What do successful transitions to net zero emissions look like in Industry?

Australian Climate Roundtable
10 November 2020

Shape of ACR Workshop Series 2

Workshop 1	Workshop 2	Workshop 3	Workshop 4	Workshop 5
What do successful transitions to net zero emissions look like?	Successful transitions in the electricity sector	Successful transitions in industry	Successful transitions in the agricultural sector	Social and regional impacts of the transition to net zero
3/8/2020	10/9/2020	10/11/2020	Q1 2021	Q1 2021

Topics

Time	Topic
4:00 pm	Start
4:05 pm	Welcome, Overview and Purpose
4:10 pm	Toward low carbon concrete: Findings from the development of Australia's first ready-mix concrete Environmental Product Declaration *Evan Smith – Environment Manager and Sustainability Lead at Holcim Australia* Concrete – the World's most widely used material – targets carbon neutral future *Ir. Claude Loréa – Cement Director, Global Cement and Concrete Association (GCCA)*
4:30 pm	Discussion/Q&A
4:40 pm	Aluminium transition: global perspective from an electricity-intensive industry *Miles Prosser, Secretary-General of the International Aluminium Institute*
5:00 pm	Discussion/Q&A
5:10 pm	Facilitated discussion: Implications for the Australian Climate Roundtable
5:30 pm	Close

Overview and Purpose

Toward low carbon concrete:

Findings from the development of
Australia's first ready-mix concrete EPD

Holcim

The case
for low carbon concrete

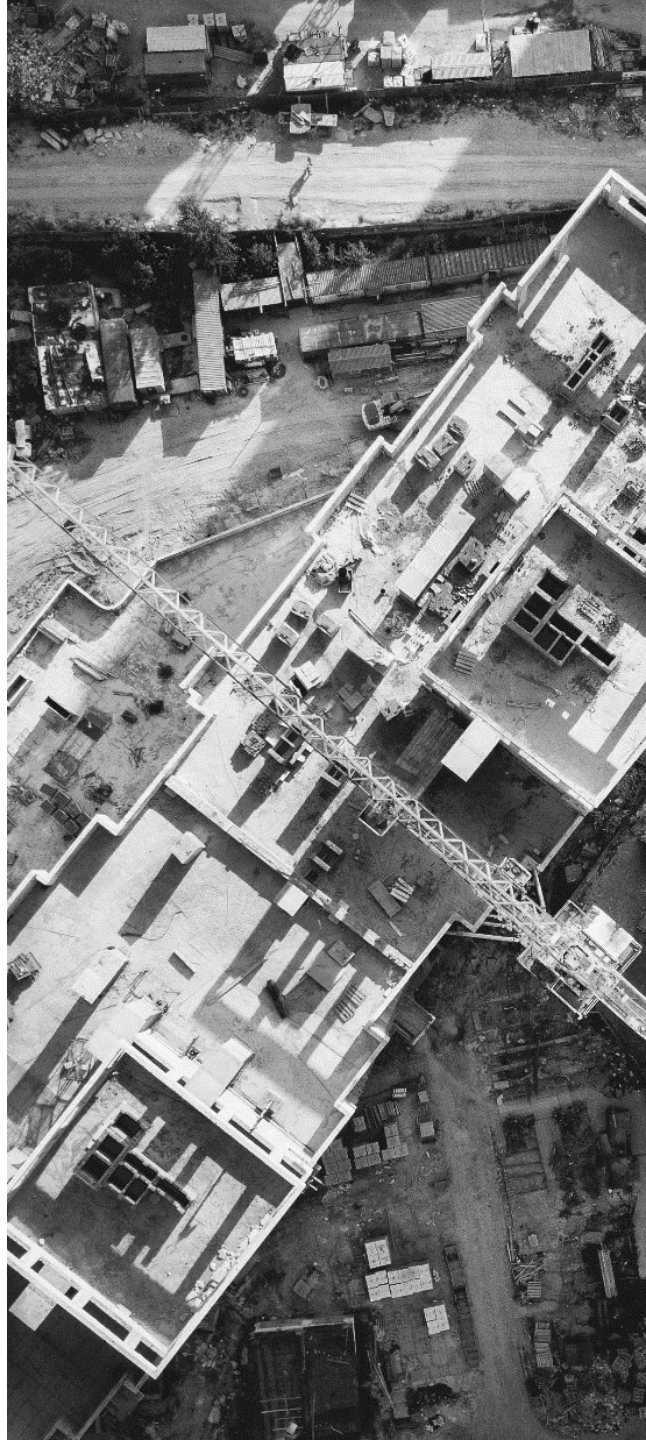
Materials: a major contributor to carbon footprint

Currently, buildings account for 39% of energy-related global CO2 emissions

From the energy used to produce building and construction materials, usually referred to as **embodied carbon**

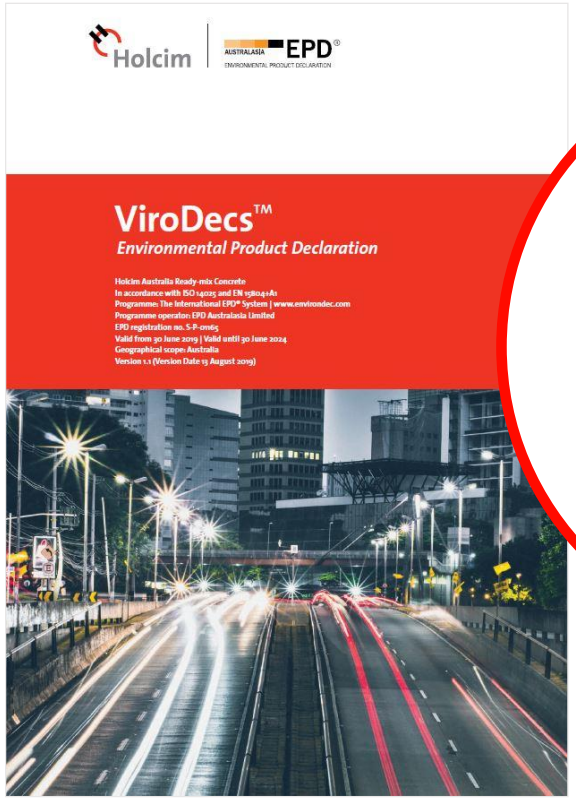
Low-carbon concrete =
A key variable in the decarbonisation of the property and infrastructure sectors in Australia

Impacts of materials
occur before it arrives at construction site



ViroDecs™ provides real data for the first time in Australia

Published August 2019



Holcim ViroDecs™

The first range of Environmental Product Declarations (EPDs) for ready-mix Concrete sold in the Australian market

Concrete

The missing link in environmental data – for the first time in Australia actual verified data is available for ready-mix concrete mixes

ISO and EN Standards

Third party verified

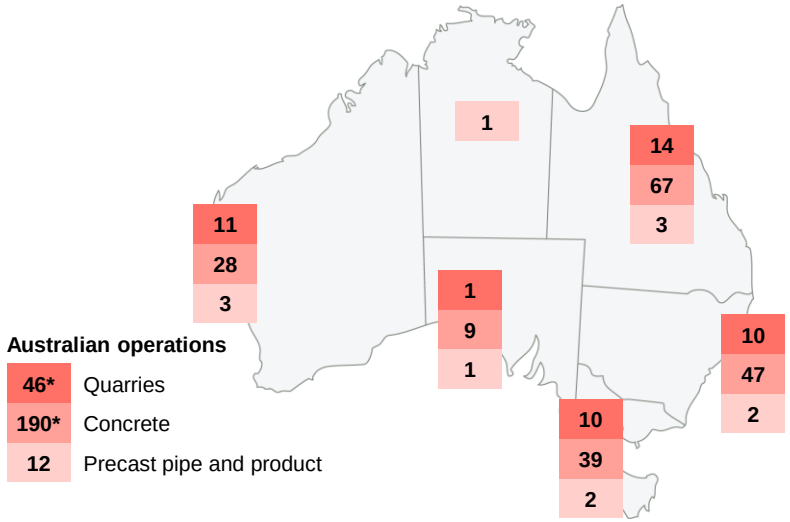
Industry Rating

Gain more points under IS and Greenstar

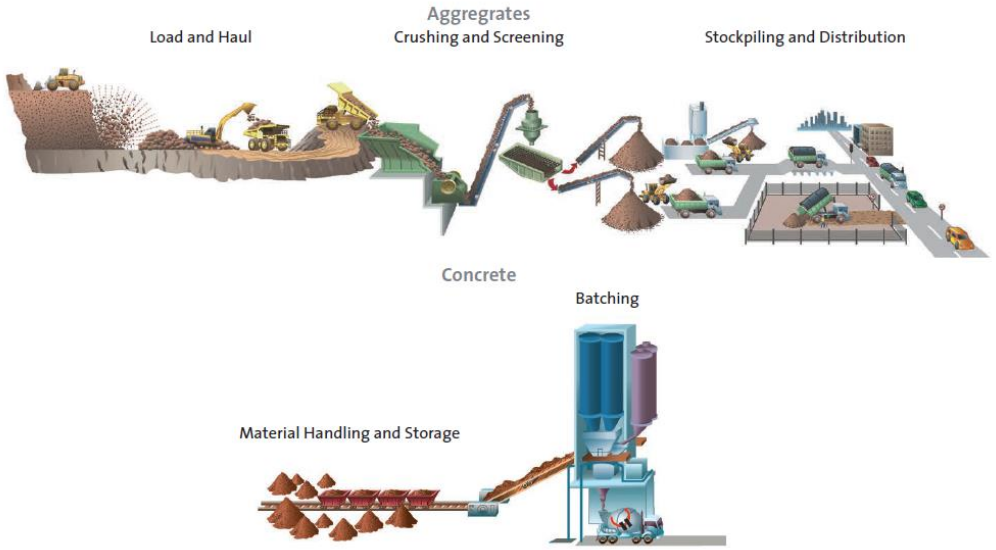
What does the ViroDecs™ EPD cover ?

Australia Wide
Data collected from across
Holcim's Australian concrete operations

190 concrete batching plant sites, includes tolling sites and excludes mobile or temporary sites, and 46 aggregate sites



Lifecycle assessment completed for A1 – A3



What products are included

The following table provides a snapshot of the Holcim normal-class concrete mixes included in this EPD

	ViroDecs™ General Blend (G)					ViroDecs™ Fly Ash Blend (F)					ViroDecs™ Slag Blend (B)					ViroDecs™ Triple Blend (T)				
MPa	20	25	32	40	50	20	25	32	40	50	20	25	32	40	50	20	25	32	40	50
NSW ACT	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
QLD	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓
VIC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						✓	✓	✓	✓	✓
SA	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓					
WA	✓	✓	✓	✓							✓	✓	✓	✓	✓					

ViroDecs™ Special-class (S)

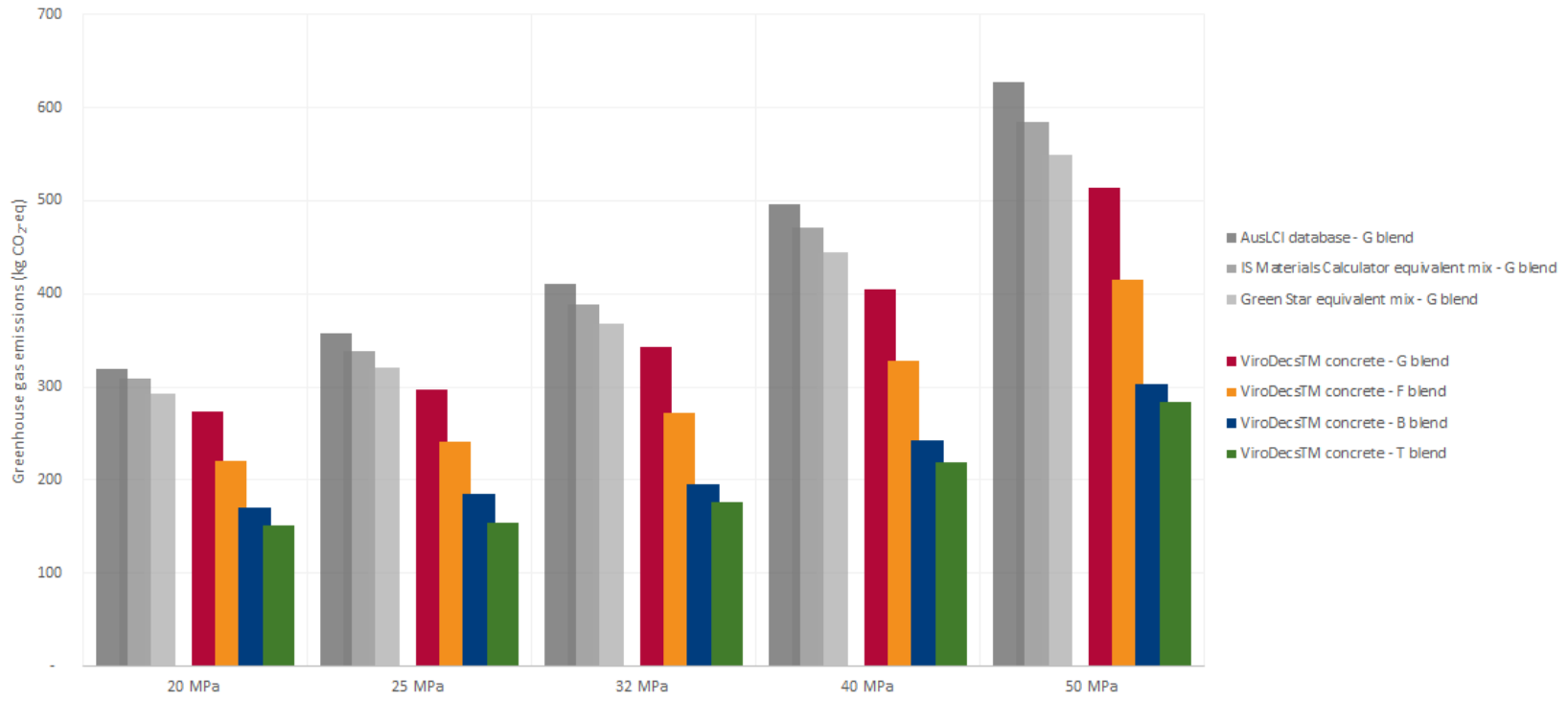
Select special mixes were modelled for three high-profile infrastructure project

- WestConnex M4 East (NSW)
- Stage 1B Basement Barangaroo South (NSW)
- Metro Tunnel Project (VIC)

What we found

NSW/ACT compared to Industry benchmarks

ViroDecs™ Triple blend concrete CO_2 impacts are **up to 57% lower** than the Australian average (no cement substitution)[1]



NSW/ACT: 1 m3 of ViroDecsTM normal-class ready-mix concrete - Cradle to gate GHG emissions (kg CO2-eq)

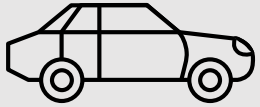
1 Australian National Life Cycle Inventory Database - AusLCI

Case study

Not all concretes are the same

For a 100,000m^3 building project the difference between using **ViroDecs™ Triple Blend** in comparison to the Australian average[1] could be as much as **34,000 tonnes of CO_2e**

This is the same as:



6,327

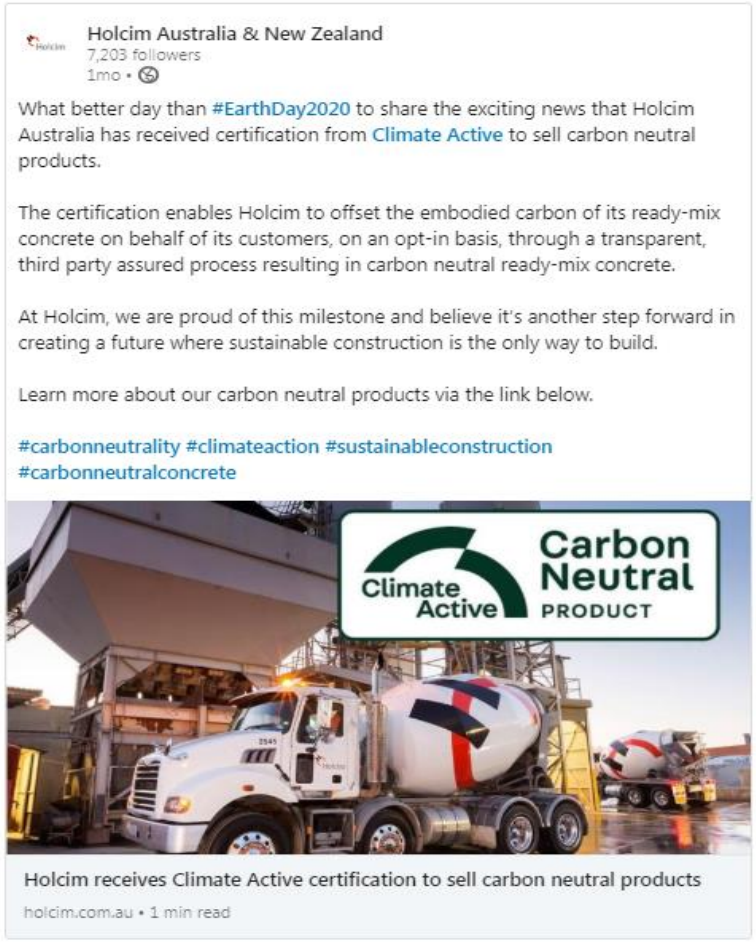
Taking 6,327 average Australian cars off the road for a year[2]

4,857

Powering 4,857 Australian homes with renewable energy sources for a year[3]

ViroDecs™ Zero - Ready-mix Concrete

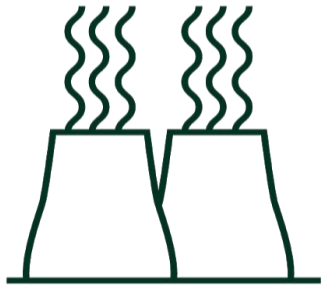
Certified Carbon Neutral Concrete



- Holcim gained certification with Australian Government's National Carbon Offset Standard ‘Climate Active’ in March
- A transparent, third party assured process resulting in certified carbon neutral ready-mix concrete
- Holcim able to offset the embodied carbon for the entire ViroDecs range of ready-mix concrete on behalf of its customers on an opt-in basis
- Carbon neutral offset in accordance with ‘Climate Actives’ standards for eligible verified carbon offset projects
- An Australian first for ready-mix concrete

ViroDecs™ Zero - Ready-mix Concrete

What does carbon neutral concrete mean?



Emissions

Reduce emissions

Remaining emissions

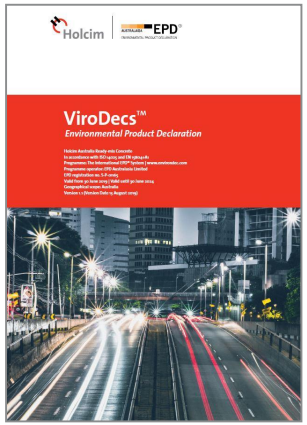
+

Offset projects to eliminate remaining emissions

=

0

Zero emissions (The state of being carbon neutral)



+

Eligible Verified Carbon Offset Projects

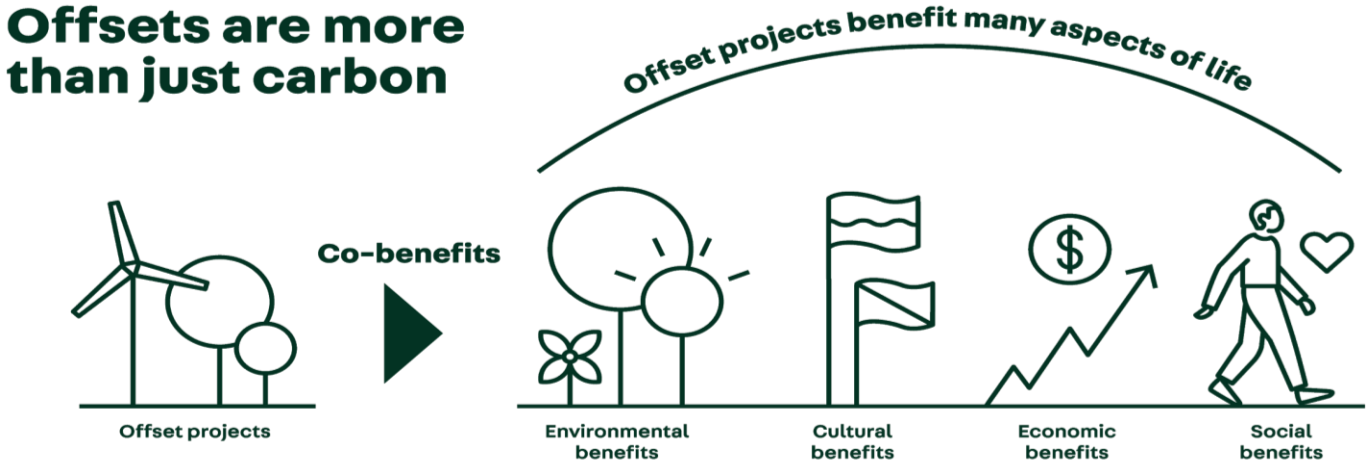
=

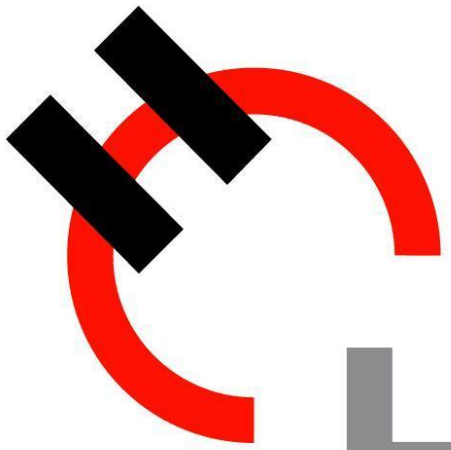
ViroDecs™ Zero - Ready-mix Concrete

Benefits

- Opportunity to be industry leader - An Australian first
- Opportunity to target additional Green Star or Infrastructure Sustainability Points
- Aligning with organisation decarbonisation strategies and targets (such as the Science Based Targets initiative)
- Alignment with the Green Building Council of Australia's and Infrastructure Sustainability Council of Australia's Roadmaps
- Additional co-benefits

Climate Active Carbon Neutral PRODUCT





Holcim

Global Cement and Concrete Association

Concrete - the world's most widely used material - targets carbon neutral future

Sydney, 10 November 2020

Claude Lorea, GCCA Cement Director


Global Cement and Concrete Association
GCCA Climate Ambition
Towards carbon neutral concrete
CARBONEUTRAL

Our member companies and affiliates operate in almost every country of the world

Member Companies

- Asia Cement Corporation
- Breedon
- Buzzi Unicem S.p.A.
- Cementir Holding
- Cementos Argos
- Cementos Molins
- Cementos Pacasmayo
- Cementos Progreso S.A.
- CEMEX
- Ciments De L'Atlas (CIMAT)
- CIMPOR
- Çimsa Çimento
- CNBM
- Corporacion Moctezuma S.A.B. DE C.V.
- CRH
- Dalmia Cement
- Dangote
- Eurocement
- Grupo Cementos de Chihuahua SAB de CV (GCC)
- HeidelbergCement
- JSW Cement
- LafargeHolcim
- Medcem Madencilik
- Nesher Israel Cement Enterprises Ltd
- Orient Cement Ltd
- SCG Cement
- Schwenk Zement KG
- Secil S.A.
- Shree Cement Ltd
- Siam City Cement Ltd
- Taiheiyo Cement
- Taiwan Cement Corporation
- Titan Cement
- UltraTech Cement Ltd
- Unión Andina de Cementos S.A.A (UNACEM)
- Vassiliko Cement Works Public Company Ltd
- Vicat
- Votorantim Cimentos
- West China Cement
- YTL Cement

gcca Global Cement and Concrete Association

Affiliates

- Cámara Nacional del Cemento – Mexico
- CEMBUREAU – the European Cement Association
- Cement Association of Canada
- Cement Concrete & Aggregates – Australia
- Cement Industry Federation – Australia
- Cement Manufacturers Association of India
- CMI – Ireland
- European Concrete Platform
- European Ready Mixed Concrete Organisation (ERMCO)
- Federación Iboamericana del Hormignon Premezclado (FIHP) – Latin America and the Iberian Peninsula
- Federación Interamericana del Cemento (FICEM) – Latin-American Region
- Japan Cement Association
- Korea Cement Association
- Mineral Products Association – United Kingdom
- National Ready Mixed Concrete Association – USA
- Portland Cement Association – USA
- SNIC/ABCP – Brazil
- Spanish Cement Association (Oficemen)
- Union of Cement Producers – Soyuzcement – Russia
- VDZ – Germany

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GCCA members commit to continue to drive down the CO_2 footprint of their operations and products, and aspire to deliver society with carbon neutral concrete by 2050. GCCA will work across the built environment value chain to deliver this aspiration in a circular economy, whole life context.

September 2020 GCCA Climate Ambition Statement

1. Concrete's essential role in the modern world

Population growth and increasing urbanisation will drive a growing global requirement for critical infrastructure over coming decades.

- This includes the need for crucial amenities such as clean water and sanitation.
- It is also anticipated that there will be a significant increase of built floor space, including the provision of safe dwellings.
- At the same time there is a growing need for resilient construction to protect our cities and natural environment from a changing climate.

Concrete is vital to meeting these challenges and for providing sustainable development.

The sustainability value of concrete

Concrete is the world's leading sustainable building material and well known for its outstanding durability.

- It has inherent safety qualities that make it fire, weather and flood resilient.
- It provides thermal mass in buildings and rigidity in road construction, both of which reduce demand for energy.
- Concrete has essential qualities that enable other sectors, such as the renewable energy industry, to meet their climate targets through the delivery of key infrastructure.
- Additionally, it is a highly versatile building material with infinite mixes and shapes which enables designers and constructors to utilise these qualities in the most material efficient manner.
- It can be reused and at end of life can be fully recycled.

Selection of performance benefits of concrete

Durability

Heating

Passive Cooling

Carbon Uptake

Concrete Roads

Circular Economy

Disaster Resilience

Fire Resistant

More benefits and full details can be found on our website

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2. How can carbon neutral concrete be achieved?

Producing cement – the magic binding ingredient in concrete – is a CO_2 intensive process.

Process emissions account for 60% of total CO_2 emissions.

Energy emissions account for the remaining 40%

- Direct emission from the combustion of fuels required to generate the necessary heat.
- Indirect emissions from electricity generation.

We believe it is possible to reach our aspiration because our industry has already made important progress in reducing these emissions. Since 1990 we have achieved an 19.2% reduction in CO_2 emissions per tonne of cementitious material
and delivered more than a nine-fold increase
in alternative fuel use replacing conventional fossil fuels.

19.2% ↓

reduction in CO_2 emissions per tonne of cementitious material since 1990

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2. How can carbon neutral concrete be achieved?

We believe in the coming decades, we can provide society with carbon neutral concrete. We are already working to achieve this and recognise the need to accelerate our actions today.

In the coming years we can achieve carbon neutral concrete by:

- Eliminating our direct energy-related emissions and maximising the co-processing of waste from other industries, which substitutes the use of fossil fuels involved in cement manufacture.

- Reducing and eliminating indirect energy emissions through renewable electricity sources where available.

- Reducing process emissions through new technologies and deployment of carbon capture at scale.

- Reducing the content of both clinker in cement and cement in concrete, as well as more efficient use of concrete in buildings and infrastructure.

- Reprocessing concrete from construction and demolition waste to produce recycled aggregates to be used in concrete manufacturing.

- Quantifying and enhancing the level of CO_2 uptake of concrete through recarbonation and enhanced recarbonation in a circular economy, whole life context.

3. Working in Partnership

The GCCA provides a platform for accelerating alignment and action for the industry to meet the opportunity of achieving carbon neutral concrete.

GCCA and its member companies are aware of our responsibility to further enhance and accelerate the progress we have made.

However, whilst we have a vision and an aspiration to deliver carbon neutral concrete to society by 2050, we recognise that we do not have all the answers, nor can we achieve it on our own.

The policy settings and levers need to be correct.

Significant work and investment are required across the construction value chain to promote innovation in new products, processes and technologies.

4. 2050 concrete in the low carbon built environment roadmap

Our Roadmap will:

- Set out the actions we have to take now, and in the future, with measurable milestones, to reach the desired destination.
- Building on existing comprehensive technology roadmaps produced for the cement sector, our roadmap will set out a clear pathway for concrete.
- Take a circular economy approach by taking into account for example: emissions reduction in cement and concrete production, savings delivered by concrete during its lifetime, reduced demand through promoting design, material and construction efficiencies and improved standards, reuse of whole concrete structures, design for disassembly and reuse of elements, and accounting for the CO_2 savings at the end of life including concrete recycling and enhanced recarbonation.
- Be the essential reference document for the sector, used by third parties, companies, partners, affiliates and the GCCA in signposting our pathway to delivering society with carbon neutral concrete by 2050 in order to meet the global climate challenge.

GCCA driving industry sustainability

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Our industry's commitment and action

The GCCA has a range of commitments and activities that are driving towards a more sustainable future for our industry – full details can be found on the GCCA website, but in summary they include:

- Measuring and reporting on CO_2 emissions in our industry.
- Providing a comprehensive data set which allows performance benchmarking for comparison and improvement by participating companies and for communication with stakeholders.
- Supporting our members to improve performance with guidance for good practices and reporting.
- Promoting knowledge sharing across the industry.
- Fostering innovation through our newly launched Innovandi – Global Cement and Concrete Research Network and exploring opportunities to support open innovation in the sector.

INNOVANDI

Global Cement and Concrete Research Network

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Global Cement and Concrete Research Network

GCCA Global Cement and Concrete Association

GCCA's policy framework for action on cement and concrete

This includes measures which:

- Promote investment in state-of-the-art technology for new and retrofit plants.
- Facilitate increased use of waste and by-products as alternative fuels and raw materials; enable governments and industry to work together to implement circular economy strategies and promote waste avoidance, collection and sorting, pre-treatment, recovery, recycling and co-processing.
- Support the research and development of breakthrough technologies as well as the acceleration and scaling-up of proven efficient low carbon technologies, with a particular focus on CCUS and new and alternative binders. Policies should help mitigate the risk through investment mechanisms.
- Promote cooperation between government and industry to develop CO_2 transport and storage infrastructure.
- Drive the demand for sustainable building materials by helping to stimulate market demand for innovative products by construction contractors and customers.
- Support life-cycle assessment-based methodologies, tools and databases to enable a whole-life based approach to procurement. Appropriate sustainability assessment methods using life cycle analysis are to be preferred in public and private tendering.
- Recognise at national level the uptake of CO_2 by existing concrete in the built environment.
- Energy performance of buildings calculation methods should be sophisticated enough to take account of thermal mass.
- Electricity systems should facilitate demand response, i.e. interaction between the grid and households, where the consumer enjoys a share of the cost savings.
- Enable revision of building codes and regulations to facilitate the adoption of innovations without jeopardising safety and durability and recognising the increased need for resilience in the built environment.
- Establish the means of recognising that the resilience of the built environment can contribute to favourable social and economic benefits for society.
- Establish the means of recognising that concrete can contribute to favourable emission benefits in other sectors of the economy.
- Access to recycled concrete for utilisation for recarbonation.

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Overview on technologies to meet the challenge

Across the life cycle and value chain of cement manufacturing and concrete production there are many technologies that can support significant advances in emissions reduction.

Some of these are well-known today and simply require scaling-up. Others require further research and development to move them from concept to reality.

Low CO_2 clinker production

Less clinker into cement, less cement into concrete

Mineral Carbonation

Reuse and Recycling

CO_2 capture

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Concrete's contribution to emissions reduction in other sectors

Concrete's benefits in buildings and structures include its versatility, strength and durability, as well as fire safety and resilience. Concrete as a construction material also has unique properties which mean it enables CO_2 emission savings during its use.

- By 2050, our energy system should be fully decarbonised. Renewable energy infrastructure simply will not be possible without concrete.
- Zero-energy buildings will also be possible thanks to concrete. Concrete has the ability to absorb and later release thermal energy, due to its density and heat capacity (thermal mass).
- Concrete buildings will play an important new role in decarbonising energy systems. With fluctuating renewable energy sources, there is an ever increasing need to manage demand for energy through storage options.
- Concrete also has a role to play in reducing CO_2 emissions from transport. Smart, low-carbon cities of the future, including intelligent urban planning, densification, optimised use of over ground and underground space, and public transport networks, will all have concrete at their core.

Global Cement and Concrete Association

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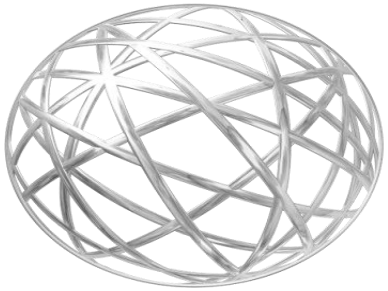
Discussion/Q&A

Aluminium transition: global perspective from an electricity-intensive industry

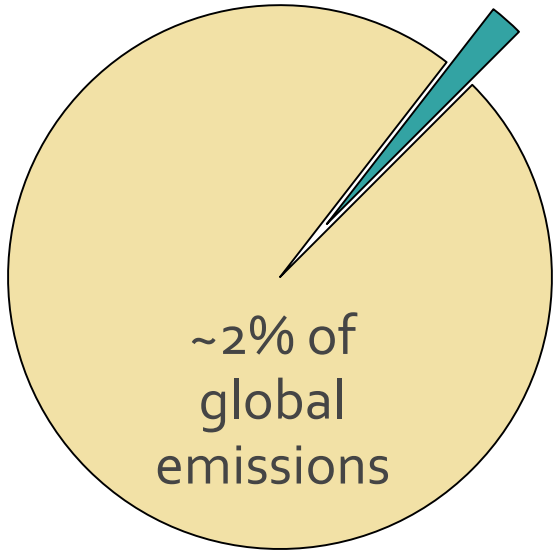
November 2020



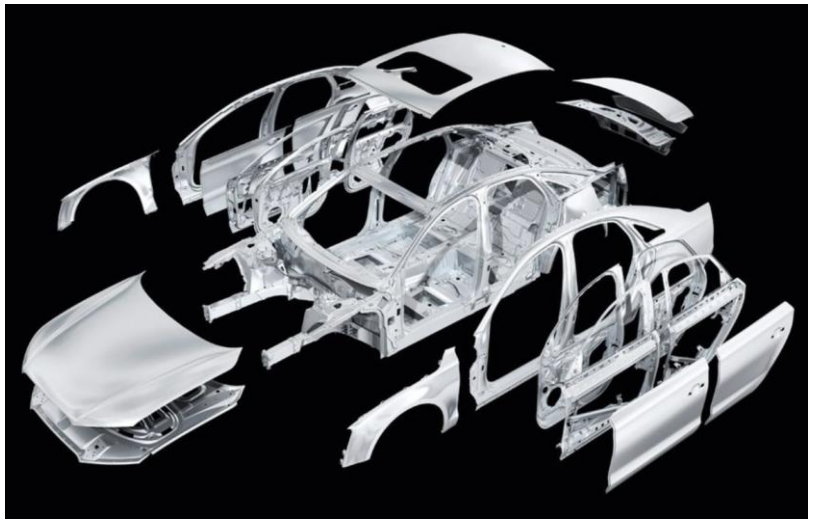
WORLD ALUMINIUM

WORLD ALUMINIUM

Aluminium and GHG Emissions



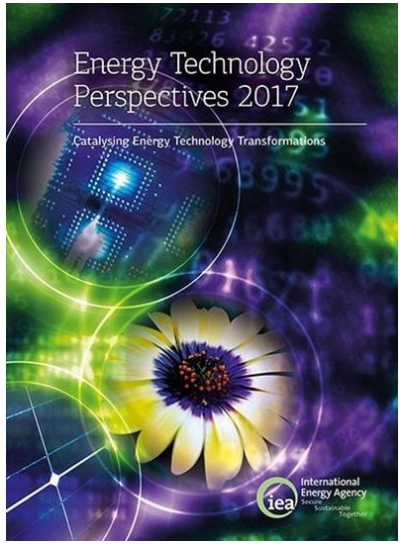
Global context

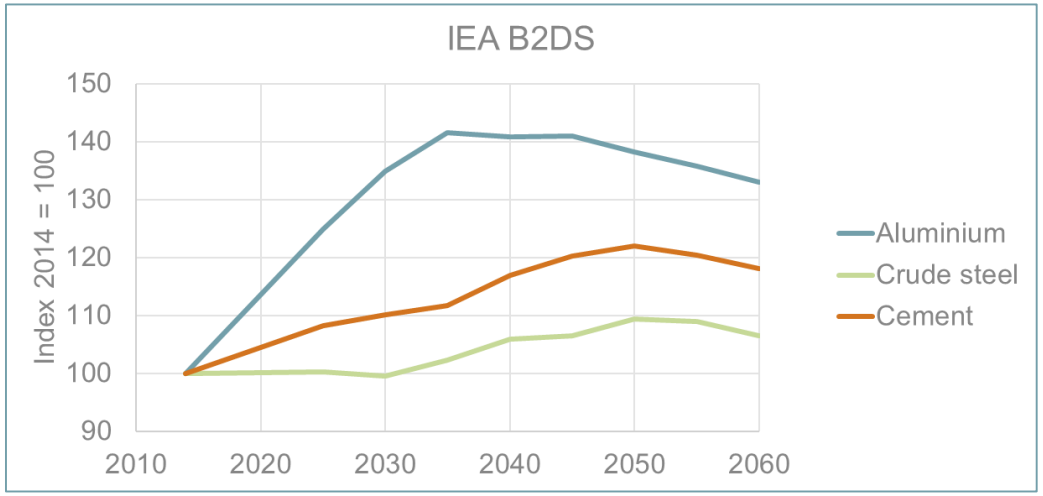


Benefits in-use

Sustainability

Aluminium demand growth





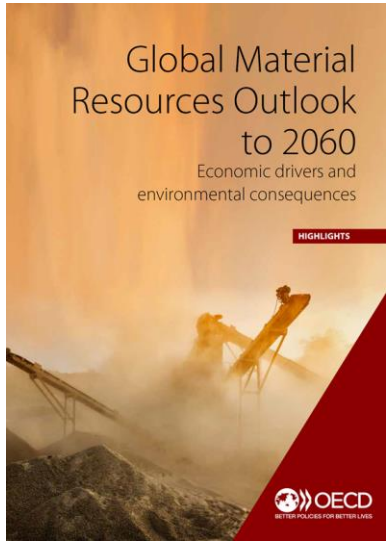
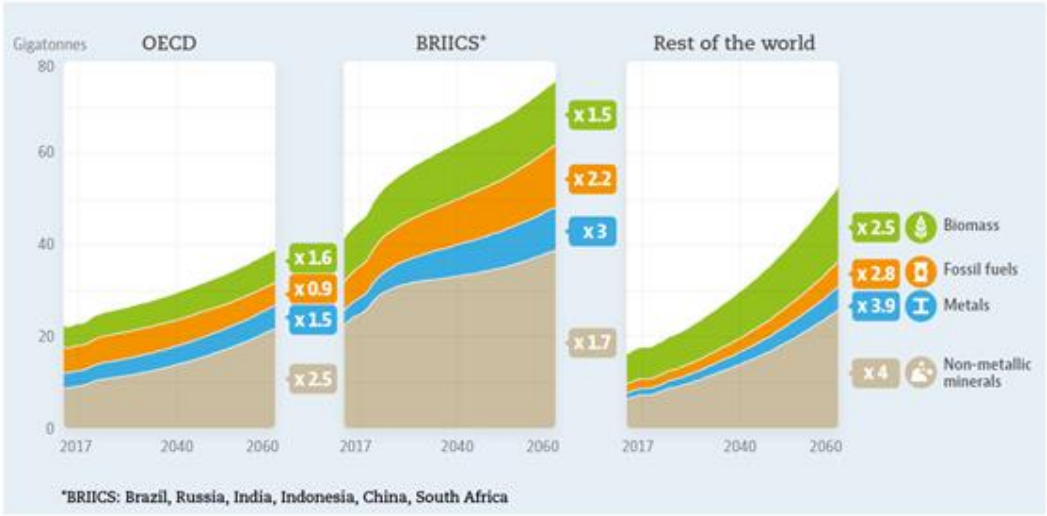


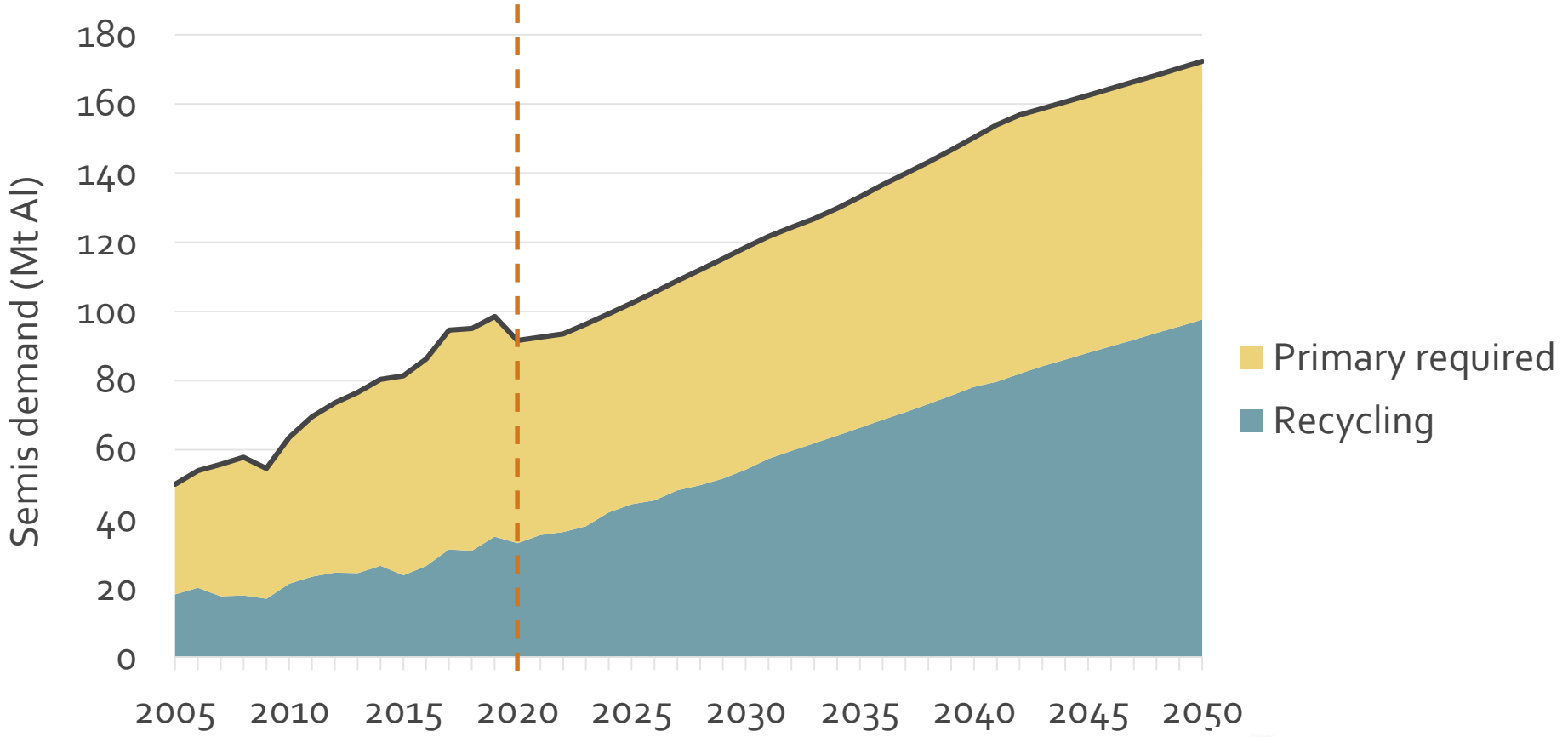
Figure 7. **Materials use rises for all material groups**



Source: IEA/OECD

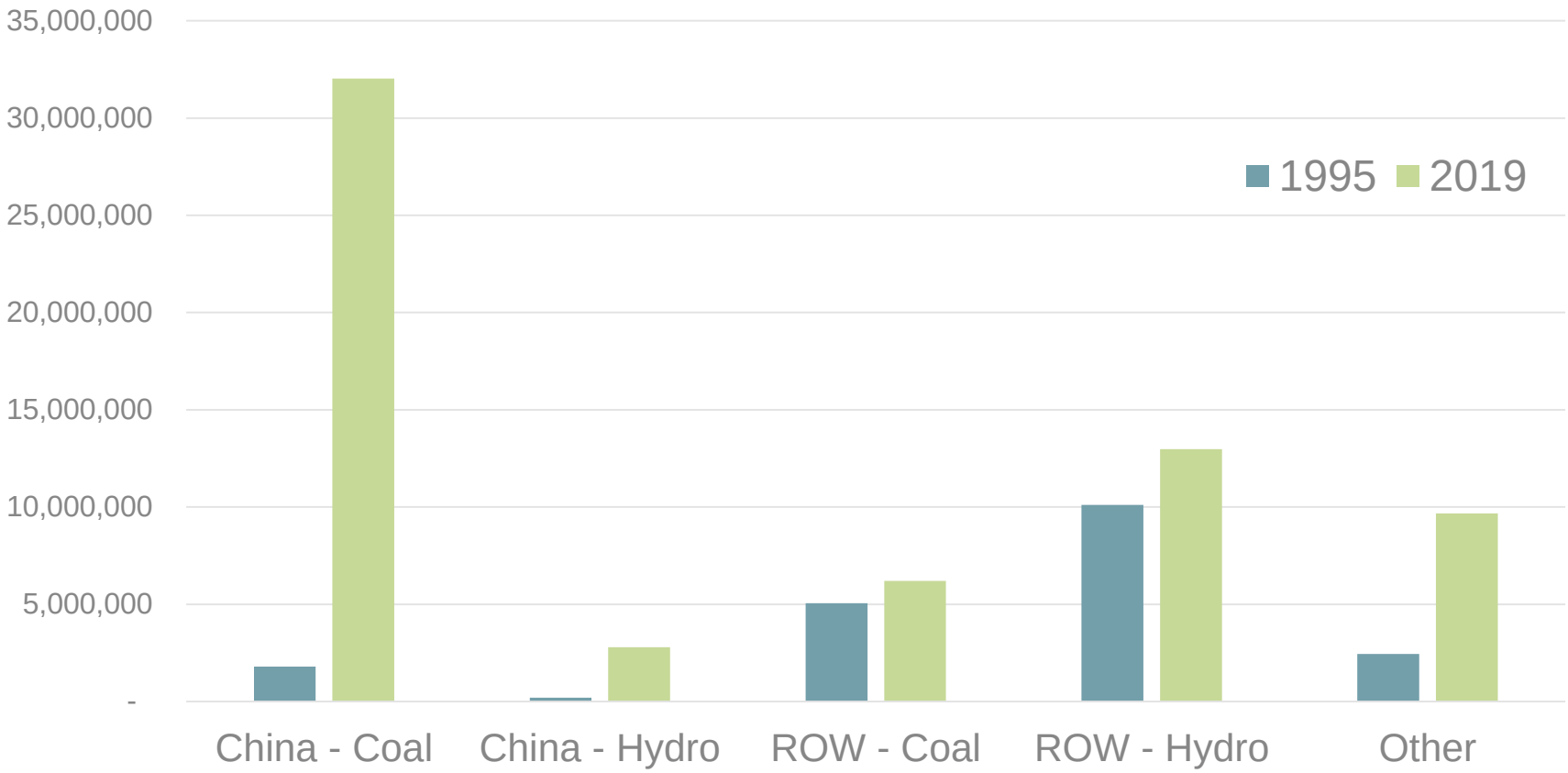
2050 Aluminium demand

(post-Covid analysis)



Source: IAI Alucycle

Al production 1995-2019



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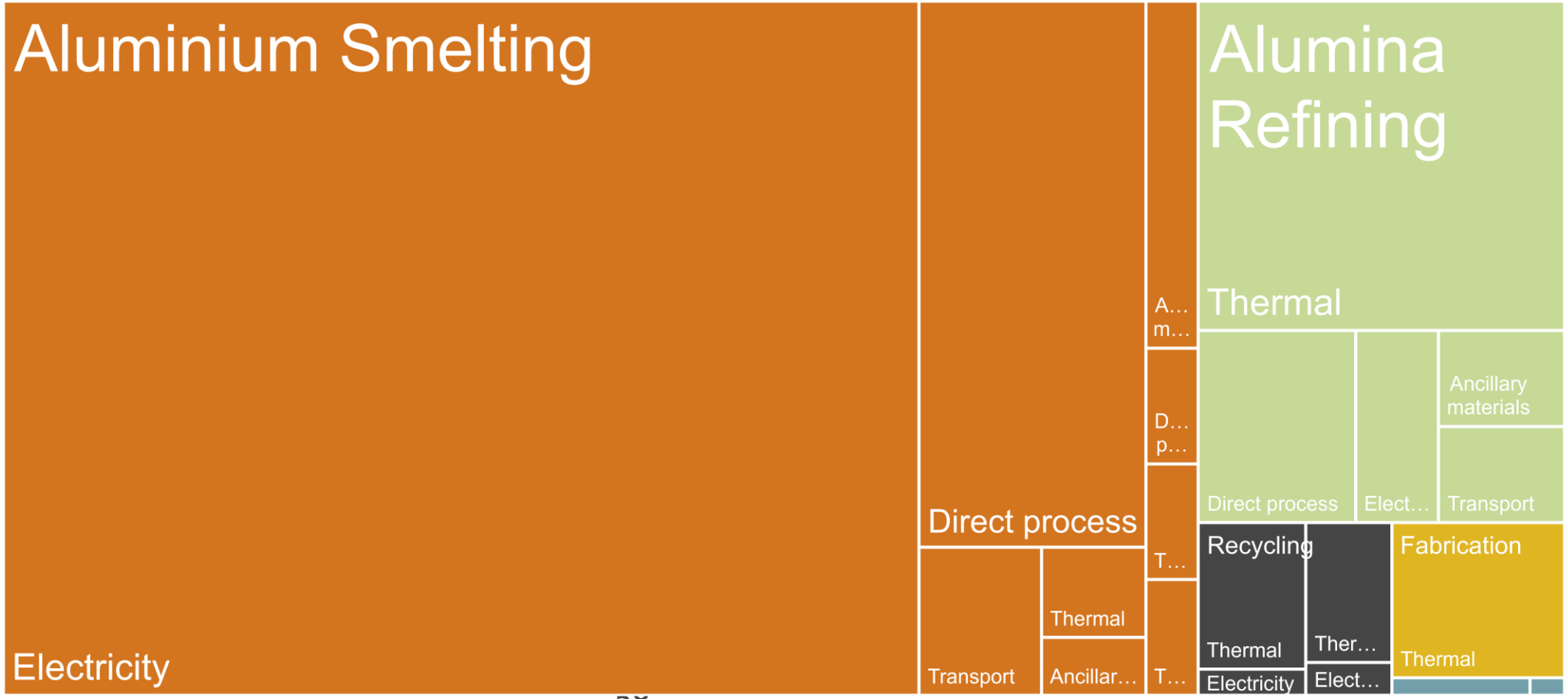
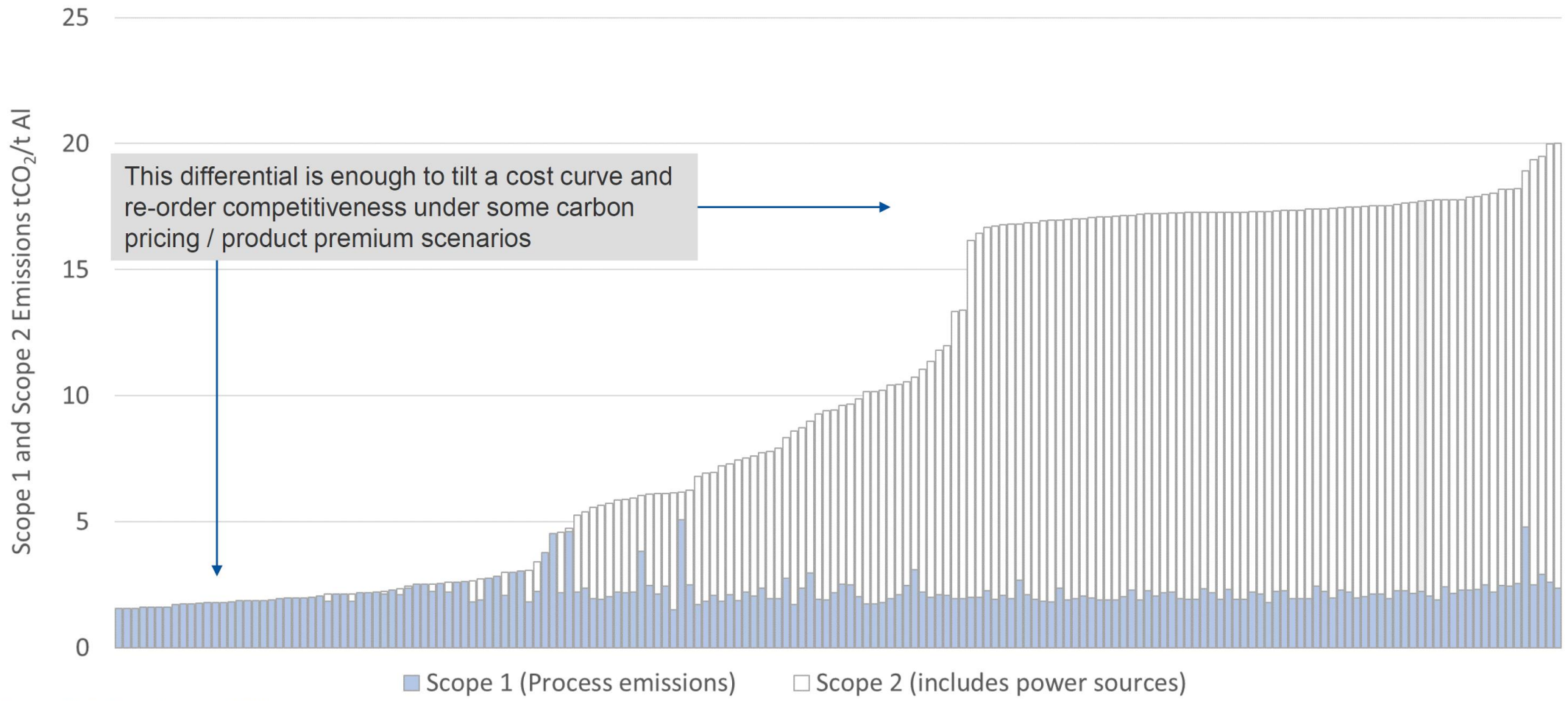
2018 Baseline – 1.1 Gt CO2e

2% of global GHG emissions (55 Gt CO_2e)
4% of global CO2 emissions (30 Gt CO_2)

- Bauxite Mining
- Alumina Refining
- Aluminium Smelting
- Recycling
- Fabrication



There is a 10-15t CO_2 emissions difference in the aluminium carbon curve



Source: CRU Consulting, © CRU

Differentiation in the market…

RenewAl™
Low CO_2 Aluminium

Allow

LME

asi Aluminium Stewardship Initiative

International Aluminium Institute

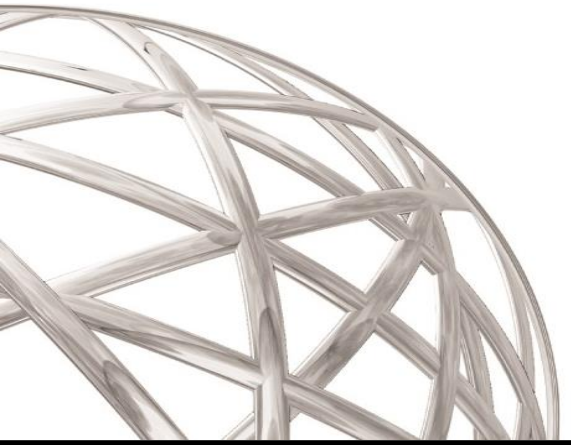
The leading association of the global aluminium industry, with a diverse membership involved in the production, fabrication and recycling of aluminium.

>40 **Years of industry data collection & analysis**

60% **Of global bauxite, alumina and aluminium production**

26 **Member companies**

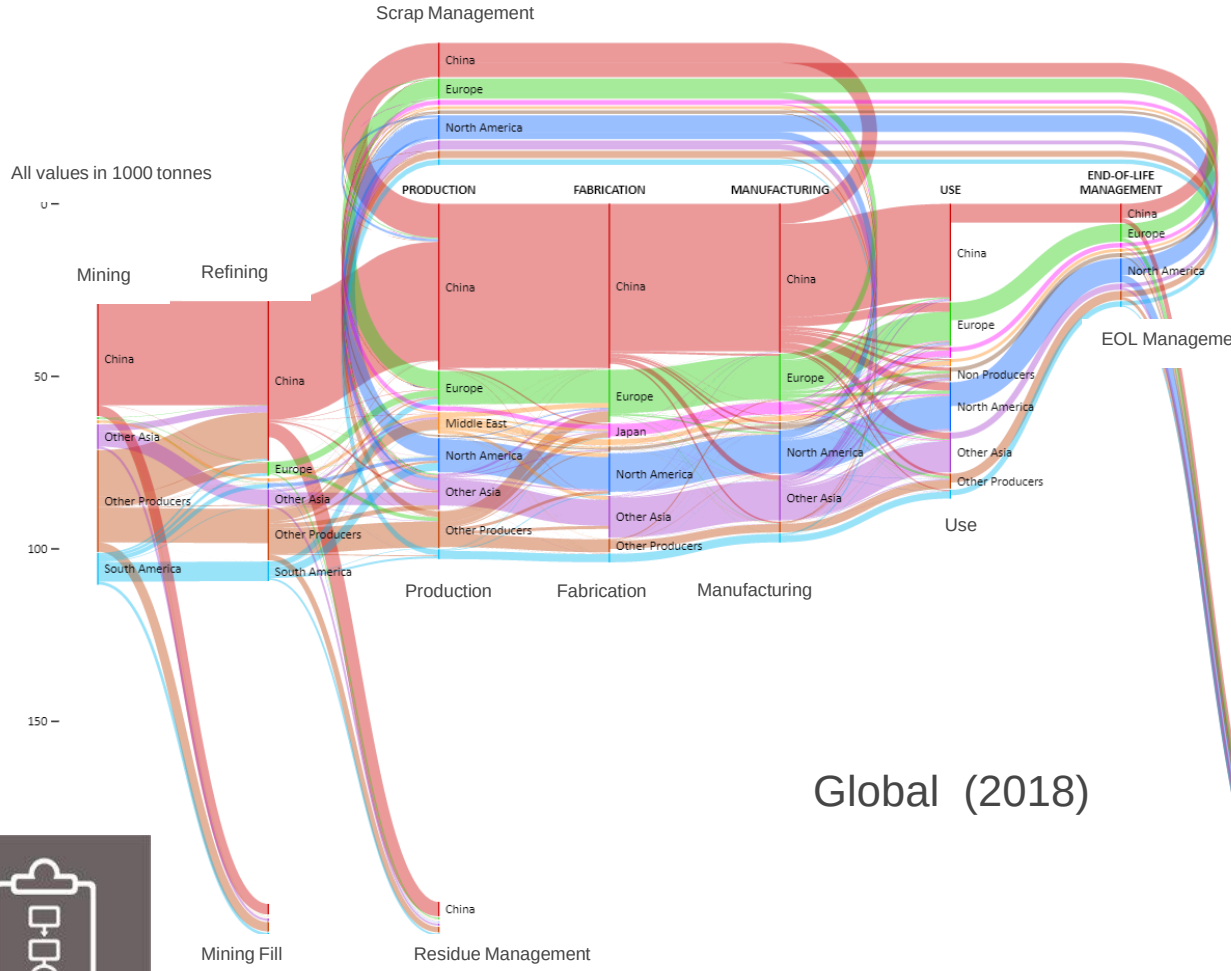
8 **Secretariat staff members**

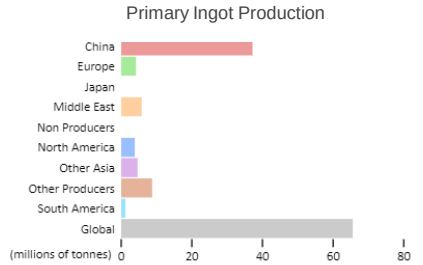


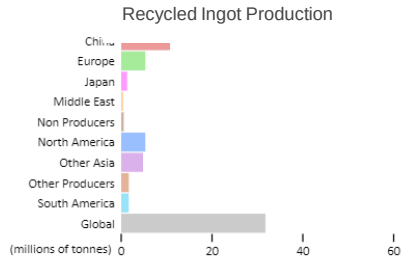
WORLD ALUMINIUM

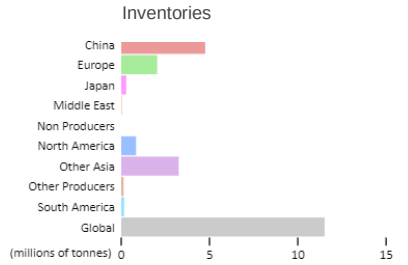
AluCycle - Regional Material Flows

https://alucycle.world-aluminium.org/









Global (2018)

IAI role on climate change

Data and Standards

Collaboration

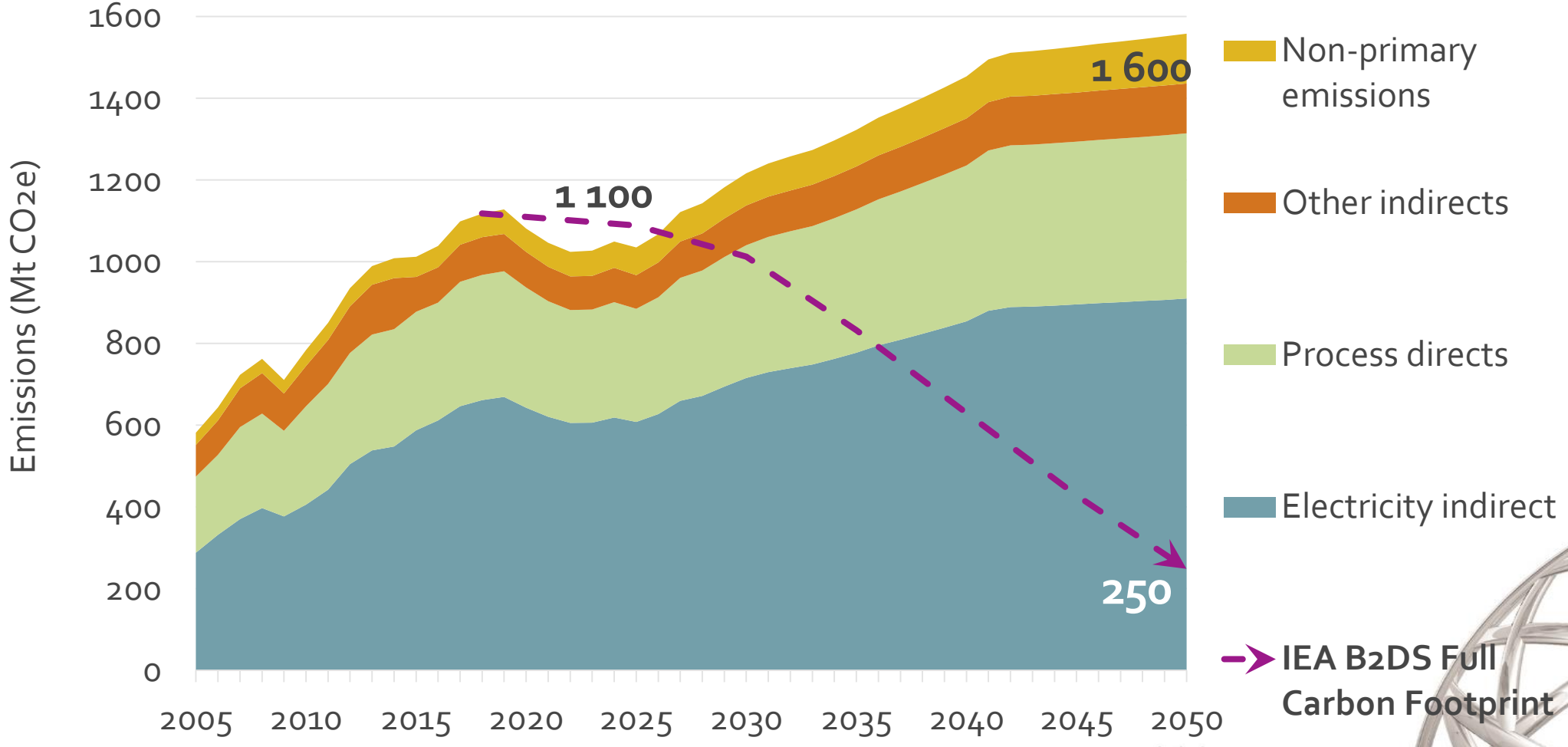
Define pathways

Inform others

Encourage ambition

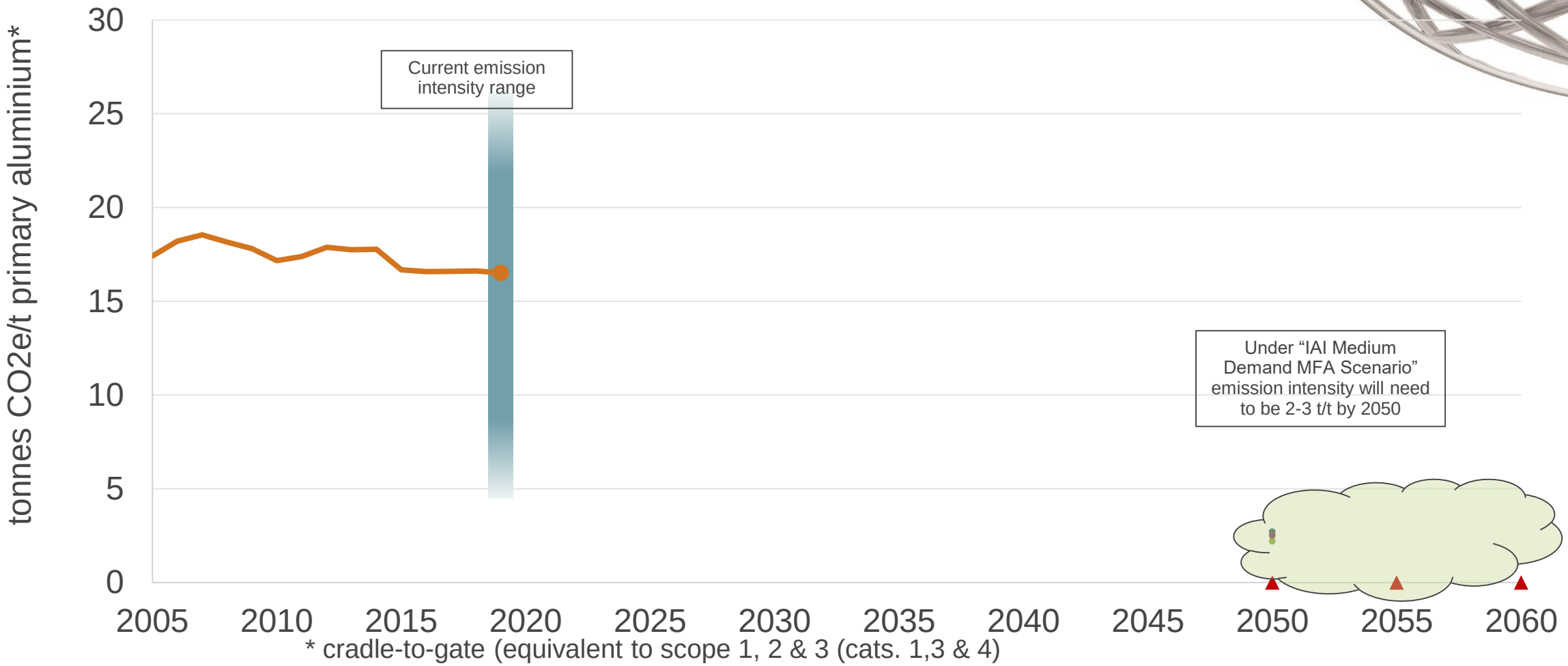
Full Carbon Footprint under IEA B2DS

If the industry is to meet IEA B2DS then the CO2e budget will be around 250 million tonnes for the aluminium sector



Source: IAI based on IEA ETP 2017

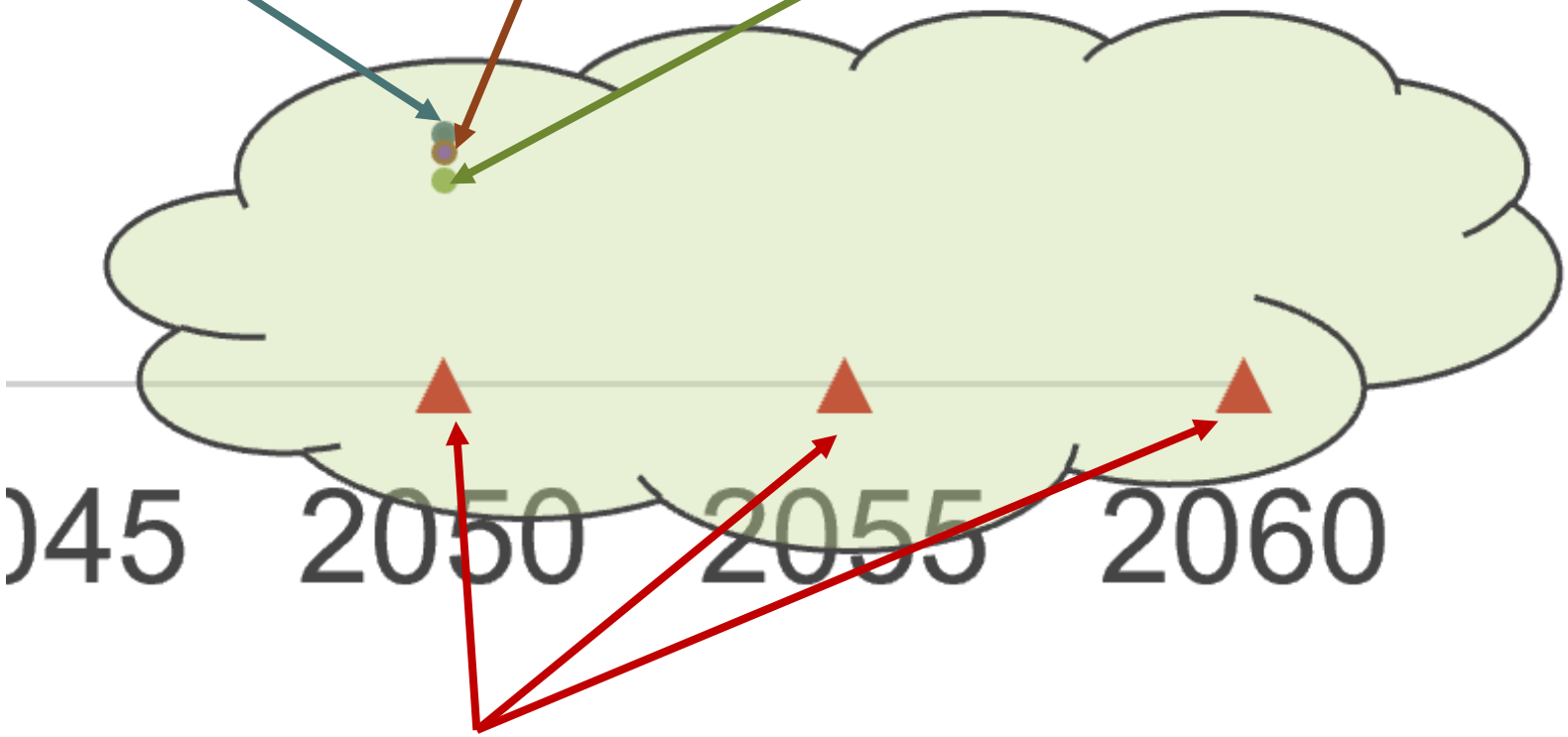
per tonne of Al…



International Energy Agency (2017)
Beyond 2 Degree Scenario-aligned*

high (>95%) recycling

no change in EoL collection rates



sector-wide neutrality (by given year)

* *Sustainable Development Scenario* (2020) data not yet available

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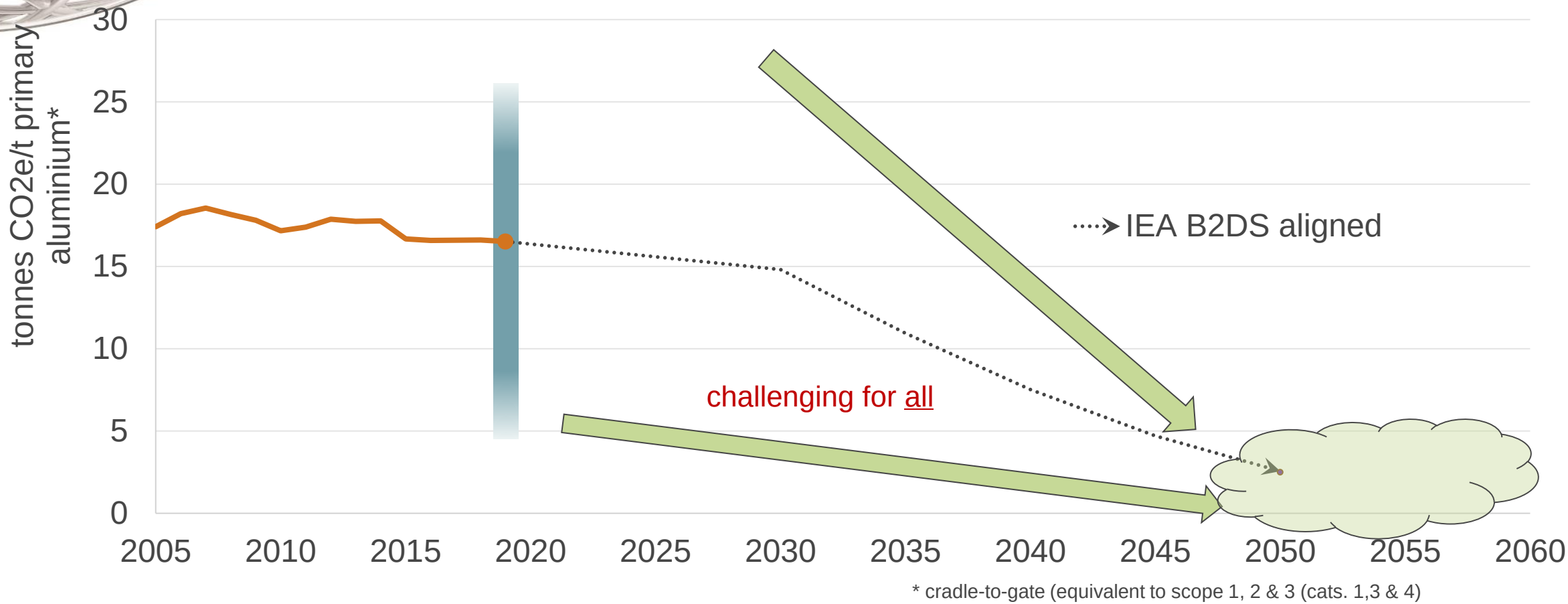
Below 2 degrees?



* cradle-to-gate (equivalent to scope 1, 2 & 3 (cats. 1,3 & 4)

Emissions reduction pathways…

Electricity Decarbonization Potential			BAU = 1.0 Gt CO_2e B2DS = 0 Gt CO_2e
• Zero carbon electricity impact on BAU	- 60%	(- 1 Gt)	
• Carbon capture & storage (CCUS)	- 50%	(- 0.8 Gt)	
• Energy consumption	- 10%	(- 0.15 Gt)	
Direct Emissions Potential			BAU = 0.5 Gt CO_2e B2DS = 0.25 Gt CO_2e
• Carbon capture & storage (CCUS)	- 35%	(- 0.5 Gt)	
• Inert anodes	- 15%	(- 0.25 Gt)	
• Refinery electrification	- 10%	(- 0.15 Gt)	
Resource Efficiency Potential			BAU = - 1.1 Gt CO_2e B2DS = - 1.35 Gt CO_2e
End of Life collection >95%			
Scrap sorting	- 15%	(- 0.25 Gt)	
Design for recycling			

- % is potential reduction from BAU (1.1 Gt CO_2e) to B2DS (0.25 Gt CO_2e)
- (Gt) values are absolute CO_2e reduction potentials
- 0.1 t CO_2e from non electricity indirects (e.g. auxiliary materials) under BAU

Technological readiness

Investment required

GHG Pathways

Demand

- Emissions need to be reduced by 80%, while demand grows over 75%
- Up to 100 Mt primary will be required by 2050

Electricity

- Decarbon-ization of electricity is the single largest driver of aluminium sector emissions reduction

Process

- Reduction requires novel technologies for heat and steam, as well as new, zero carbon cell technologies

Recycling

- Improving collection & sorting of post-consumer scrap requires action from players all along the value chain

Key messages…

- Technology development
- Investment
- Collaboration
- Changed incentives - supportive policies

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Thank-you!

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www.world-aluminium.org

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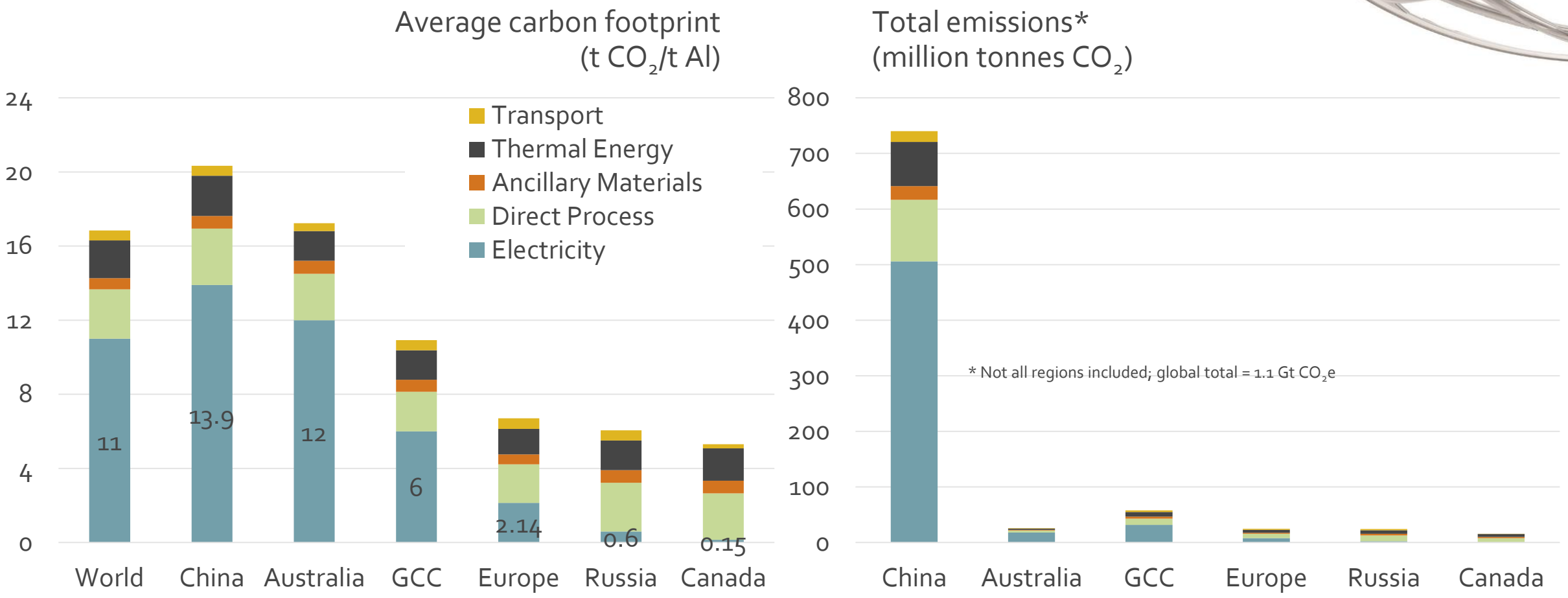
Primary Al GHG Emissions (2018)

(cradle to gate – mine to casthouse)



Source: IAI

Discussion/Q&A

Discussion: implications for the Australian Climate Roundtable

Discussion – themes emerging from today

There are a lot of technical options and pathways, but **innovation** remains necessary for deep decarbonisation.

Demand for low, zero or negative carbon products is essential to underpin investment in production.

Trade competitiveness is very important. More widespread commitments to net zero emissions are positive over the medium term.

Investment investment investment! **Policy needs to be investable**.

Data and confidence about life cycle emissions are essential for low-carbon products to be viable and competitive.

Close

Close

- Next workshop will focus on agriculture sector transition
- Subsequent session will address social and community transition
- Welcome feedback on the format and process to:
  - Tennant.reed@aigroup.com.au AND
  - Rachael.Wilkinson@aigroup.com.au