Circular economy in the steel industry

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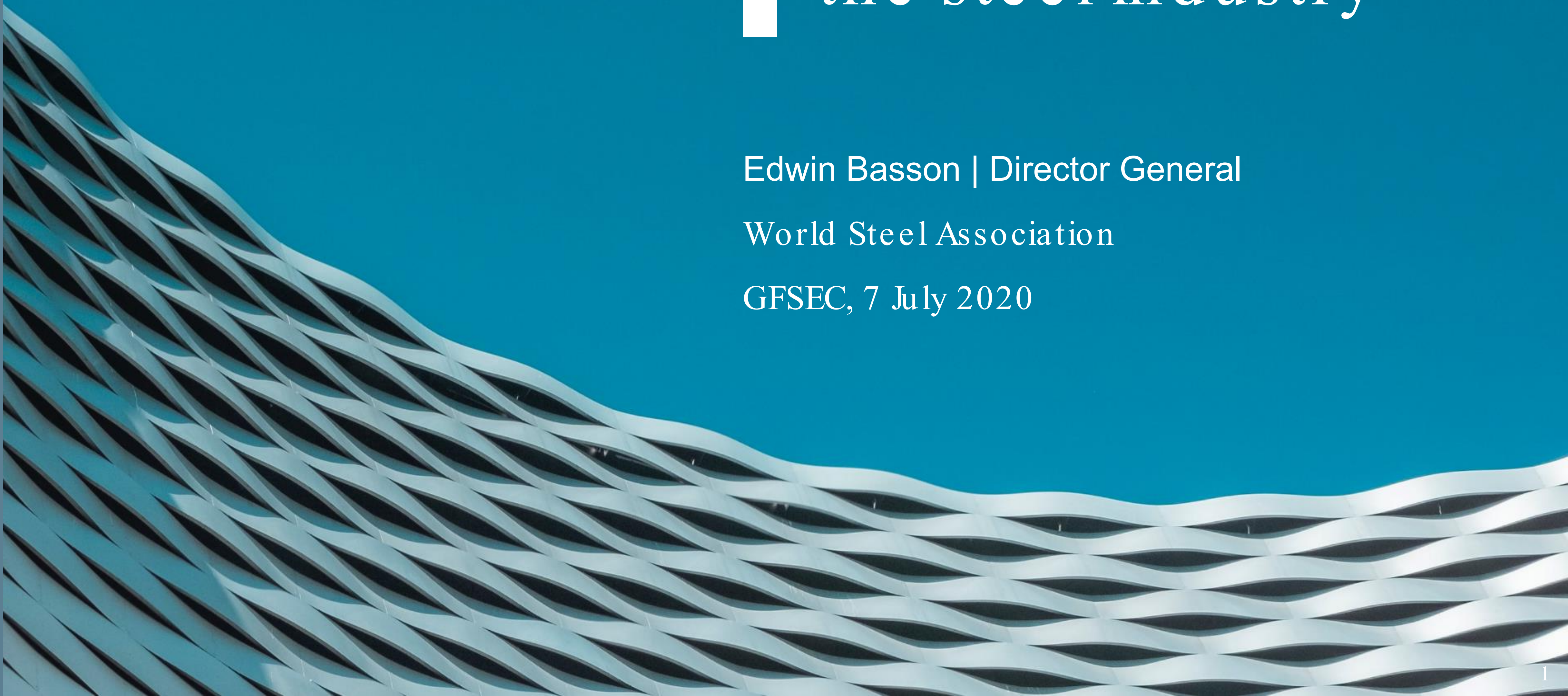
World Steel Association

GFSEC, 7 July 2020



Disclaimer

Antitrust

As worldsteel meetings are also meetings of competitors, antitrust and competition law concerns are paramount and certain are as of discussion must be totally avoided:

- No discussions on current or future pricing, pricing terms or any component of price
- No discussions on current or future production output or current or future capacity or capacity utilisation involving non-public information, or desired capacity or production output or capacity utilisation levels, or coordinated capacity, capacity utilisation or production output increases or decreases
- No discussions on allocating geographical or product markets or customers or classes of customers
- No discussions on concerted actions involving costs (including concerted actions against suppliers)
- No discussions on future raw material prices, price terms or negotiating strategies
- No discussions regarding how to respond to price increases or other charges from suppliers or whether or how to pass on any costs to customers
- No discussions on contemplated trade actions or complaints about trade flows
- No discussions on non-public company-specific forward looking commercial strategies or plans

Visit worldsteel.org \About us for detailed antitrust guidelines.

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Contents

worldsteel – who we are

The World Steel Association (worldsteel) is a non-profit organisation.

It has headquarters in Brussels, Belgium. A second office in Beijing, China, opened in April 2006.

worldsteel represents steel producers, national and regional steel industry associations, and steel research institutes.

Members represent around 85% of global steel production.

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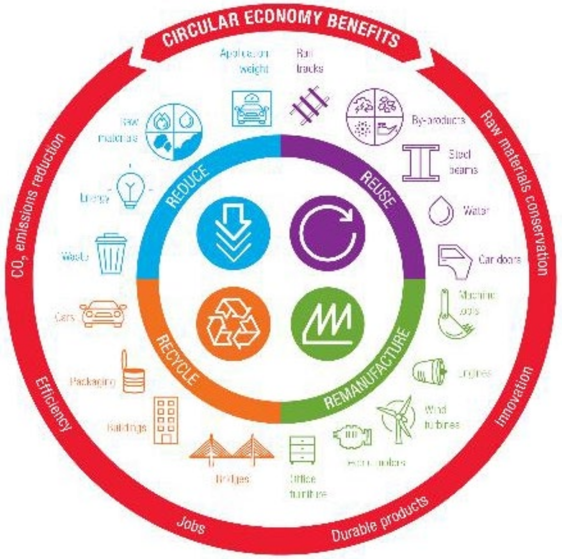
worldsteel – our key focus areas

worldsteel is active in key areas of interest to the steel industry:

- Automotive
- Climate change and environment
- Communications
- Construction
- Education and training
- Life cycle assessment
- Raw materials
- Safety and health
- Sustainability
- Steel market analysis
- Technology

Circular economy and the steel industry

Influences in the spread of circular economy



Reduce

- Efficient transformation
- Design philosophy
- Steel grades, applications, labelling

Reuse

- Low complexity applications
- Technical requirements
- Material durability
- Disassembly challenge

Sharing economy

- Concentration of underutilised assets
- Population density
- Trust and culture, regulatory schemes

Remanufacturing

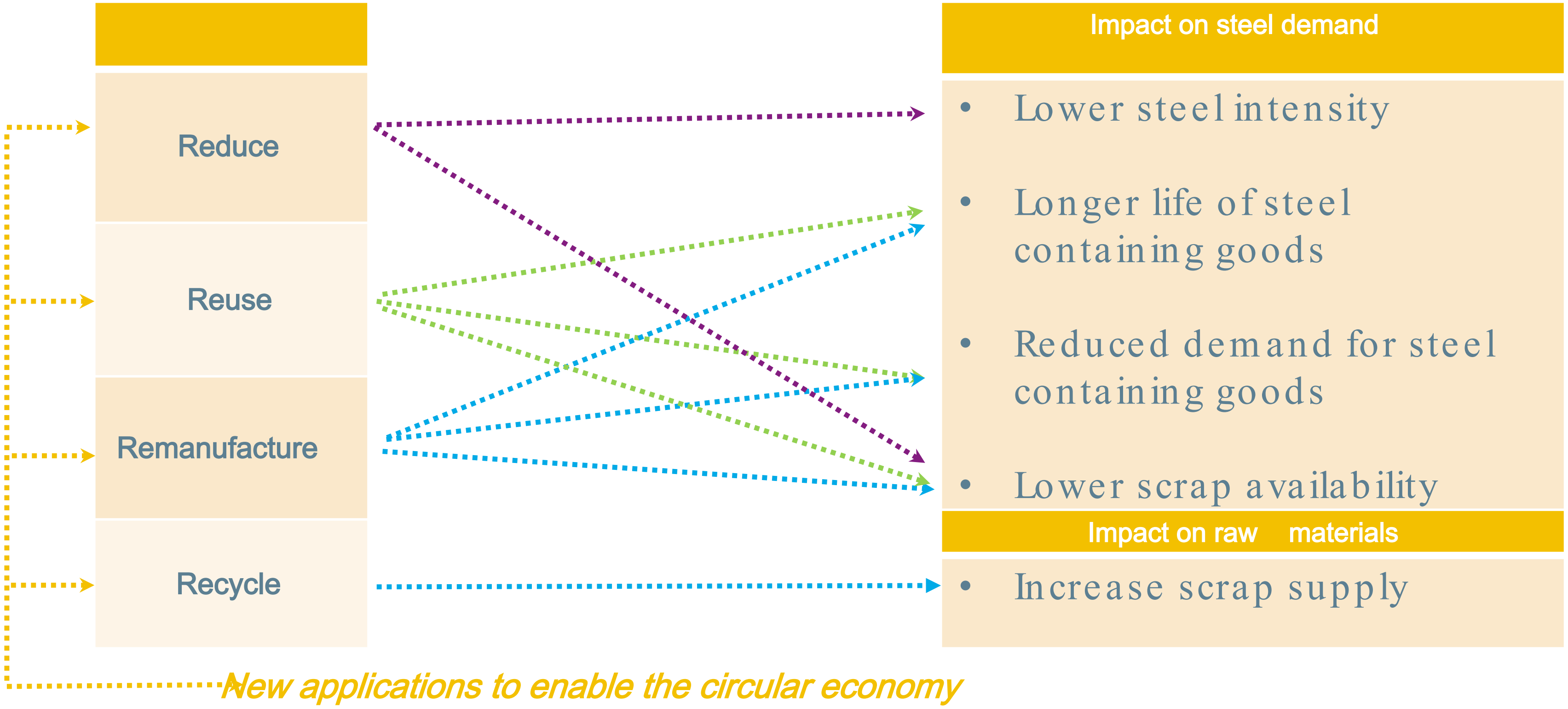
(refurbish and repair)

- Repair/reconditioning to "as normal" state
- High manual labour requirements
- Uncertainty in deciding optimal capacity
- Changing complexity of reverse logistics

Recycling

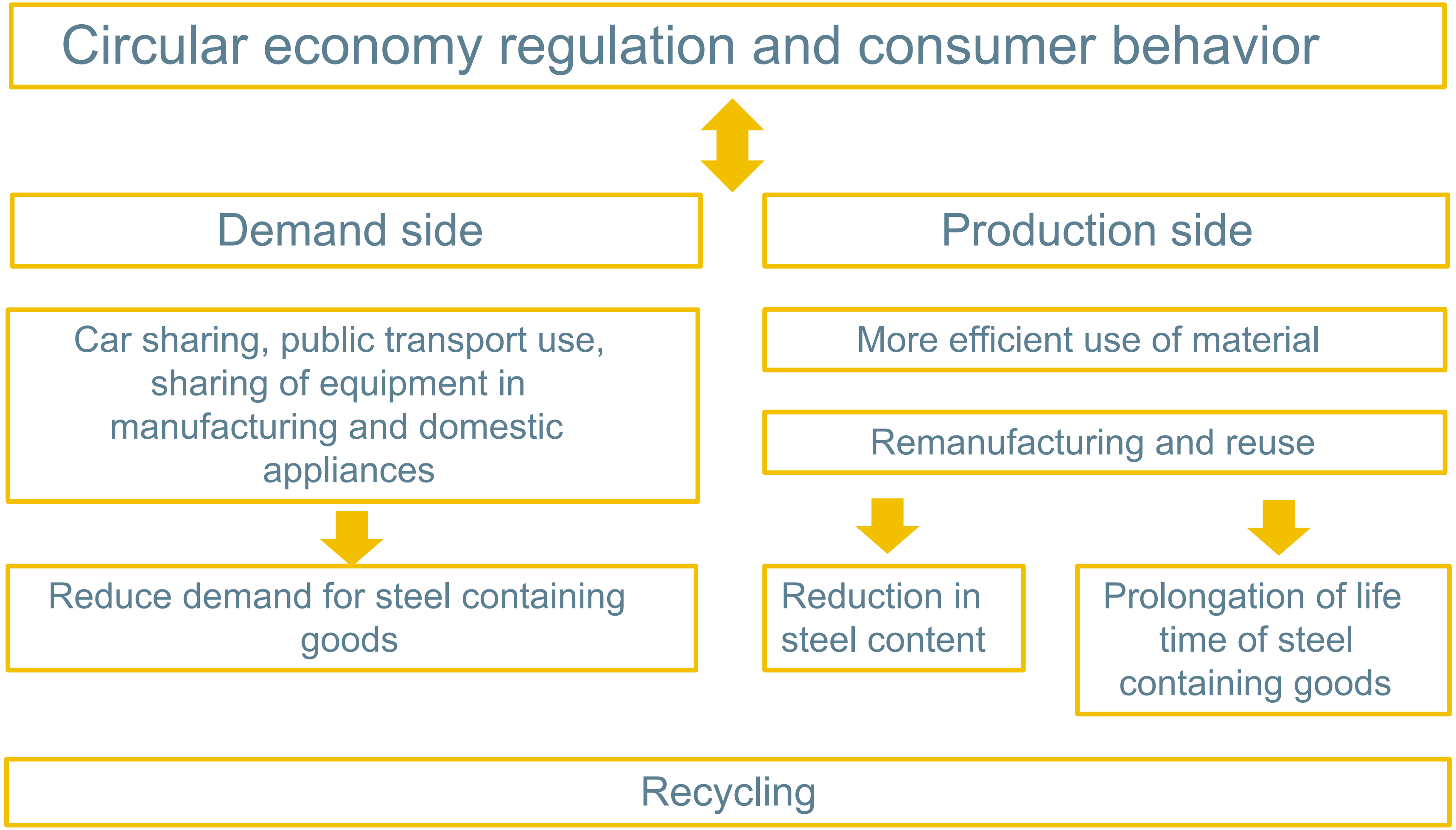
- Technical requirements
- Scrap collection
- Scrap sorting

Circular economy impacts steel demand via multiple channels

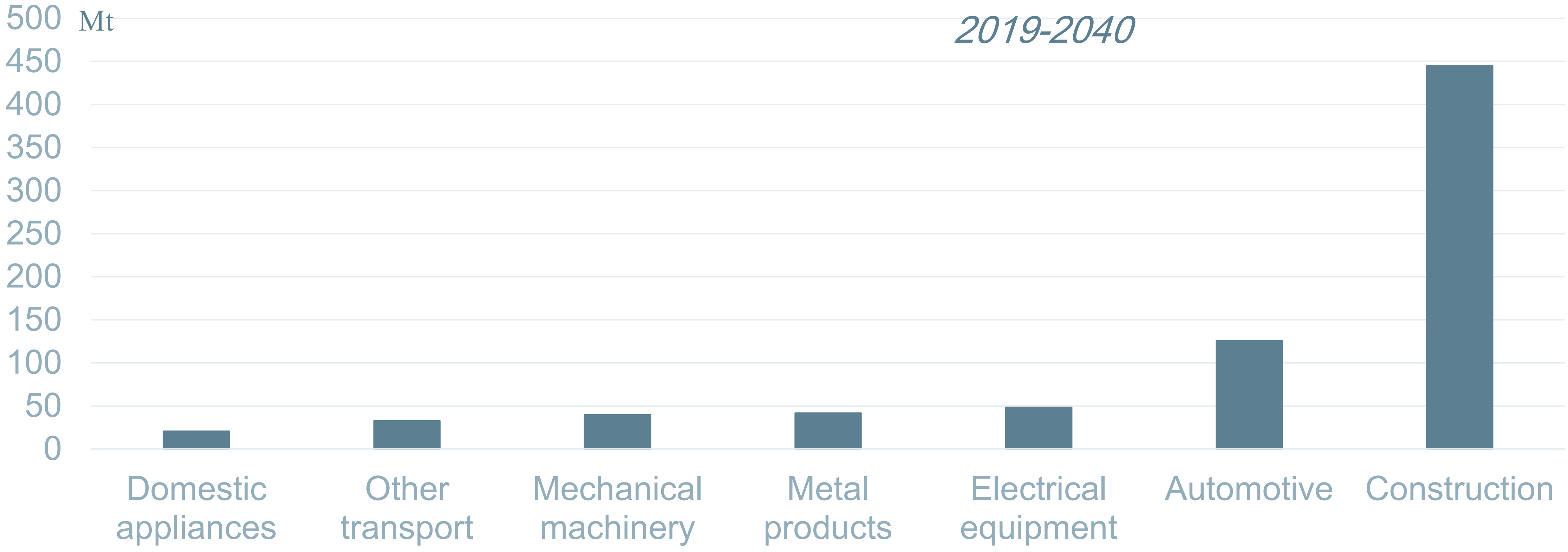


Reuse and remanufacturing extend the service life of steel applications

Circular economy influences all aspects of the industry



Early estimates on postponed steel demand



Source: worldsteel estimates

In 2021 steel demand is expected to recover to 1,717 Mt, an increase of 3.8 % over 2020

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Remanufacturing in Europe

Automotive industry remanufacturing

Automotive dashboard

MARKET OVERVIEW

Automotive remanufacturing is a mature industry on the cusp of significant changes

CURRENT VALUE

2018 value estimated at **€ 8.2 bn**

STEEL CONTENT

Commonly remanufactured products have high steel content and high steel retention during remanufacturing (85 – 95%)

Steel content is expected to decrease with the transition to electric vehicles

FUTURE REMANUFACTURING

Future remanufacturing activity is estimated to reach between **€ 18.8 and 28.1 bn** by 2050

MAIN TRENDS

- Transition to EV technology
- Increasing OEM engagement with remanufacturing
- Pressure on independent remanufacturers
- Pressure from increase in quality of low cost imports
- Service-based business models, e.g. leasing, car sharing, car hailing are increasing

Source: Study done for worldsteel by Oakdene Hollins

Domestic appliances remanufacturing

Domestic appliances dashboard

MARKET OVERVIEW

Domestic appliance remanufacturing is currently a niche activity but has the potential for fast and widespread uptake

CURRENT VALUE

2016 activity of sole domestic appliance remanufacturer identified to date reported at **€ 1.8 m**

MAIN TRENDS

- Increasing new entrants exploring circular economy business models
- Increasing circular economy pilot activity from OEMs
- Examples of contracted remanufacturing
- Sole independent domestic appliance remanufacturer identified expanding operations around Europe

STEEL CONTENT

Domestic appliances potentially suitable for remanufacturing are typically about 50% by mass.

Remanufacturing at a product-level has a high steel retention at over 95%

FUTURE REMANUFACTURING

Future remanufacturing activity is estimated to reach between **€ 1.8 and € 2.5 bn** by 2050

Source: Study done for worldsteel by Oakdene Hollins

Heavy duty and off -road remanufacturing

Heavy duty and off -road dashboard

MARKET OVERVIEW

Heavy duty and off-road remanufacturing is a mature industry, however there is still potential for growth

CURRENT VALUE

2018 value estimated at **€ 4.9 bn**

STEEL CONTENT

Commonly remanufactured products have high steel content and high steel retention during remanufacturing.

Steel content is expected to decrease with the transition to electric vehicles

FUTURE REMANUFACTURING

Future remanufacturing activity is estimated to reach between **€ 6.8 and 13.2 bn** by 2050

MAIN TRENDS

- Increasing breadth of OEM engagement with remanufacturing
- Emissions regulations becoming increasingly stringent
- Increasing competition from distributors who dilute connection between OEM remanufacturer and customer
- Lower end equipment not designed for reman

Source: Study done for worldsteel by Oakdene Hollins

Mechanical equipment remanufacturing

Mechanical equipment dashboard

MARKET OVERVIEW

Mechanical equipment remanufacturing is a mature industry but remains challenging to quantify due to diverse nature of products and terminology

CURRENT VALUE

2018 value estimated at **€ 1.0 bn**

STEEL CONTENT

Remanufactured equipment has a wide range of steel content values, but generally steel content is expected to be high

Steel retained during remanufacturing would also be expected to be high for the majority of structural elements

FUTURE REMANUFACTURING

Future remanufacturing activity is estimated to reach between € 1.4 and 3.1 bn by 2050

MAIN TRENDS

- Business-as-usual practice for the sector
- Overhaul and refurbishment more commonly used terminology
- Remanufacturing linked to general manufacturing industry growth
- New products, e.g. wind turbines, emerging as new remanufacturing markets

Source: Study done for worldsteel by Oakdene Hollins

Impact of product as a service

Market trends - uptake of CE business models

	Growth related to enterprises operating in the rental and leasing of relevant product categories (EU28) from 2011 - 2016			
	Number of enterprises (%)	Turnover (%)	Gross operating surplus (%)	Gross investment in tangible goods (%)
Cars and light motor vehicles	20	31	46	48
Trucks	26	4*	10*	21*
Personal and household goods	28	33	32	65
Agricultural machinery and equipment	16	35	70	26
Construction and civil engineering machinery and equipment	1	10	28	58
Other machinery, equipment and tangible goods n.e.c.	38	6	-12	6

Source: EUROSTAT, Annual detailed enterprise statistics for services (NACE Rev. 2 H-N and S95)

Most product categories have seen growth in the number of enterprises operating in rental and leasing and/or growth in the related turnover. This could indicate an uptake in CE business

Source: Study done for worldsteel by Oakdene Hollins

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Conclusions

Conclusions

Current status

- The 2018 value of remanufacturing for the four product sectors examined in this analysis is estimated to be €14.2 bn
- Remanufacturing is currently a small fraction of Circular Economy activity (for example, compared to recycling and reuse), both in value and by steel volume
- Automotive and HDOR reman activity in 2018 was estimated to retain 483 kt steel
- While remanufacturing volumes are small, it is generally a high value activity suited to technical products
- Remanufacturing activity varies from a business-as-usual activity (e.g. the HDOR and industrial equipment sectors) to novel (domestic appliances)
- The remanufacturing industry has adapted to operate in a changing regulatory landscape (e.g. emissions regulations in automotive and HDOR), however, regulatory barriers to remanufacturing still exist (e.g. transboundary shipments of core)
- The remanufacturing concept is not widely known beyond the industry and particularly by the general public

Source: Study done for worldsteel by Oakdene Hollins

Conclusions

Future potential

- The remanufacturing industry in Europe is set to grow against a backdrop of a changing technical landscape (and product composition)
- The total size of the four remanufacturing sectors examined could grow to between €29 bn and €47 bn by 2050
- The future trajectory of the remanufacturing sector will depend upon remanufacturer's ability to absorb new products into their operations (e.g. EV components, domestic appliances, wind turbines etc.)
- Regulatory and social trends are anticipated to support the greater acceptance and uptake of remanufacturing, as part of the wider Circular Economy agenda
- Remanufacturing will generally benefit from the uptake of CE business models, especially those moving towards offering products as a service
- Assuming steel retention scales with remanufacturing revenue, an initial estimate of steel retained during remanufacturing in the automotive and HDOR sectors is between 675 kt and 1,360 kt per year, by 2050
- This approximation gives a cumulative volume of retained steel from remanufacturing (between 2018 and 2050) of 20 – 31 Mt

Source: Study done for worldsteel by Oakdene Hollins

Thank you

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