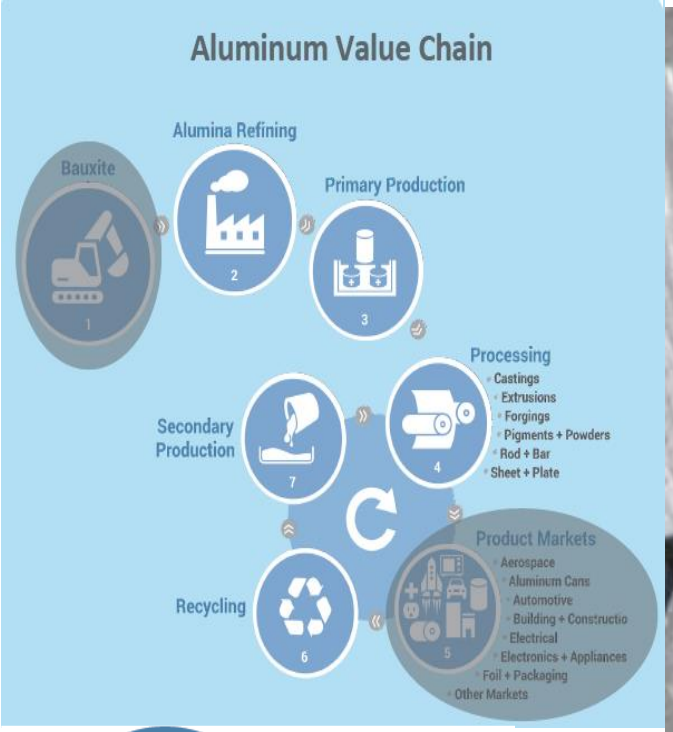
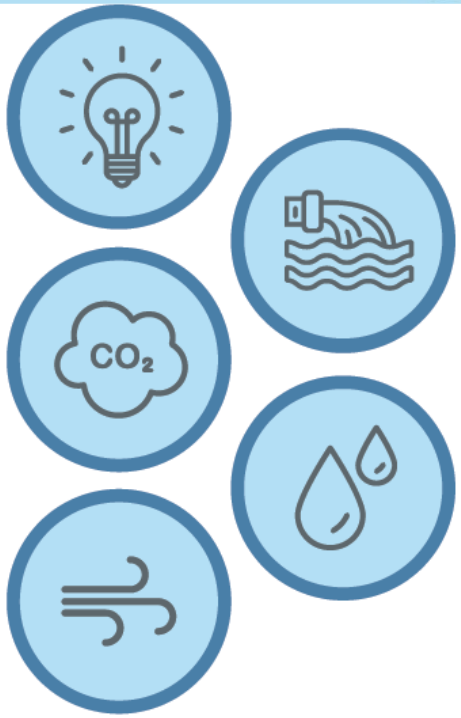


Aluminium
-A Sustainable Resource-



IBAAS Lecture Series 2022

29.04.2022

JNARDDC

Pillars of Sustainability

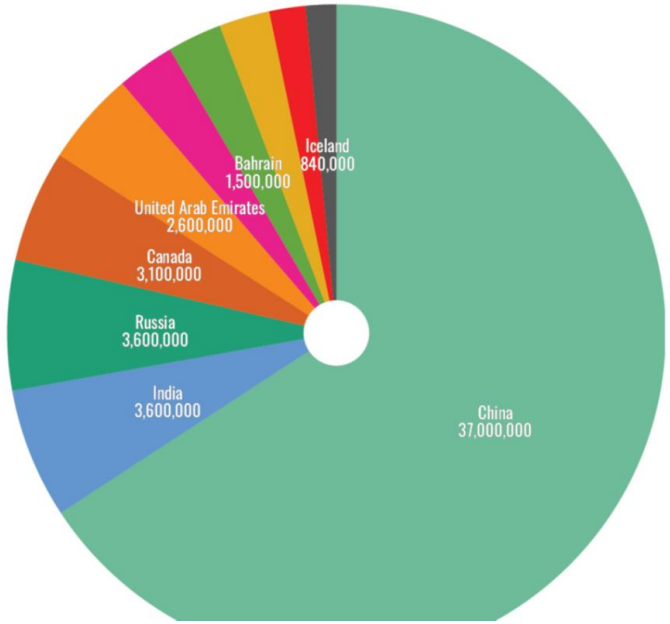
- **Environmental**
  - Circular Economy
  - Carbon Footprint
- **Economic**
  - Resource Efficiency
- **Social**
  - Stewardship
  - Commitment towards above two

Social + Economic Sustainability = Equitable
Social + Environmental Sustainability = Bearable
Economic + Environmental Sustainability = Viable


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

Aluminium : 8 SDGs with Highest Impact

World Aluminium Production, 86.2mT (2020)



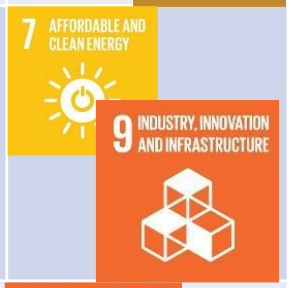
50%↑

Demand for aluminium is expected to grow by more than 50% by 2050

2%

Aluminium accounts for 2% of all human-caused greenhouse gas emissions each year

Connecting the Aluminium Sustainability with the SDGs

Pillars	KPIs	Pathway	Impact on SDG
Environment Sustainability			
Raw Material Sourcing	• Source raw materials from SEE perspective • Promoting traceability	• Criteria for sourcing • Improve sourcing & traceability standards	
Energy Consumption	• Reduce energy consumption by fixed %	• Energy saving within existing technologies • Development of innovative technologies across the whole value chain (alumina refining, smelting, semi-fabrication and recycling)	
Industrial Waste Management	• Reduce and recycle industrial waste • Minimise landfill of recyclable waste	• Waste assessment of value chain • Identifying the needs and treatment • Solutions for value-addition & minimising waste • Identify inter-industrial needs for waste consumption	
Greenhouse Gas Emissions	• The realisation of the greenhouse gas reduction potential 2050	• Stability of the energy network • Renewable energy sources • Low-carbon production technologies • Advanced smelting technologies	 

Circular Economy

- **The circular economy is a framework for systems solutions and transformation that tackles global challenges like climate change, biodiversity loss, waste, and pollution. It has three principles, all driven by design:**
- **Eliminate waste and pollution**
  - **Designing For Circularity**
  - **Eliminating Waste**
  - **Substituting Materials**
- **Circulate products and materials**
  - **Reusing products and components**
  - **Recirculating materials**
- **Regenerate nature**
  - **Regenerative production**

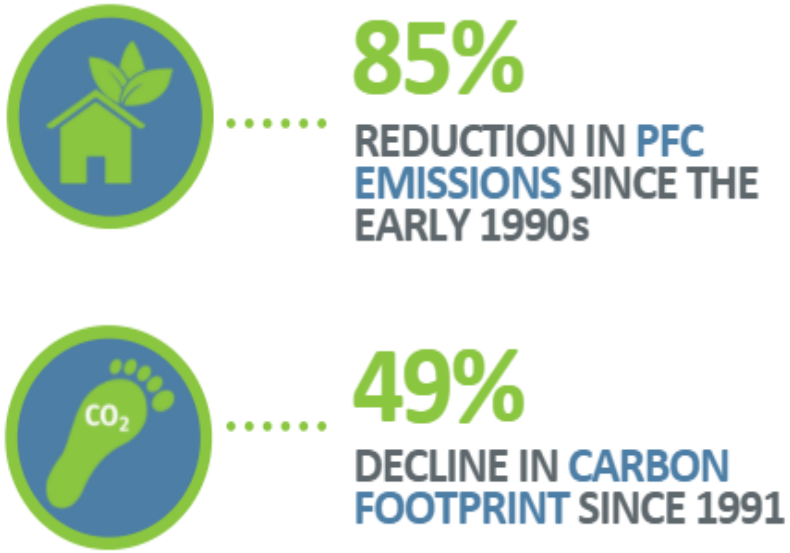
Eliminate waste and pollution

Circulate products and materials

Regenerate nature

Reducing Aluminium's Carbon Impact

- Aluminum production is more sustainable today than ever before
- Since the early 1990s, a significant decrease in
  - PFC emissions
  - Energy consumption
  - Carbon footprint
- Improvement due to voluntary efforts and technology improvements, including the expanded use of hydroelectric power sources for aluminium production, which has risen from 63% in 1995 to 75% today.
- And innovative technologies like carbon anode smelting promise to make future primary aluminium production even more sustainable — with zero direct greenhouse gas emissions.



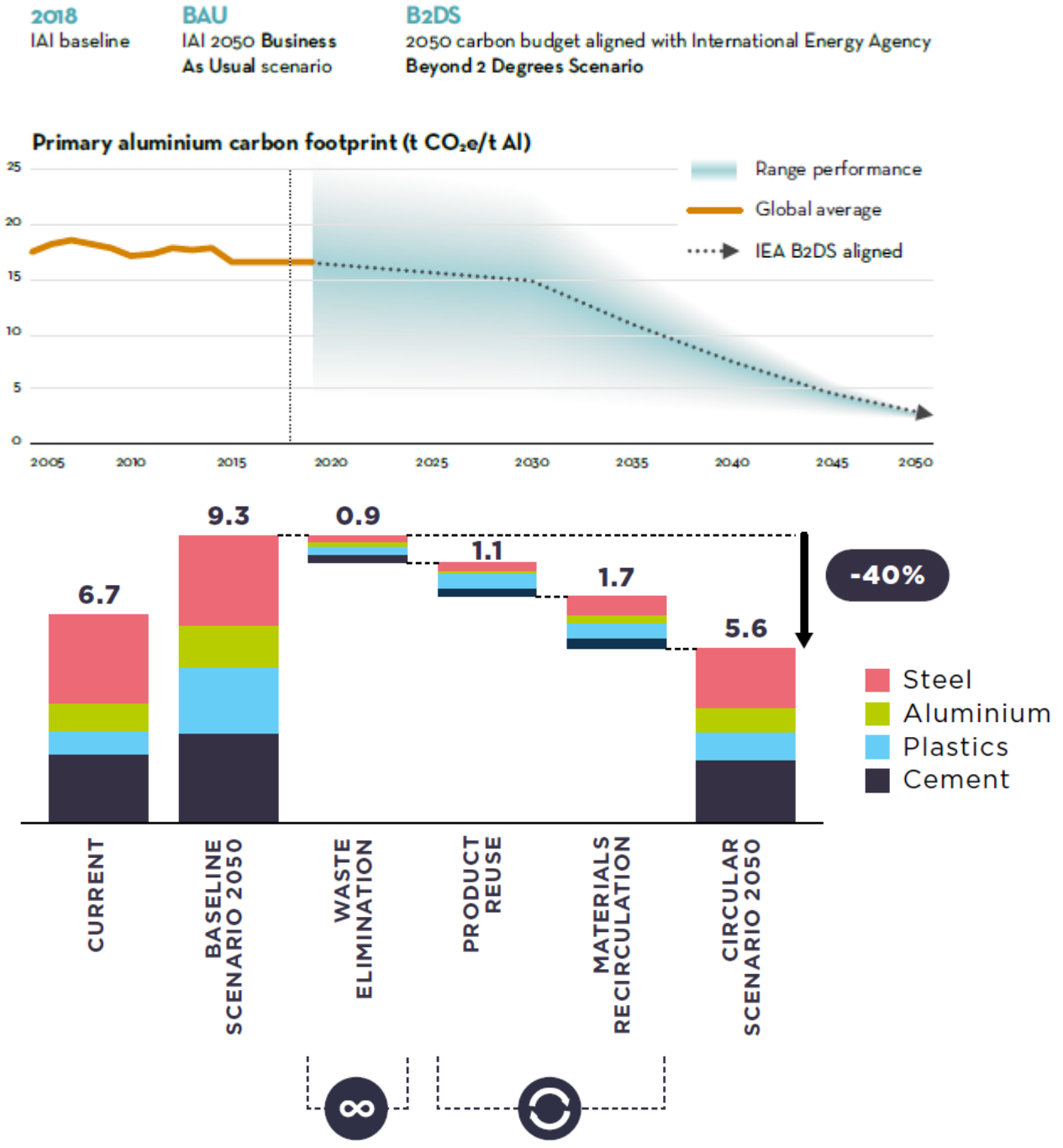
Aluminium Carbon Footprint Cut in Half Over 30 Years

Life cycle assessment (LCA) report found that since 1991, the carbon footprint of primary aluminium production declined by 49% while the footprint of recycled aluminium production dropped by 60%.

During the same time period, the energy needed to produce primary and recycled (or secondary) aluminium has dropped by 27 and 49%, respectively. Between 2010 and 2020 alone, the carbon footprint of aluminium production (primary and secondary) declined between 5 and 25%.

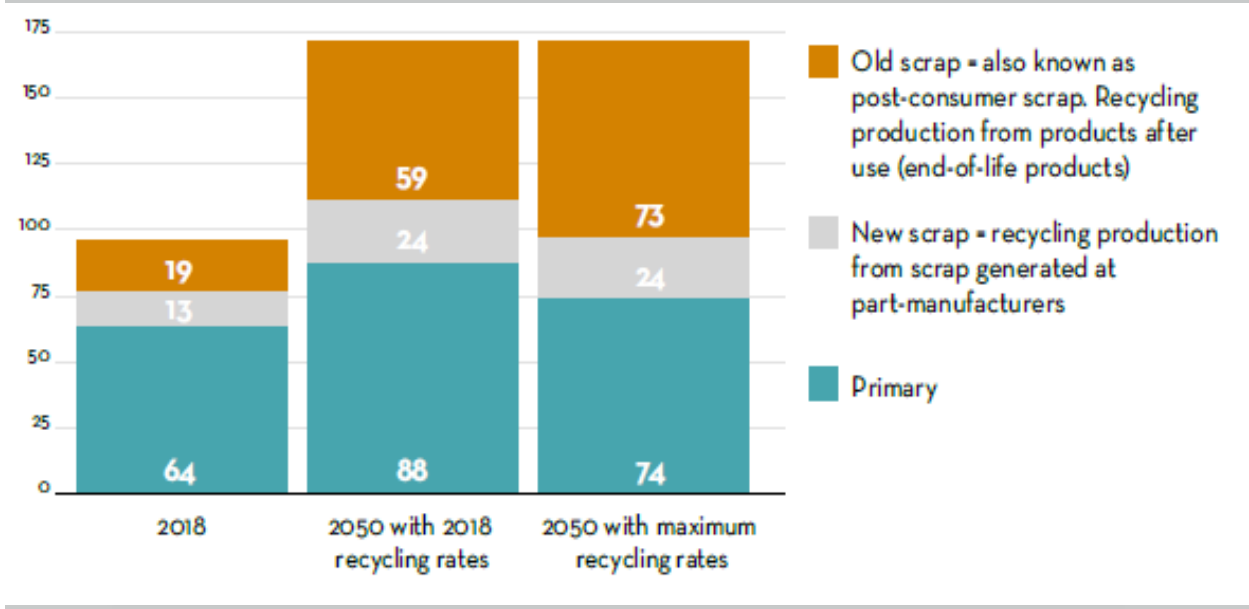
Global CO2 Emissions from four Key Materials Production (Billion tons CO2 per year)

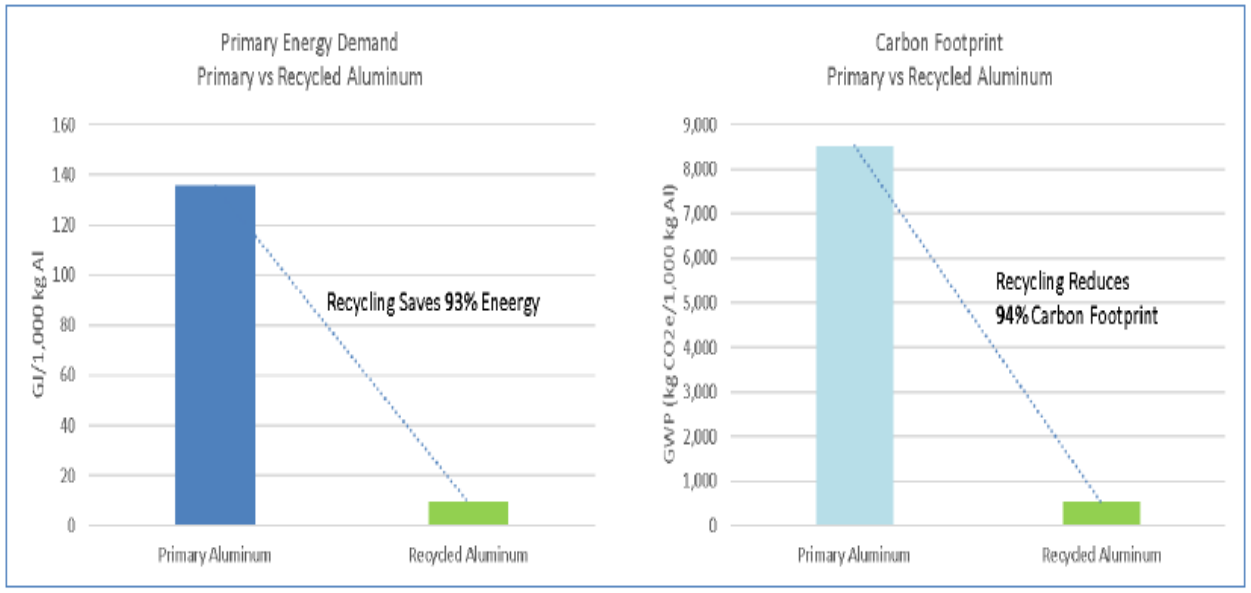
- The circular economy can reduce global CO^2e emissions from cement, steel, plastic, and aluminium production by 40% or 3.7 billion tonnes in 2050, thereby achieving almost half of their net-zero emissions target
- This opportunity comes from making better use of products and materials within key sectors such as built environment and mobility
- These solutions are cost-effective and offer system-wide benefits.



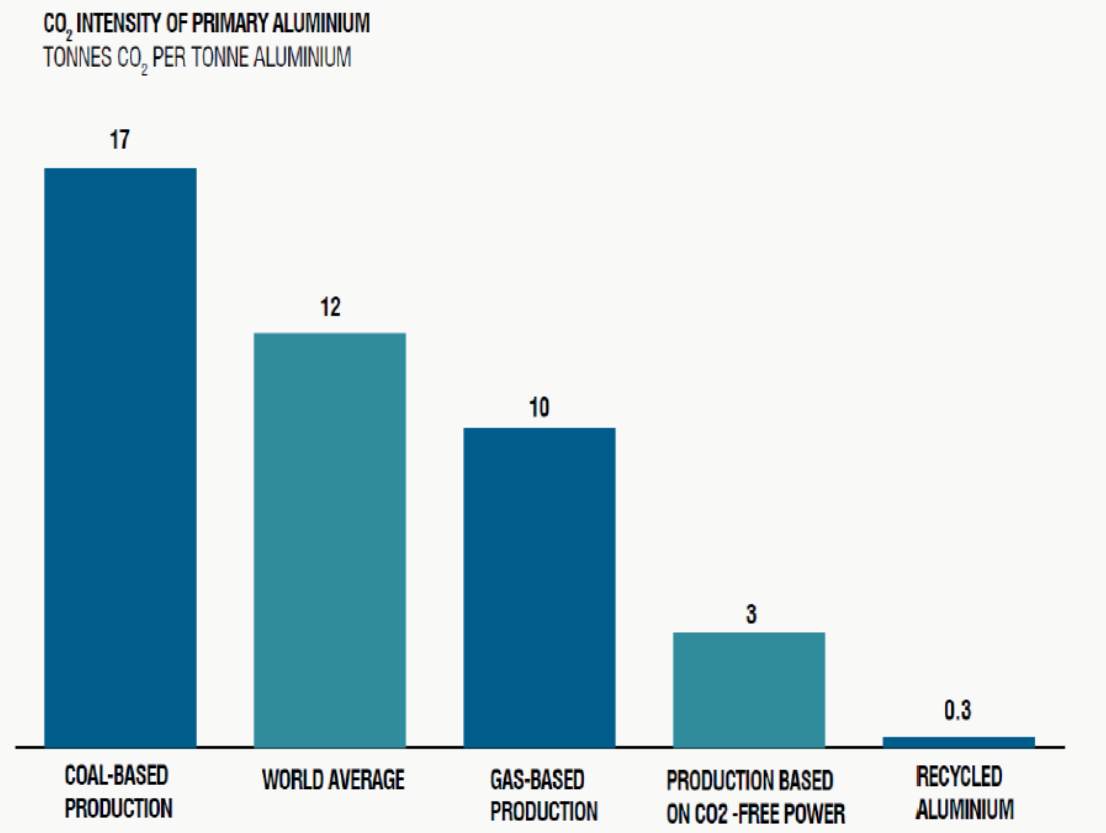
Increased Recycling Reduces Carbon Impact

- Higher Al recycling makes the industry more sustainable
- Recycled Al is 94% less carbon-intensive than primary
- Increasing the Al recycling rate by 1 % can reduce the overall product carbon footprint by 80 kg of CO2 equivalent per 1,000 kg of Al produced
- Al into landfills is a loss to the economy and the environment.
- The GoI is committed to increasing Al recycling rates and is working on multiple fronts to accomplish this goal, including advocating for new investment in recycling infrastructure and other policy changes to incentivize the increased collection and capture of used Al





Recycled Aluminium has the Lowest CO2 Intensity



18 t CO2/ t Al is more than 7 times the emissions associated with producing one tonne of primary steel.

Emissions can be reduced using low carbon sources

Remelting requires just 5% of the energy for production

Connecting the Aluminium Sustainability with the SDGs

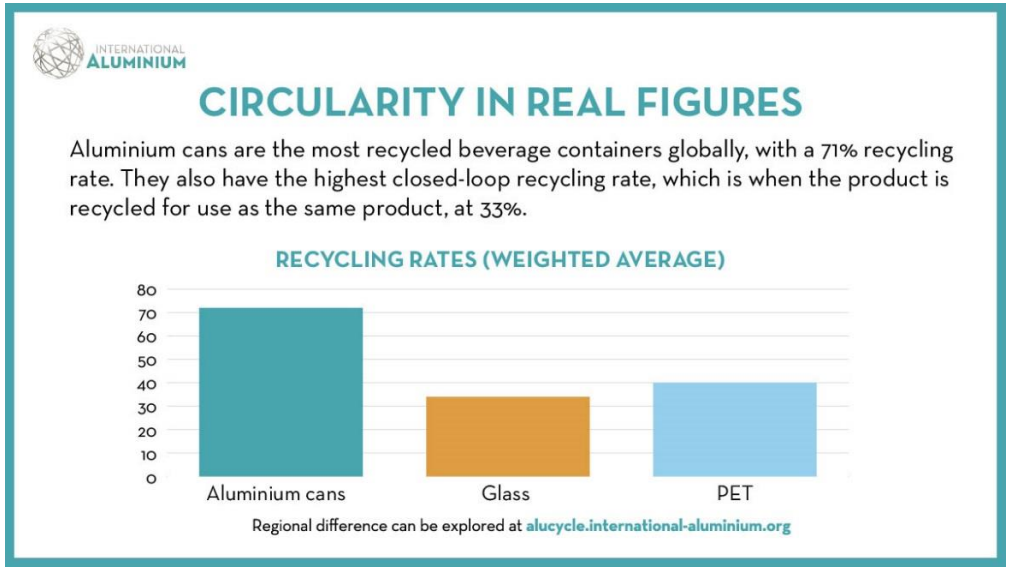
Pillars	KPIs	Pathway	Impact on SDG
			Direct
Economic Sustainability			
Products	• Enabling properties of Al • Promoting full lifecycle design • End of Life benefits • Circular economy • Phase-out landfilling of recyclable Al	• Aluminium Effect for all products and support the circular economy • Assess further applications for aluminium carefully, with a view to further expanding the scope of the product dimension (e.g. mobility beyond cars, packaging beyond beverage cans, etc.) • Partnerships across the value chain and create synergies with other sectors	

The Sustainable Material of Choice

- As people and industries around the world look for a sustainable future, Al is uniquely positioned as the material of choice.
- No matter the industry, innovators rely on Al for greener, more sustainable solutions.
- A highly durable metal, Al is 100% recyclable and can be recycled again and again without degrading its inherent value. Nearly 75% of all Al ever produced is still in use today.
- Aluminium's high strength-to-weight ratio makes it especially useful as a structural material, weighing up to 65% less than steel.
- The Al industry is working constantly to reduce its carbon impact. In fact, over the past 30 years, Al industry has cut its carbon footprint by more than half.
- Al products help significantly save energy and reduce greenhouse gas emissions from the automobiles we drive and the buildings we live in, to durable goods and the drinks we chill,.

Aluminium's Sustainability: Infinitely Recyclable. Uniquely Sustainable

- Lightweight and strong, durable and infinitely recyclable, energy-saving aluminium is the sustainable material of choice.
- As we strive for a more energy-efficient future, aluminium continues to provide innovative solutions and competitive advantages for businesses and consumers.
- Cars and trucks are more energy-efficient without any compromise on safety or performance.
- Beverage cans are lighter, easier to ship and infinitely recyclable.
- Durable, longer-lasting buildings with material that is easily recycled at the end of life.
- Supports a more circular and sustainable economy.



Uniquely Sustainable

For sustainable future, Al is uniquely positioned as the material of choice

Al Makes Good Products Great and Great Products Even Better

Infinitely recyclable Al is lightweight, durable and corrosion-resistant which helps innovators do more with less environmental impact.

49%

Emissions reduction potential to transport and cool Al beverage cans vs. glass bottles

75+ years

The potential service life of Al building & construction materials

20%

Total life cycle energy reduction of Al vehicles according to Oak Ridge National Laboratory study

Connecting the Aluminium Sustainability with the SDGs

Pillars	KPIs	Pathway	Impact on SDG
			Direct
Economic Sustainability			
Mobility	• Use the lightweight, crash-energy absorptive • Full recyclability of Al • Transition to low-carbon and safe mobility • Material of choice	• Al recycling in the automotive industry • Design for dismantling and recycling of Al parts to maximise the quantity and quality of recovered Al scrap • Facilitate fuel-efficient vehicles • Promote the use of Al in cars, trucks, buses, tramways, metros and railways • Reduce energy consumption and CO2 emissions in transportation • Improved vehicle efficiency standards • Awareness of the importance of the weight of vehicles	

Connecting the Aluminium Sustainability with the SDGs

Pillars	KPIs	Pathway	Impact on SDG
Economic Sustainability			
Construction	Use the high durability, design flexibility, lightweight and full recyclability of aluminium to position it as an essential component of energy efficient and sustainable buildings, in both residential and commercial sectors.	• Develop, implement and monitor the progress of aluminium recycling in the building industry • Design for the dismantling and recycling of Al products and maximising the quantity and quality of recovered aluminium scrap • Enhance buildings' energy efficiency, durability, comfort, safety and low maintenance requirements • Address the durability of Al products and its ability to cope with climate change • Optimise performance through using Al products • Add knowledge and expertise to standards and testing harmonisation processes	

JNARDDC's Role in Government of India's Program for SDG Agneda 2030 and Circular Economy

NITI Aayog

MINISTRY OF MINES

Zero waste management policy in line with zero discharge to encourage utilization of various wastes and improving sustainability in metal Sector, Steel Plants/producers	
Tentative timeline	3 months
Proposed actions	1. Collect existing waste management or utilization practices from relevant stakeholders (both primary & secondary producers of Al, Cu, Pb and Zn sectors) in the country 2. Benchmarking the existing domestic practices 3. Collect Best Available Technologies globally followed for complete utilization of wastes. 4. Stakeholders' consultation 5. Draft policy on “Zero Waste Management”
Progress/work done	• Existing practices relevant to their industry • Best available technology • Stakeholder’s meet regarding utilization/disposal waste • Draft Zero waste Policy” comprising of various utilisation options and responsibilities

DRAFT

Zero waste management policy to encourage utilization of various wastes and improving sustainability in Primary Aluminium Production

सत्यमेव जयते

Ministry of Mines

Contents

DRAFT

Zero waste management policy to encourage utilization of various wastes and improving sustainability in Primary Copper Production

सत्यमेव जयते

Ministry of Mines

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Zero waste management policy to encourage utilization of various wastes and improving sustainability in Primary Zinc Production

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Ministry of Mines

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DRAFT

Zero waste management policy to encourage utilization of various wastes and improving sustainability in Primary Lead Production

सत्यमेव जयते

Ministry of Mines

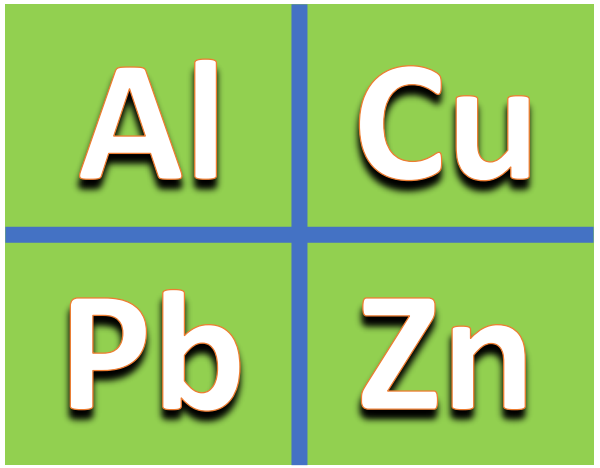
Contents

Developing of guidelines for environmentally sound management of Red mud: i. Mandating use of dry stacking of red mud in Alumina refinery ii. Mandating use of red mud in cement industry iii. Frame up of separate rules and guidelines under Hazardous and Other Waste Rules 2016 for utilization of red mud	
Tentative timeline	6 months
Proposed actions	1. Collect existing Red Mud management or utilization practices from Indian Alumina refineries 2. Benchmarking the existing practices 3. Collect Best Available Technologies globally followed for storage and utilization of red mud 4. Stakeholders' consultation 5. Draft rules and Guidelines
Progress/work done	• Communicated All Primary Aluminium refinery requesting to share their existing practices relevant to their industry • Best available technology • Stakeholder’s meet • Draft Guidelines

Guidelines by CPCB for mandating use of spent pot line in cement industry as an alternative fuel (Aluminium Smelter)	
Tentative timeline	6 months
Proposed actions	1. Collect existing SPL management or utilization practices from Indian Aluminium Smelters 2. Identify globally available Technologies for utilization of SPL in cement industry 3. Stakeholders' consultation 4. Draft Guidelines to support CPCB in mandating use of spent pot line in cement industry
Progress/work done	• Existing practices relevant to their industry • Best available technology • Stakeholder’s meet • Draft Guideline for mandary utilisation/dry stacking is under preparation

SOP and compliance to air pollution norms for recovery on Zn from EAF/IF dust of steel industry (Zinc Sector)	
Tentative timeline	6 months
Proposed actions	1. Collect existing SoPs and compliance status of air pollution norms for recovery on Zn from EAF/IF dust of steel industry (Zinc Sector) 2. Draft SOP for recovery of Zn from EAF/IF dust generated during steel recycling 3. Draft guidelines for pollution abatement measures and compliance to air pollution norms
Progress/work done	• Existing practices /compliance • Best available technology • Draft SoP and guidelines

Ministries to carry out scoping and have stakeholder consultation for EPR provisions for different wastes and scraps for effective utilization	
Tentative timeline	9 months
Proposed actions	1. Compilation of Al, Cu, Pb and Zn Products and their OEMs 2. Draft EPR provisions 3. Organize Stakeholder consultation for discussion on draft EPR provisions 4. final report on EPR provisions for different wastes and scraps for effective utilization
Progress/work done	1. AUTOMOBILE, food processing ,SPL are proposed in NITI Aayog report 2. EPR is also part of MRA activities 3. Accordingly, EPR related references are being collected 4. EPR on Spent Pot Lines



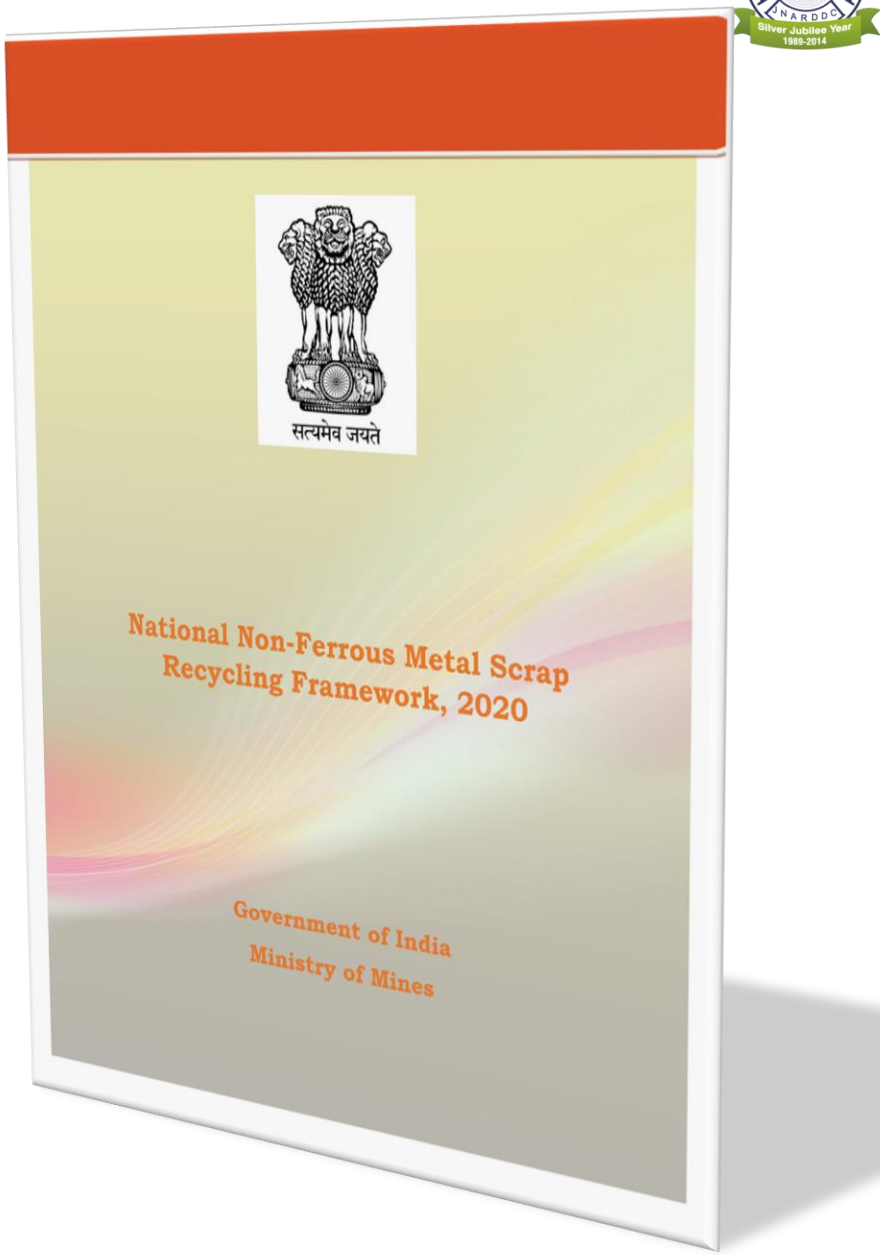
Metal Recycling Authority (JNARDDC)

Ministry of Mines, Govt of India

OBJECTIVEs

Promoting Organized Recycling Ecosystem
and work towards
Economic Wealth Creation, **Job Creation**
and **increased contribution to GDP** through
METAL RECYCLING

Shift towards a
CIRCULAR ECONOMY
in coming years



Metal Recycling Authority (JNARDDC)

VISION

Organise NF Metal recycling sector

Improve quality of recycled products

Visibility and support to the recycled industry

Envisioned Work of MRA

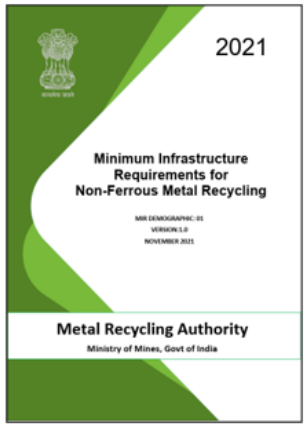
Framework envisages setting up of a **CENTRAL AUTHORITY** for **RECYCLING OF NON FERROUS METALS** which may be called as Metal Recycling Authority. The Authority will act as **FACILITATOR** to implement the Non-Ferrous Metal Scrap Recycling Framework.

Fallout of National Non ferrous metal scrap recycling framework

Some of the responsibilities

- To **standardize** the recycling practices
- To devise and maintain **databank of recycling value chain**
- **Inspection of the recycling units**
- **Technology**
- **Infrastructure** like Recycling zone etc.

Draft Standard Documents/Guidelines



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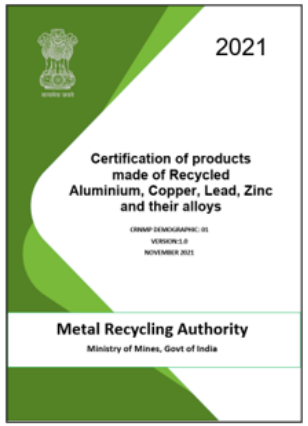
1. Scope
2. Normative References
3. Objective
4. Description
5. Target Demographic
6. Type of Standards Document:
7. Definitions and Acronyms
8. Details
9. Minimum infrastructure recommendations for recycling industry
10. Annex 01: Details of furnace for melting of Non Ferrous Metals



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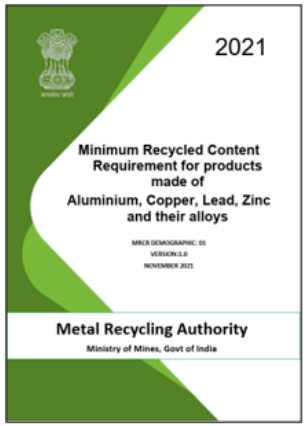
6. Type of Standards Document:
7. Definitions and Acronyms
8. Details
9. Certification process
10. Annex-01: List of Products for which certification will be required
11. Annex-02: Format of Application for product certification



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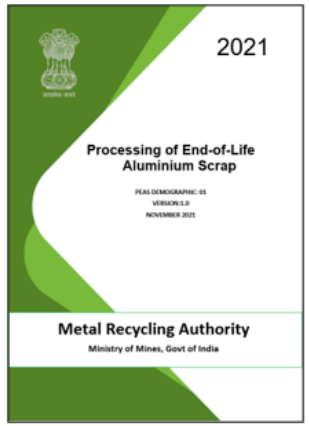
4. Description
5. Target demographic
6. Type of Standards Document
7. Definitions and Acronyms
8. Details
9. Certification Process
10. Annex – 01: Reporting of Recycled Content, Reportable Products & Reportable Recycled Products



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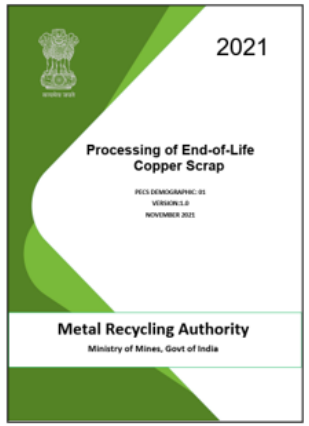
8. Details
9. Practices in Aluminium Recycling
10. Annex – 01: MRA's Star Rating Methodology



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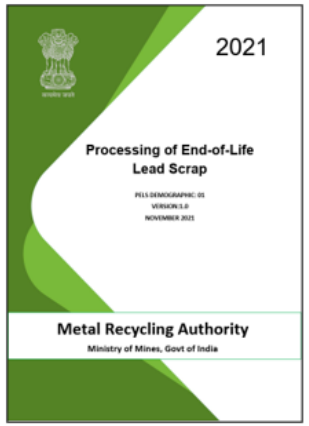
3. Objective
4. Description
5. Target Demographic
6. Type of Standards Document
7. Definitions and Acronyms
8. Details
9. Practices in Copper Recycling
10. Annex – 01: MRA's Star Rating Methodology



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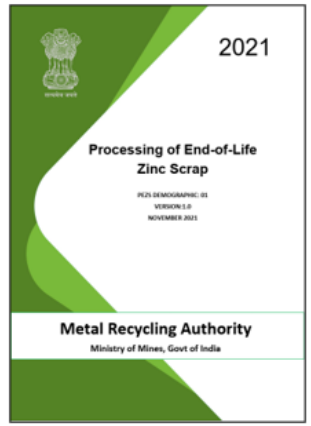
2. Normative References
3. Objective
4. Description
5. Target Demographic
6. Type of Standards Document
7. Definitions and Acronyms
8. Details
9. Practices in Lead Recycling
10. Annex – 01: MRA's Star Rating Methodology



Contents

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2. Normative References
3. Objective
4. Description
5. Target Demographic
6. Type of Standards Document
7. Definitions and Acronyms
8. Details
9. Practices in Zinc Recycling
10. Annex – 01: MRA's Star Rating Methodology

Aluminium Sector Pathway to sustainability

- Despite increased projected recycled metal supply, the IAI estimates that up to 90 million tons of primary aluminium will be required per annum in 2050.
- The IAI is exploring realistic and credible technological pathways for 2050 sector-wide greenhouse gas emissions reduction in line with IEA scenarios.
- Under a Beyond 2 Degree Scenario (B2DS), the industry would need to reduce its total emissions to 250 Mt CO2e, from a 1.1 Gt CO2e 2018 baseline and a projected 2050 Business As Usual scenario of 1.6 Gt CO2e.
- To achieve this, the IAI has identified three broad pathways for emissions reduction whilst meeting growing demand:
  - Electricity decarbonization
  - Direct emissions reduction
  - Recycling & resource efficiency
- All pathways will be a mix of technologies, including existing, new, under-development and yet-to be-developed solutions

2050 demand

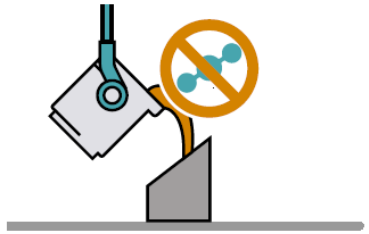
Total sector emissions need to be reduced by 80%, while demand for aluminium products grows by over 70%

Electricity

Decarbonisation of electricity offers the largest potential for aluminium sector GHG emissions reduction

Recycling

Improving post-consumer scrap recycling requires action from players all along the aluminium value chain



Process emissions

Novel technologies for heat and steam, and zero carbon smelting are required

The Next Generation of Primary Aluminum

- Revolutionary technology eliminates virtually all direct greenhouse gas emissions from the production of new aluminium
- Instead of CO2, the newly devised “inert anode” system emits oxygen during the smelting process. (The electric energy that runs through an anode is what enables aluminium smelting).
- This game-changing innovation has the potential to make aluminium – already one of the most sustainable materials on the market today – even greener.
- Already, primary aluminium production in Wolrd is cleaner today than it has ever been.
- Since 1991, the carbon impact of primary aluminium production in the world has declined by nearly half thanks to voluntary efforts by the industry to reduce emissions, technology control improvements and increased regional reliance on renewable hydropower as an energy source.

Thank You

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Ministry of Mines
Government of India

25 Years of Commendable Service to the Aluminium Industry
JNARDDC
Silver Jubilee Year
1989-2014