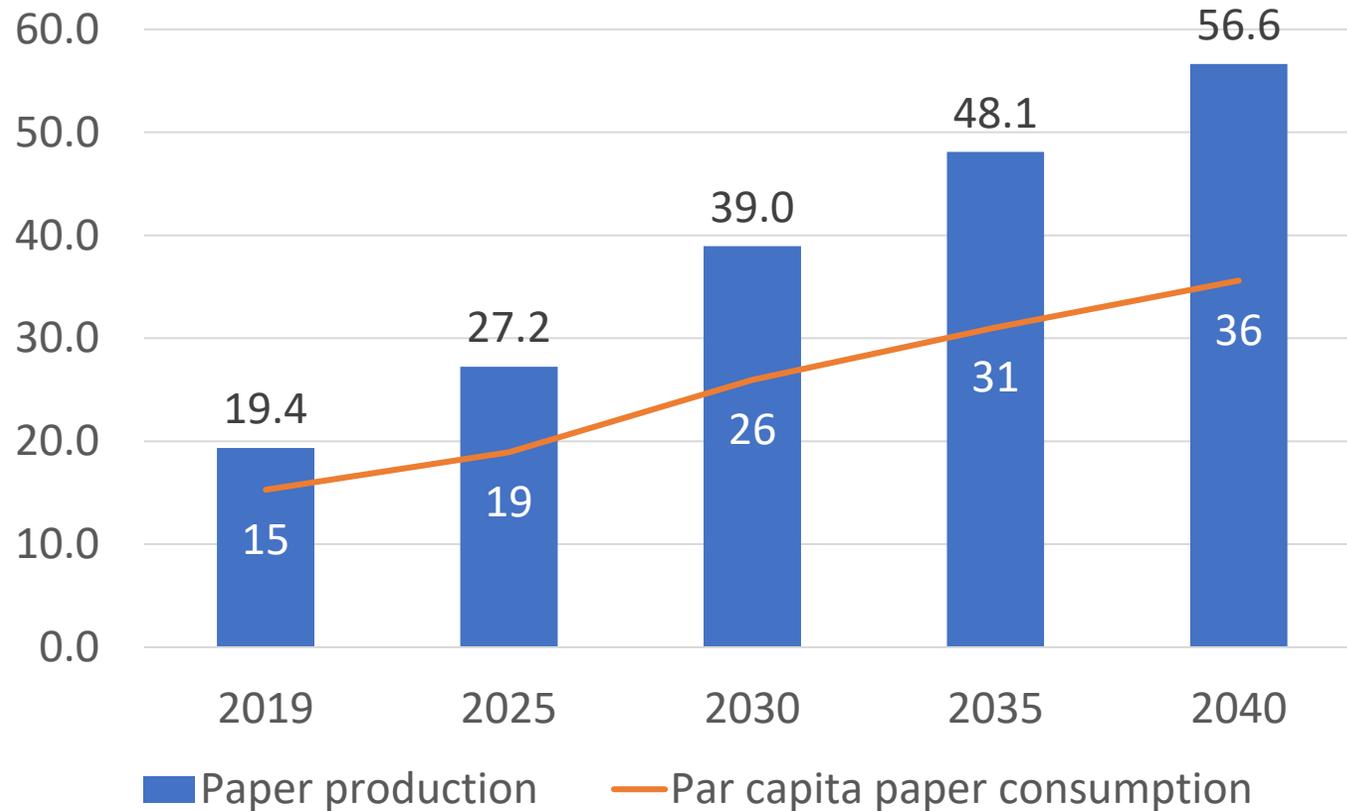
- The industry is highly fragmented with varying sizes ranging from **10 TPD to 1500 TPD**
  - **75-80% production** are from medium and small category mills
- Per capita consumption of paper (**15.75 kg**) is significantly low compared to global per capita paper consumption (**57 kg**)

Paper consumption per capita worldwide by region



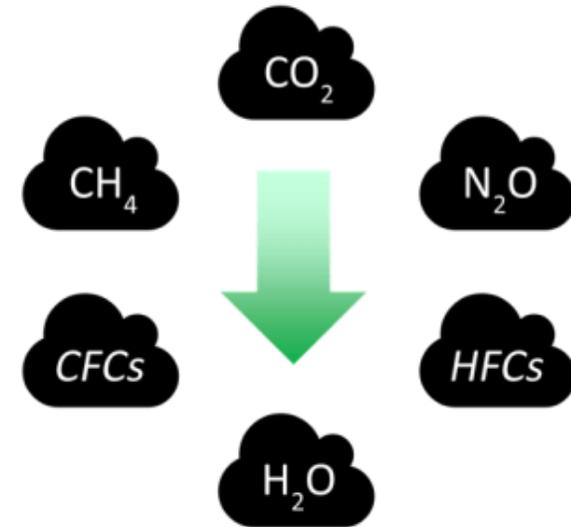
# Indian Paper industry – Growth potential & Demand drivers

Projected growth of Indian Paper Sector

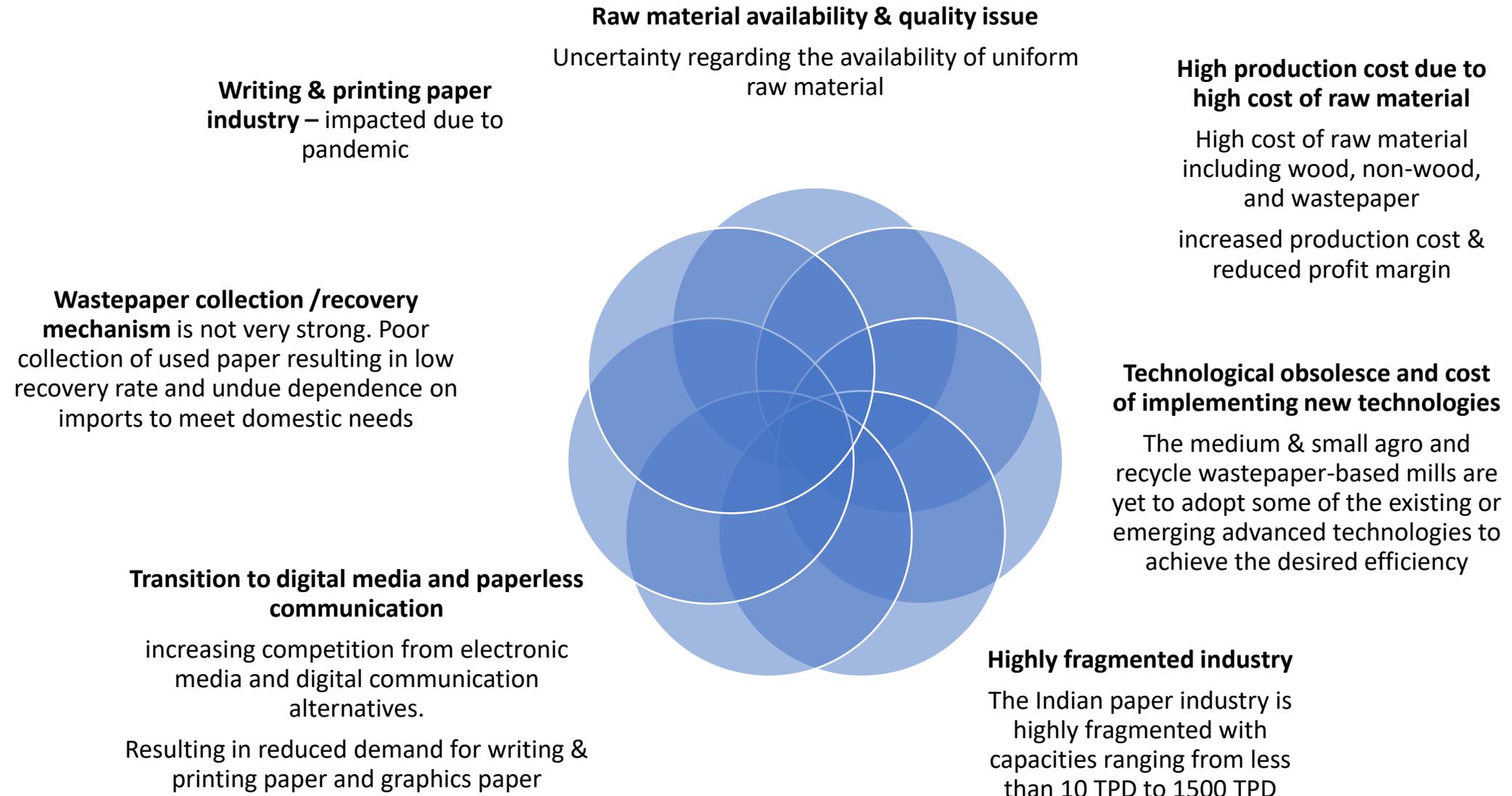


# Decarbonisation in Indian paper industry – Need

- Assess the potential for a low-carbon future across the energy intensive industrial sectors
- **Energy cost – 16 to 25%** of manufacturing costs
  - Need to decarbonize and increase energy efficiency whilst remaining competitive
- CO<sub>2</sub> emissions from Indian Paper industry – **1.09%** of total net CO<sub>2</sub> emission
- Few major players are already carbon positive
- Need to focus on small and medium size mills for energy efficiency improvement



# Decarbonization in Indian paper industry – Challenges



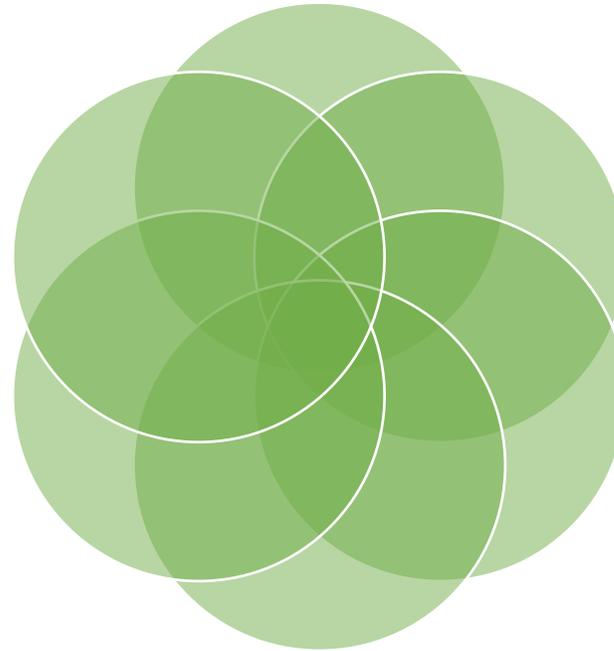
# Decarbonization in Indian paper industry – Opportunities

## Support climate goals of the nation & world

Paper sector can play a vital role in achieving climate goals

Enable **Partnerships among stakeholders** – bring together R&D, industry, government, experts, innovators, technology providers toward common agenda

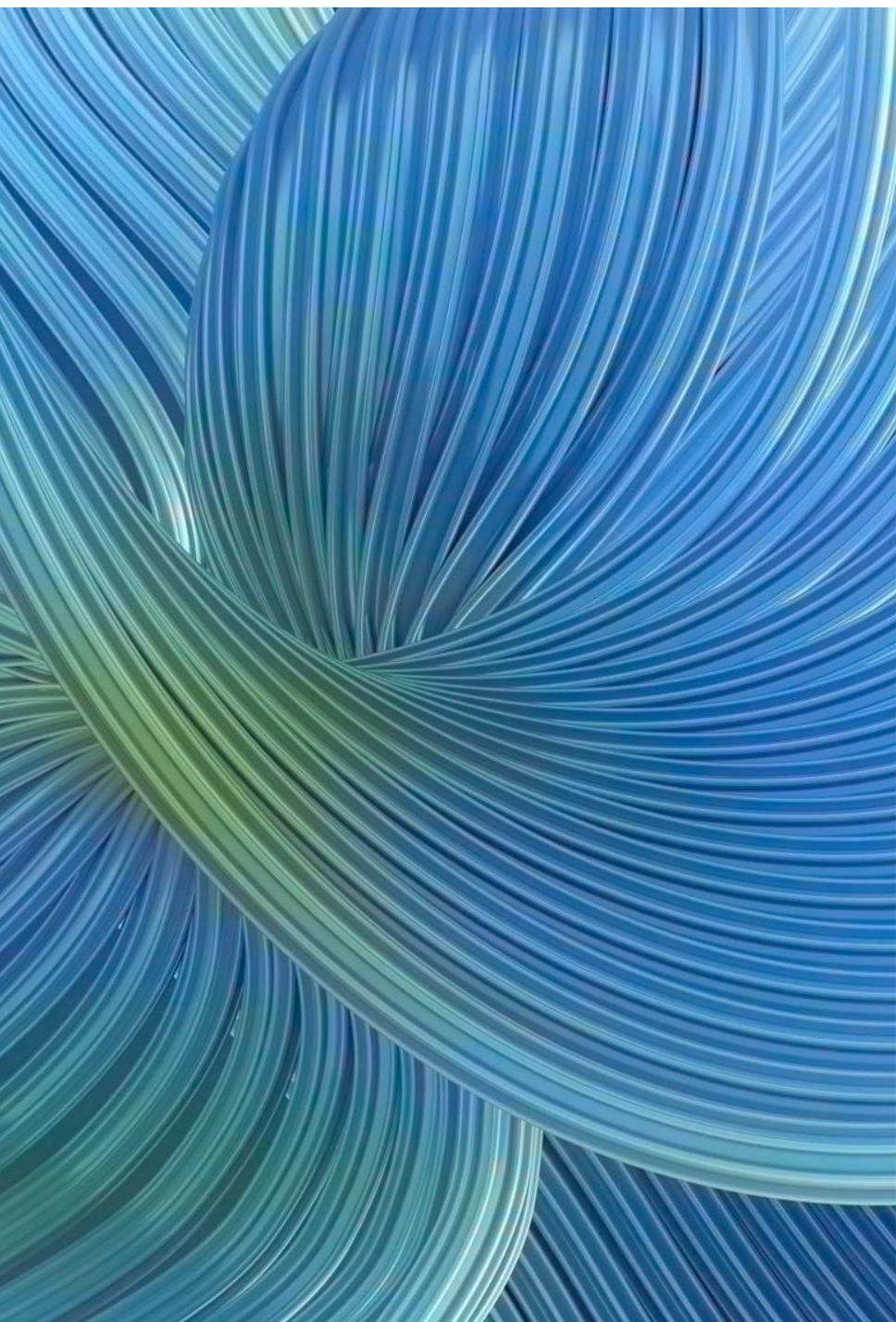
**Brand image & social acceptance** of the sector will improve



**Circular economy and resource efficiency**  
Waste material usage promotes industrial symbiosis and reduce dependence on virgin materials.

**Breakthrough technologies & innovations**  
Breakthrough technologies, for example those reducing the use of heat in paper production through reduced water consumption, are needed

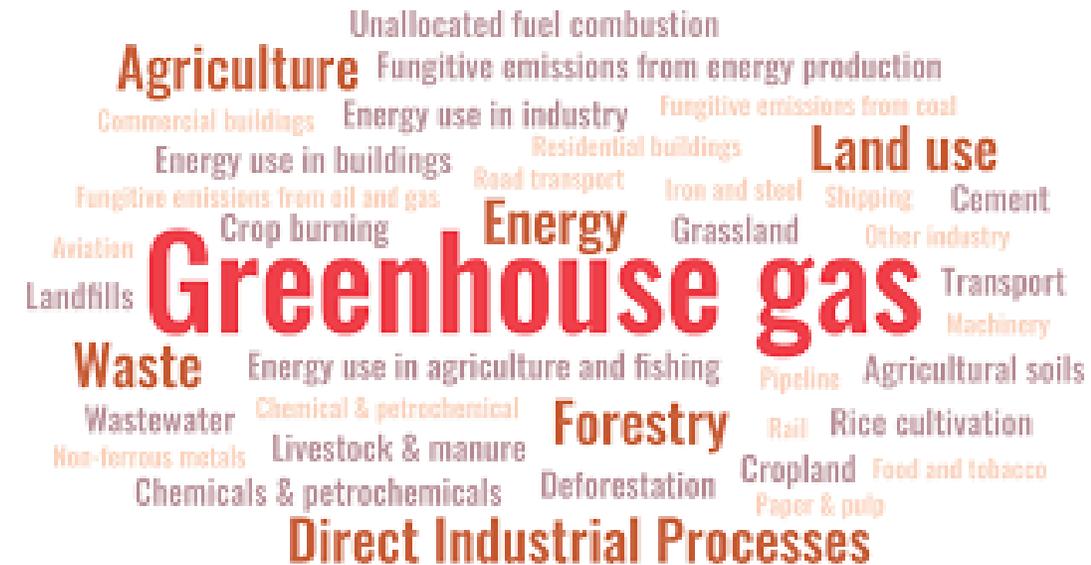
**Reduce Production cost & fossil fuel dependency**



# Energy and GHG Performance (Baseline Scenario)

# Indian Paper industry – GHG emissions

- India is the 3<sup>rd</sup> largest emitter of greenhouse gases and accounted net emissions of **2.53 billion tons in 2016**
  - **7% total global emissions**
- Estimated GHG emission from Indian Paper sector
  - **GHG emission – 30.5 Million MTCO<sub>2</sub>e ,**
  - **Carbon emission intensity – 1.58 MTCO<sub>2</sub>e/MT paper**
  - **Paper Sector contribution in total net emission – 1.09%**



# Decarbonization in Indian paper industry – Baseline year

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## Baseline year

- 2019

## Production details

- 19.36 million tons of paper production
- Raw material share – Wood : 22%, Agro : 9%, RCF : 70%

## Energy Performance

- 0.57 TOE/ton of paper

## GHG levels

- Carbon emission intensity – 1.58 MTCO<sub>2</sub>e/MT paper

# Decarbonisation in Indian Paper Industry – Proposed scenarios

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## Scenario 1 : Business As Usual (BAU)

- Moderate efforts

## Scenario 2 : Ambitious – Deep decarbonization

- High efforts

# Potential levers for decarbonization of Indian Paper sector



**Electrification and use of clean energy**



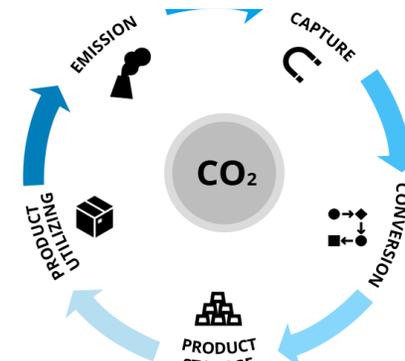
**Energy efficiency**



**Circularity, material efficiency, Alternate materials**

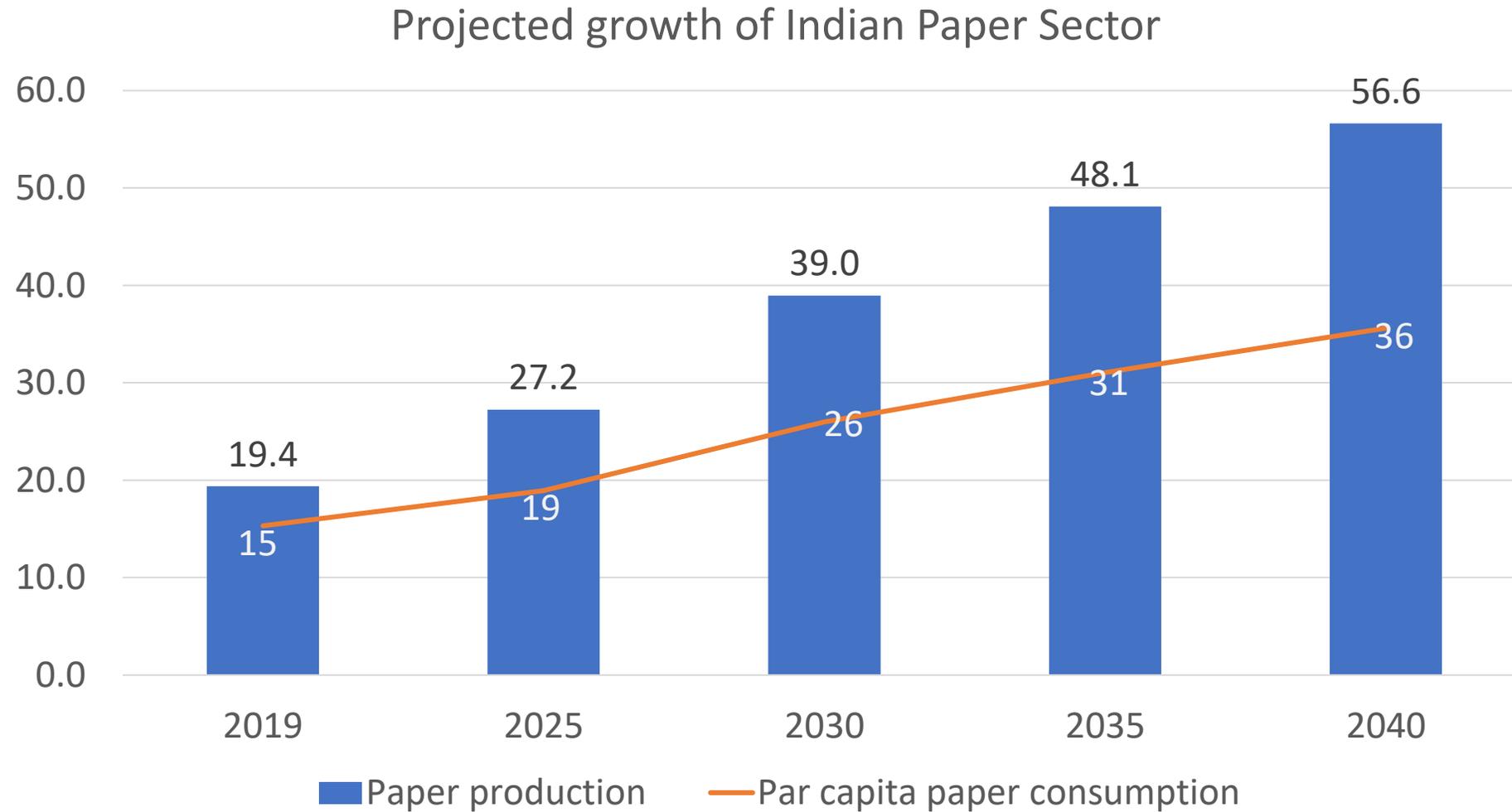


**Biomass and zero energy fuels**

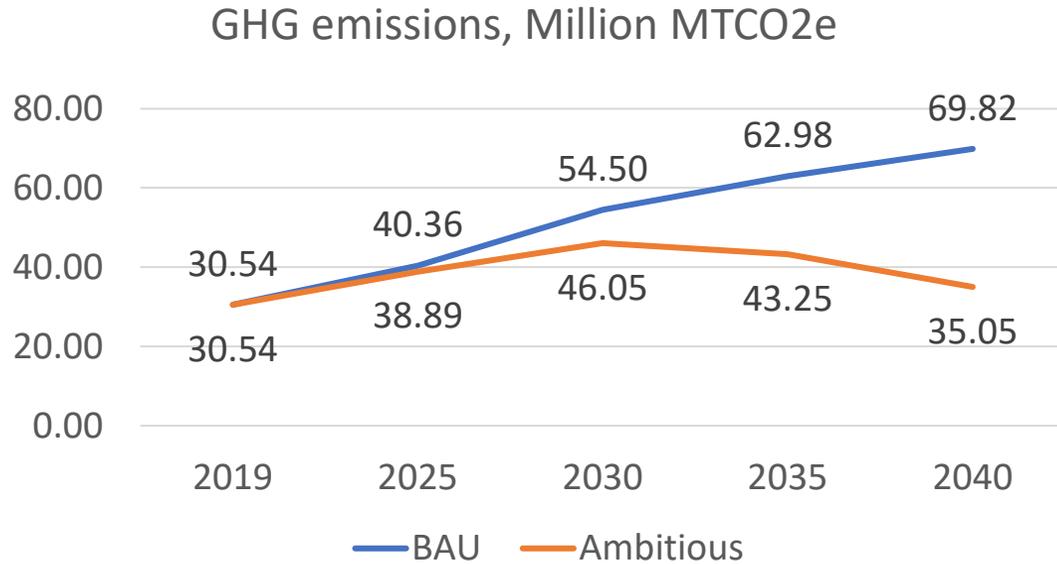


**Breakthrough technologies**

# Estimated projections – Paper production and par capita consumption



# Emissions and emission intensity – Proposed scenarios



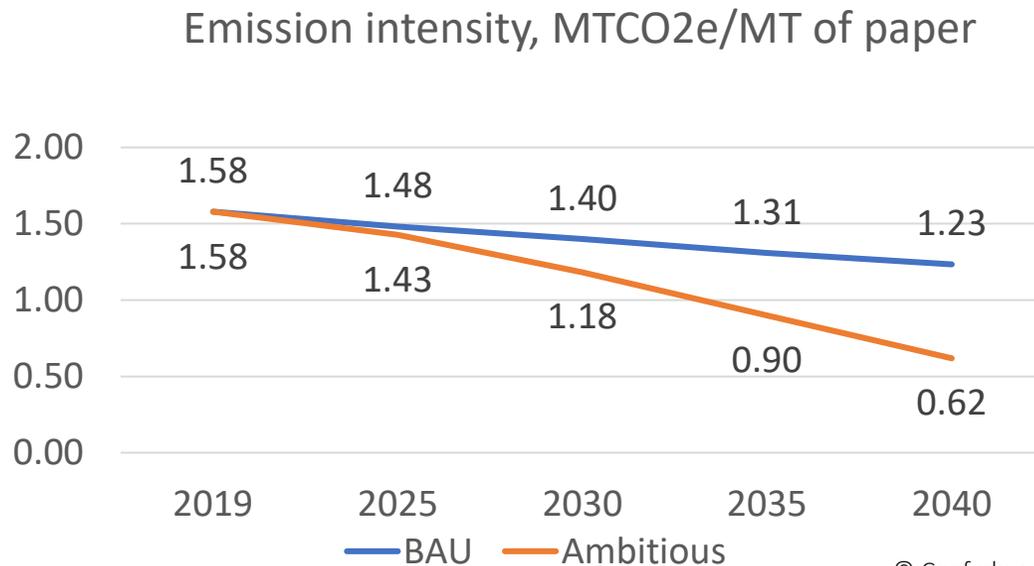
## Emission increase

129% in BAU scenario  
15% in Deep decarbonization scenario



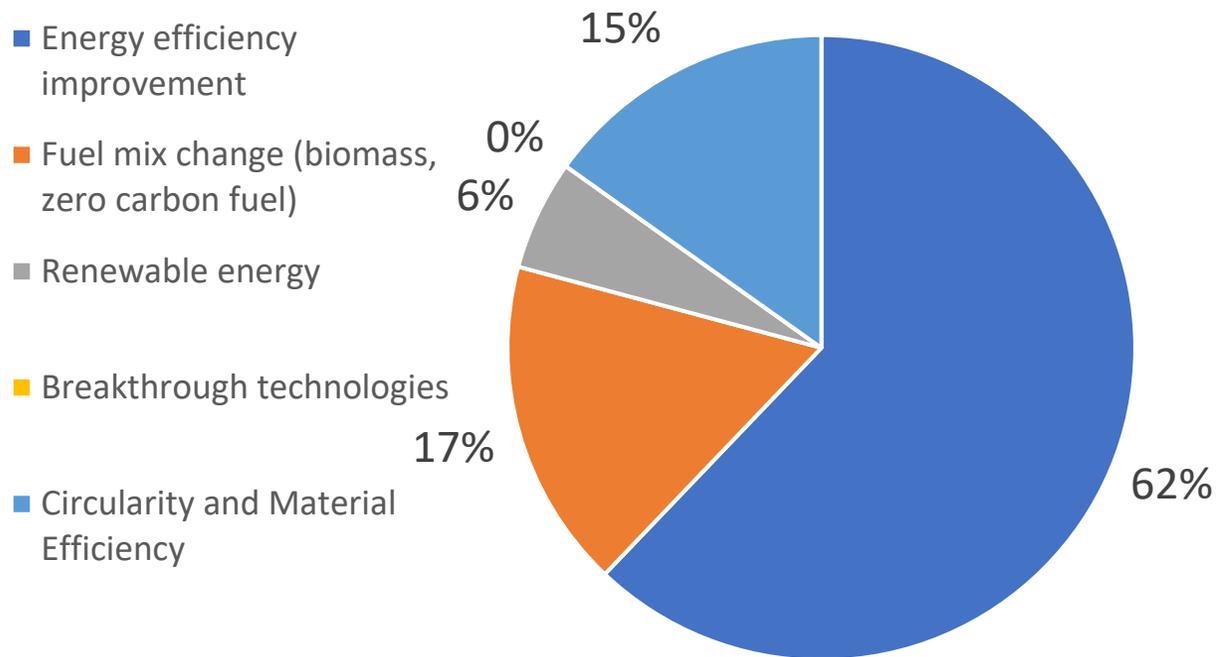
## Emission intensity

22% reduction in BAU scenario  
61% reduction in Deep decarbonization scenario

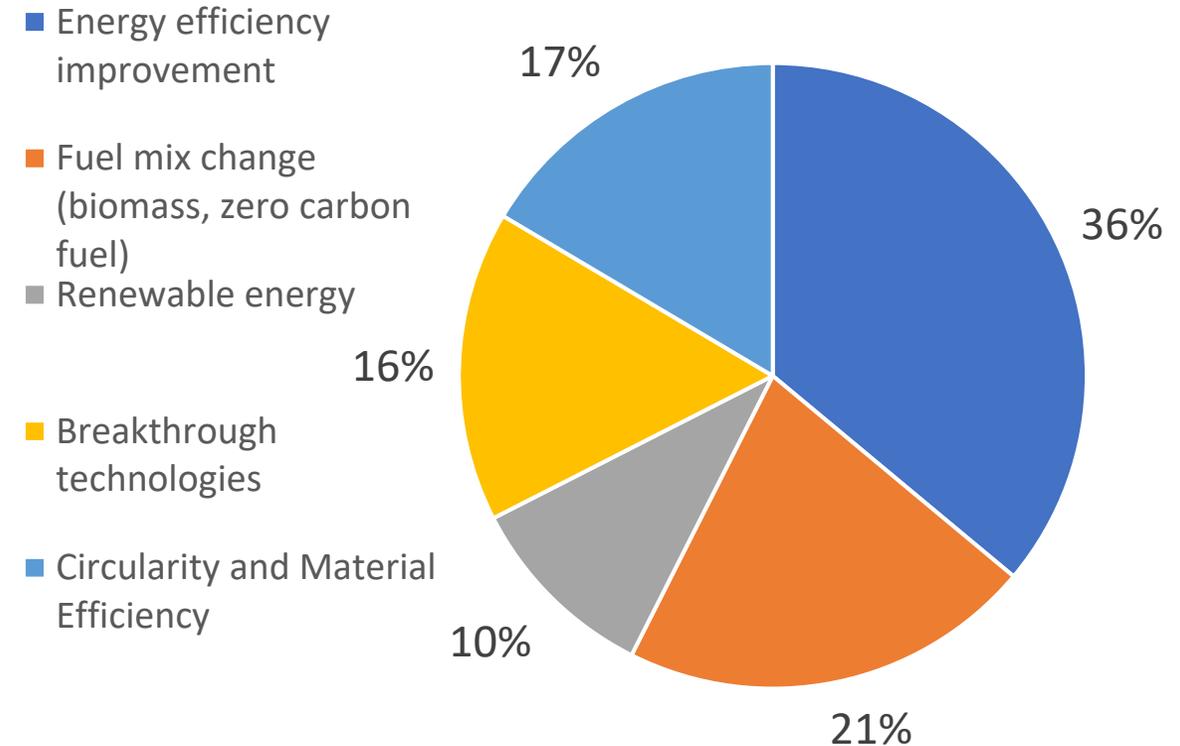


# BAU Vs Ambitious scenario – impact of various levers on emission reduction

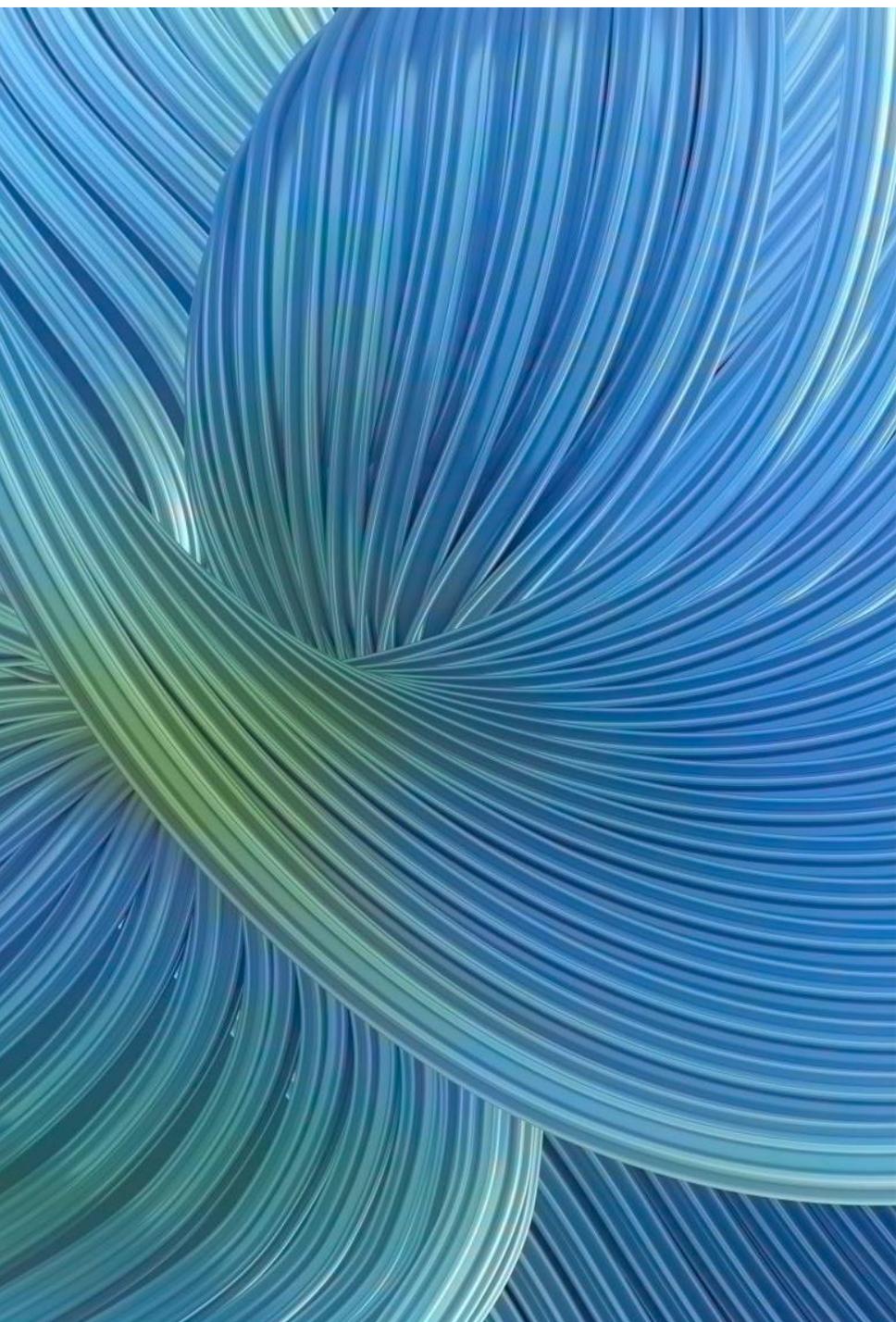
Baseline Vs BAU –  
Impact of various levers



Baseline Vs Deep decarbonization scenario  
- Impact of various levers



- Energy efficiency – important role in paper sector decarbonization – major contribution
- Use of biomass or zero carbon fuels to be accelerated
- Breakthrough technologies to be introduced by 2030 to further reduce the emissions



# Approach for decarbonization in Paper and Pulp sector

# Energy efficiency improvement

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- Centralized refining
- Vacuum blowers in place of vacuum pumps
- Shoe press in paper machine
- Advanced process control systems
- Micro turbine in place of PRDS
- Oxy-fuel burning in lime kiln and black liquor boiler
- Blow down steam recovery
- Condensate recovery improvements
- Steam trap monitoring and improvements
- Waste heat recovery

# Breakthrough Technologies

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## Breakthrough technologies

- Direct electric heating
- Solar thermal
- Gas fired dryer
- Carbon capture and storage
- Barriers
  - Cost of technologies
  - Awareness of breakthrough technologies
  - Uncertainty of energy saving

# Conclusion & way forward

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- As per the projection and potential,
  - 60 to 70% reduction in emission intensity is possible in deep decarbonization scenario
- Carbon neutrality – can be achieved through
  - Selecting a combination of technologies,
  - R&D for making the technology viable commercially
  - Carbon tax introduction
  - Schemes like PAT, CDM etc
- Futuristic technologies –
  - need to be demonstrated at the earliest – should be cost effective
- Industry leaders and best performers should come forward and demonstrate their commitments to the adoption of latest technologies
  - set examples for others to follow

Thank you!