

# Circular Futures

## Accelerating a new economy



# Introduction

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The combination of a number of trends is driving the urgent development of a circular economy. The need is clear – resource scarcity, rising pollution levels and rapid urbanisation and digitisation are just a few of the issues driving us to create a more sophisticated and sustainable approach to material flow on this planet.

Sustainability non-profit Forum for the Future has partnered with Novelis Inc., the global leader in aluminium rolled products and the world's largest recycler of aluminium, to continue the debate on this. Our joint report highlights aluminium as a potential exemplar of the circular economy, and explores how learning from the aluminium recycling industry can be applied to other industries and supply chains. We also explore the barriers and opportunities to 'going circular'. We know that the world can do so much better than simply using and recycling this precious commodity.

Novelis has opened the world's largest cutting-edge aluminium recycling facility in Nachterstedt, Germany. The opening is a chance to bring together global experts from across the aluminium value chain to discuss how waste management, design and innovation could be transformed in a circular economy.

We hope this becomes the start of a wider discussion with other industries and supply chains. It is only together that we will begin to accelerate progress towards a more sustainable economic system.



**Forum for the Future** is an independent non-profit organisation that works globally with business, government and others to solve complex and others to solve complex sustainability challenges. We believe it is critical to transform the key systems we rely on to shape a brighter future and innovate for long-term success.

## Novelis

**Novelis Inc.** is the global leader in aluminium rolled products and the world's largest recycler of aluminium, delivering unique solutions for the most demanding global applications, such as beverage cans, automobiles, architecture and consumer electronics.

# From one recycling plant...

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In 2014, Novelis opened the largest aluminium recycling centre in the world at Nachterstedt in Germany. Producing up to 400,000 tonnes of aluminium sheet ingot from recycled material each year, the plant incorporates the latest recycling technology and state-of-the-art processes.

Nachterstedt will be capable of recycling more than 18 different categories of materials including used beverage cans and numerous other forms of aluminium scrap from consumers, construction and industrial applications across continental Europe. The centre is creating around 200 new jobs in closed-loop recycling in the area and, thanks to its ground-breaking technologies, Novelis is well on track to meet its mid-decade goal of 50% recycled content and its 2020 goal of 80%.

Innovative technology employed at Nachterstedt will also be replicated in Novelis's other new recycling facilities.

“ We are putting into place regional scrap collection, re-melting and casting operations to grow the circular economy. Nachterstedt is the latest and largest of these which also provides a secure, predictable supply of recycled input material for our plants. ”

**Phil Martens**, President and Chief Executive Officer





# Nachterstedt recycling facility

Year opened

2014

Site size

659,637 sq. m

Production capacity

400,000 mt

of aluminium sheet ingot  
from recycled material

Employment

214

people

Site capabilities

- Recycling
  - Re-melting
  - Casting
- Cold rolling
- Heat treatment
- Coating
- Finishing

Markets served

**Automotive and Transportation**

Supplies sheets for body panels, doors, hoods and trunks, as well as structural parts.

**Beverage Cans**

Applies coatings to rolled aluminium coils which are used to produce aluminium beverage cans.

**Consumer and Industrial**

Supplies high-end aluminium material for a variety of industrial and consumer products.

**Building and Construction**

Supplies pre-anodised and pre-painted aluminium which are used in façades, doors, windows, roofs, walls and interior applications.



# ...to a circular product

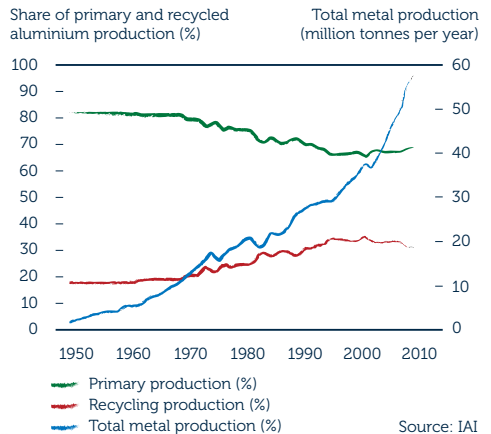
Aluminium is an incredibly versatile and recyclable metal. Because its atomic structure doesn't change during melting, its value can be continuously recovered without loss of quality. This is why it's the ideal candidate to show how we might build a circular economy.

Increasing demand for aluminium has led to a doubling in production since 1990 with global primary aluminium production expected to exceed 70 million tonnes a year by 2020.

## 60%

of this will be consumed by China with growing markets in Brazil and India as well. The pattern of aluminium production and consumption could change significantly over the next decade.

**Figure 1. Global share of primary and recycled metal production**



## 75%

Today, approximately 75% of the aluminium ever produced is still in use, and, in some cases, has been recycled multiple times.

A symbol  
of the circular  
economy

## 60–90%

The aluminium beverage can is the most recycled container in the world – with a global average recycling rate of 60% and with some countries recycling at a rate of 90% or above.

...with significant  
benefits for  
sustainability

## 95%

The recycling process uses up to 95% less energy than producing the metal from scratch.

# Drivers of a circular economy

The world is facing major challenges. Our linear economic system of 'use and dispose' (or if we are lucky, use and recycle) is not fit to take on these challenges in the long term. Against this backdrop, too many of the world's resources are being consigned to waste.

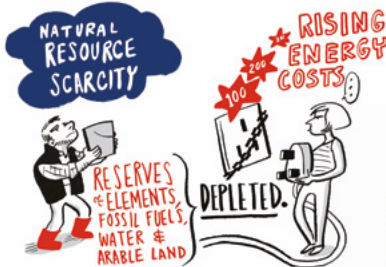
**Population growth and consumption:** a rapidly increasing population and a burgeoning middle class are pushing global consumption to unprecedented levels.



**Urbanisation:** by 2050, 70% of the world's population will be living in cities. Existing infrastructure and consumption patterns are not currently designed to cope with this.



**Legislation:** businesses face more constraints than ever around degradation of ecosystems, preventing waste to landfill and reducing carbon emissions.



**Extreme weather, natural resource scarcity and rising energy costs:** these issues, associated with climate change, call for more resilient supply chains and smarter, more efficient resource use.



**Transparency and information sharing:** supply chains are expected to be far more open to scrutiny, while the speed of information exchange has resulted in industry-wide collaborative discussions about product redesign.

# What's holding us back?

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Despite the overwhelming need for a circular economy, many socio-economic and political barriers remain. These range from short-term linear thinking and outdated business models, to a lack of regulatory and economic incentives to experiment and change.

When it comes to aluminium recycling, there are specific hurdles to overcome. Manufacturing and recycling processes can be disjointed as design for recycling is yet to be fully understood in complex products. The logistics of addressing such a globally dispersed goods market are challenging. Aluminium can be difficult to recover and reuse when it is mixed with other materials. There is a lack of consistency in levels of technological sophistication across the supply chain making it hard to establish a 'cradle-to-cradle' system.

Finally, legislation tends to focus on high volumes, often ignoring the quality and scarcity of products. Some governments take a protectionist stance through trade tariffs and export bans on scrap.

Perhaps more importantly, there is the complex barrier of consumer behaviour change. When people don't directly experience resource scarcity, it is difficult to raise awareness of how finite a commodity is.



# The journey has started

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There are positive signs that a more sustainable system is emerging. Some insights are below.



**A can-do attitude:** Novelis, as a result of focus and investment, has brought evercan™ to the market; the world's first guaranteed high-recycled-content can. This provides the opportunity for beverage producers to package their soft drinks and beer in a high-recycled, low-carbon footprint beverage container.



**Remanufacturing of Industrial manufacturing:** Caterpillar has run its parts repurposing division since 1972 and put 70,000 tonnes of redundant parts back into use in 2010 alone.



**Cradle-to-cradle shipping:** Maersk Line's new Triple E ships are designed so that 98% of each vessel can be recycled once the ship has ended its working life. The ships are designed with 'cradle-to-cradle' passports that include instructions on dismantling and recycling materials.



**A good call:** Fairphone have created a phone made from components that are ethically sourced and designed to be repaired. The company is looking at how to 'close the loop' by incorporating materials from scrap electronics.



# Sharing ideas

The circular economy will enable businesses to become more efficient, optimise their value chains and innovate in a longer-term time frame. Making this a reality calls for businesses, consumer organisations, governments and civil society to work together.

Forum for the Future and Novelis sought ideas from business leaders, aluminium experts, engineers, academics, designers and sustainability professionals.

## We asked them:

- ➡ How can we close the aluminium loop?
- ➡ How can suppliers help consumers understand aluminium recyclability?
- ➡ How can we encourage people to design for the circular economy?
- ➡ How can we pioneer a new value chain with aluminium as the exemplar?
- ➡ How can we foster increased separation and recovery of high-quality scrap aluminium?

## The winning idea...

“I am a designer. I use aluminium and I want to do so responsibly but there is nothing telling me how to do this.”

**Matthew Laws**, Director,  
The Agency of Design

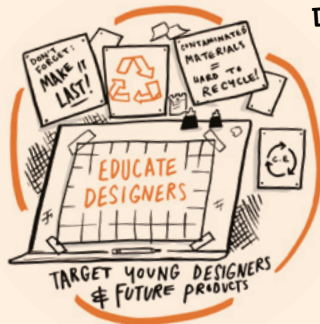


**Champion:** Aluminium ambassadors could educate designers, engineers and product development teams about the guidelines.



**Map progress:** Alumap will pinpoint areas in the world that are missing opportunities for aluminium recycling and it will suggest how to increase recycling rates. This initiative will create jobs in local communities and draw on the 'internet of things' to measure, in real time, the amounts of aluminium recycled.

# The Aluminium Design Guide for a Circular Economy



**Design:** When developing a new product, the design phase is critical in ensuring a positive environmental and social impact. The Aluminium Design Guide will be co-created in partnership with every member of the value chain and aims to show designers how to design responsibly.

## CIRCULAR ECONOMY

### The Aluminium Design Guide for a Circular Economy

The ideas submitted by experts have led Novelis to collaborate with others to develop The Aluminium Design Guide for a Circular Economy.

**Advertise:** An advertising campaign will work with celebrities to engage younger audiences in recycling electronics and cans. The aim is to bring about behaviour change by giving consumers simple ways to recycle and an understanding of the real value of materials.



**Intelligent Products:** All consumer goods of a certain complexity and value will be embedded with active or passive data transfer capabilities which will detail what materials are present in the product and how they can best be recovered for reuse. This information can be gathered by scanning the product or in cases where the product is directly connected to the internet, the information can be live on a circular economy database. Simpler products could contain the information within a barcode or QR code.



**Campaign:** A gamification campaign between different consumer brands aims to engage people and increase recycling performance. The brand league table will incentivise consumers and brands to work collaboratively.



# Lessons

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The circular economy is still in its infancy. This report aims to accelerate the conversation about scaling up the development of a more sustainable system. These discussions, and Forum for the Future's wider work in this area, pose five key recommendations on how to progress the circular economy, with aluminium as an exemplar.

➡ **Technology is not a barrier:**

facilities like Nachterstedt show that it is possible to develop the technology to make the transition to a circular economy, as long as businesses are willing to invest to upgrade their assets.

➡ **From 'supply chain' to 'value network' thinking:** developing a circular economy product or service means creating a new value network. This means forming a web of new relationships to access a greater variety of assets and capabilities. In doing this, it will be possible to develop circular business models that rely on new physical (materials or components) and value flows.

Creating progressive cultural change of this nature requires a dynamic community of interested parties, those that are open to creating new relationships and thinking outside the box.

➡ **Have a positive vision:** in order to achieve a successful, sustainable circular economy, organisations require a clear, positive vision to help drive the change that's required. This vision will help establish clear objectives and ambitious targets too.

➡ **Value for the whole network:** so far the focus has been on efficiency, materiality and technology. We also need to bring people into our thinking. This is important for a material like aluminium for which communities are vital to closing the loop. By creating value for people *and* for the environment, we can help ensure that the circular economy creates value for all of those within the value network.

It will be important for businesses to consider how disruptive the shift towards a circular economy will be for all stakeholders, and to anticipate how their value network will change when implementing these innovations.

➡ **Be prepared to disrupt:** businesses on this journey need to recognise that they will be changing their supply chains. Existing suppliers and customers may well feel threatened by such transformative change and key commercial relationships will be affected by the shift. It is important to manage supplier and customer involvement and expectations along the complex journey to a circular economy.

# Join the debate

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Forum for the Future is an independent sustainability non-profit working globally with organisations to create a transition to a circular economy.

If you would like to know more, or to be involved in developing The Aluminium Design Guide for a Circular Economy, then please contact Rodrigo Bautista at [r.bautista@forumforthefuture.org](mailto:r.bautista@forumforthefuture.org)  
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