



# Carbon, Energy and Materials Visions for the Future

Identifying aspects and relevance of the  
climate-resource-nexus

Webinar, 29 Sept. 2020

Edgar Hertwich<sup>1</sup> and Stefan Pauliuk<sup>2</sup>

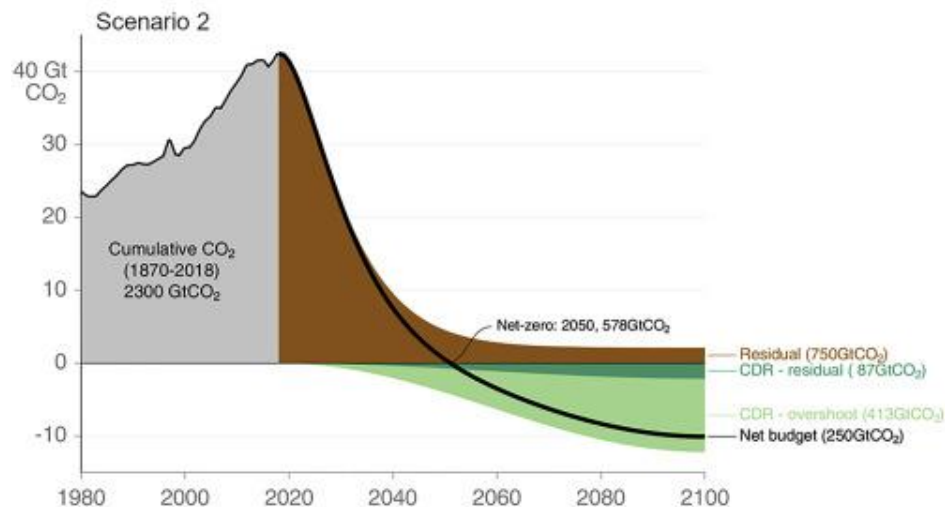
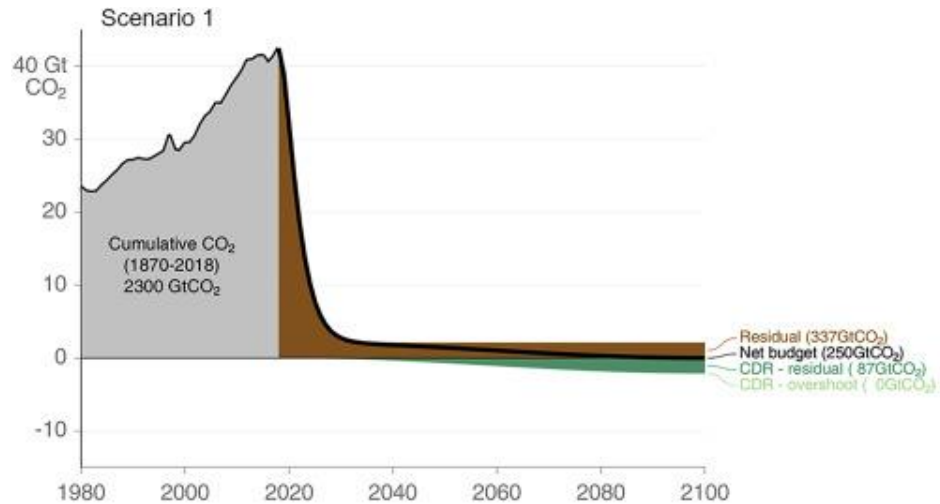
<sup>1</sup>Norwegian University of Science and Technology and <sup>2</sup>University of Freiburg



International  
Resource  
Panel

# Carbon budget

## CO<sub>2</sub> emissions until we reach 1.5°C



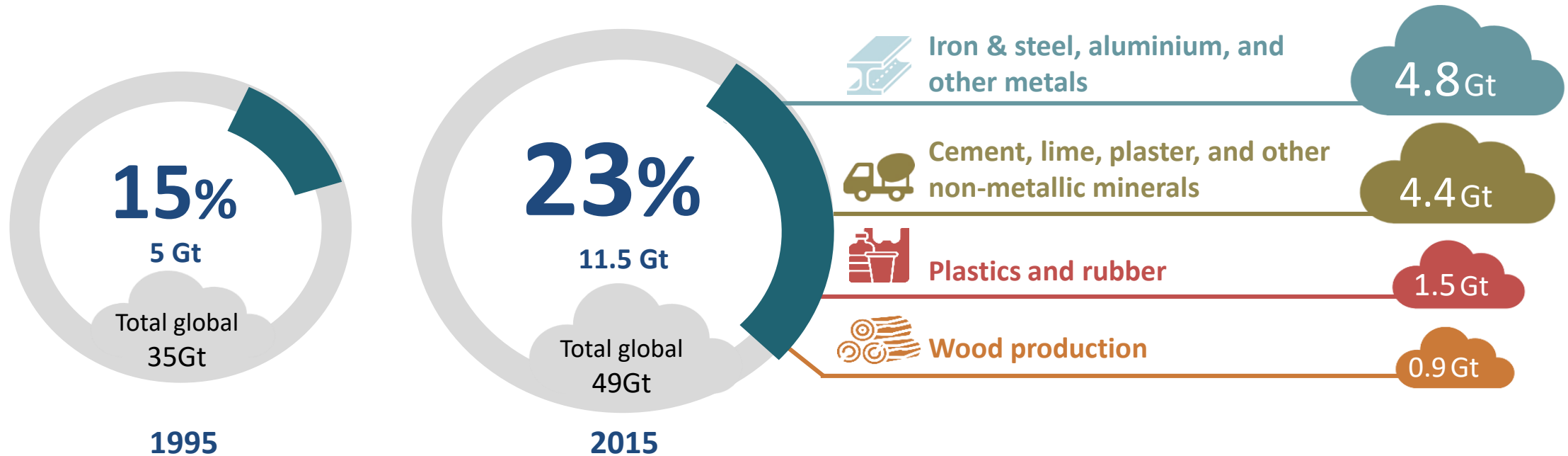
Aggregate cumulative emissions lead to ultimate temperature rise.

Therefore, they are limited if we want to limit temperature rise.

Rapid drop, faster than what we achieved with COVID 19, needed to keep below 1.5 and avoid expensive carbon removal operation.

# The production of materials causes 23% of global GHG emissions

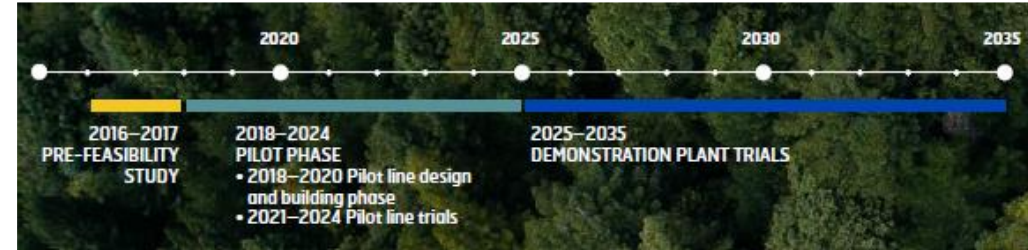
## Global GHG emissions from a value-chain perspective



# Decarbonization of materials production is in the works ... but its commercialization is some way off



Stefan Löfven: "Ett epokskifte i svensk stålindustri" Foto: SVT



## Här invigs nya pilotanläggningen: "Ett epokskifte i svensk stålindustri"

31 aug. 2020

UPPDATERAD IGÅR 17:50 PUBLICERAD IGÅR 17:36

**Nu är ett stort steg taget när det gäller produktion av fossilfritt stål. Under måndagen invigde statsminister Stefan Löfven (S) Hybrit:s pilotanläggning i Luleå.**

Målet med Hybrit, ett samarbete mellan SSAB, LKAB och Vattenfall, är att byta ut kokskolet vid stålframställning mot fossilfri el och vätgas, för att på så sätt minska koldioxidutsläppen.

Nu testas delar av tekniken i en pilotanläggning på SSAB-området i Luleå som invigdes under måndagen.

*I klippet hör du bland annat statsminister Stefan Löfven om vad anläggningen kommer betyda för Sverige.*

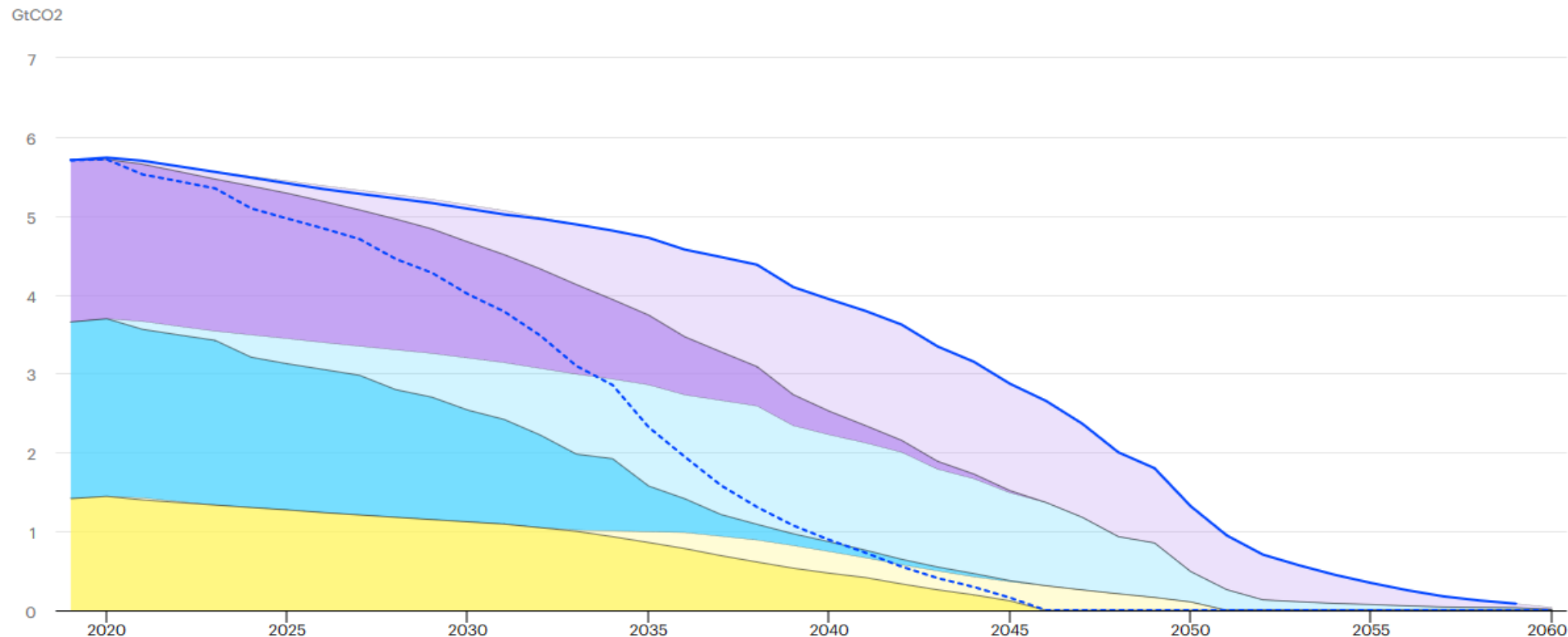
<https://www.svt.se/nyheter/lokalt/norrboten/stefan-lofven-ett-epokskifte-i-svensk-stalindustri>  
<http://www.hybritdevelopment.com/>



# Long-term lock-in to existing, polluting technology

Unlocking CO2 at the next investment point in heavy industrial sectors by sector, 2019-2060

Open



● Chemicals ● Cement ● Steel ● 25-year investment cycle ● Typical lifetime

UN   
environment  
programme



# RESOURCE EFFICIENCY AND CLIMATE CHANGE

Material Efficiency Strategies for a Low-Carbon Future

Summary for Policymakers

*#ResourceEfficiency4Climate*

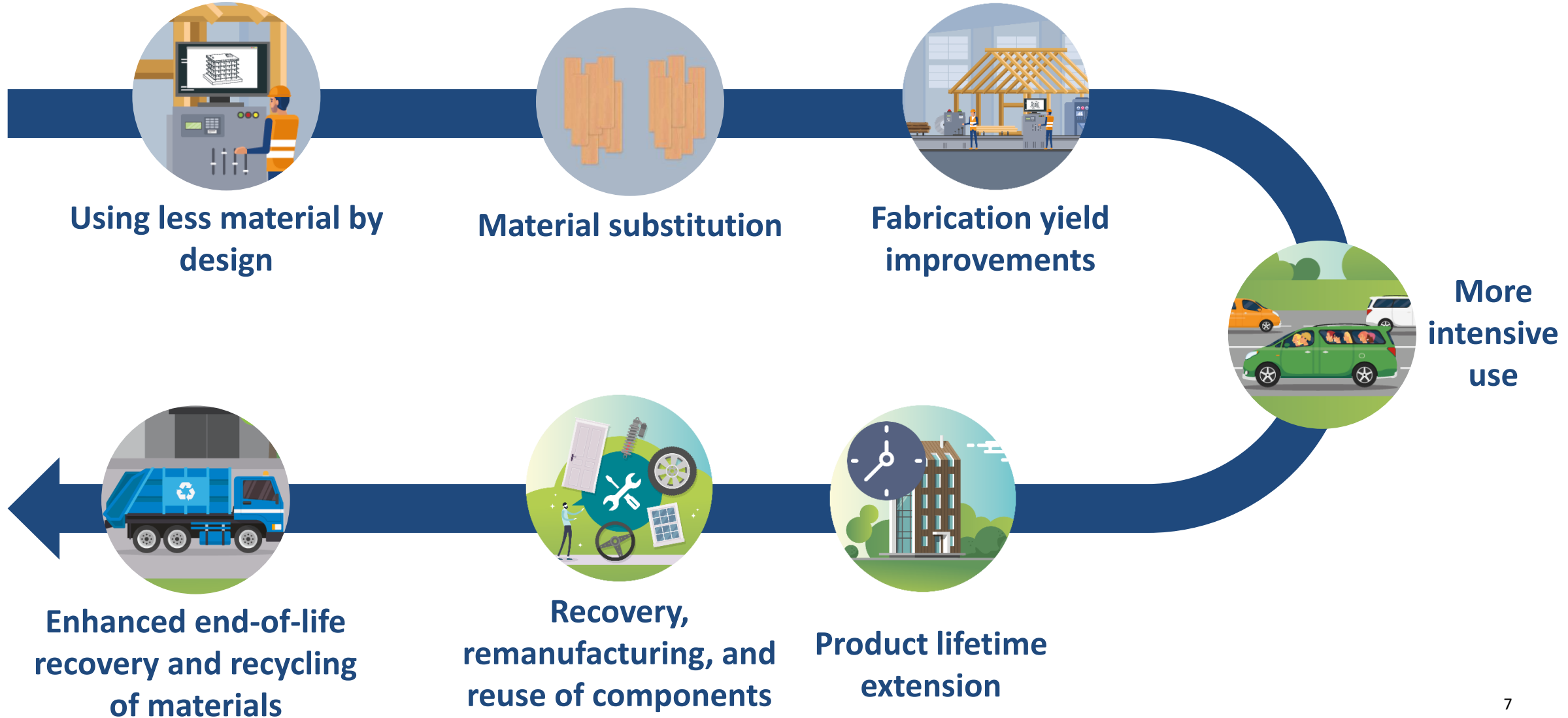
*@UNEPIRP*

*@EmissionsGap*



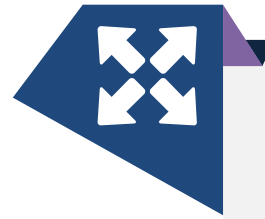
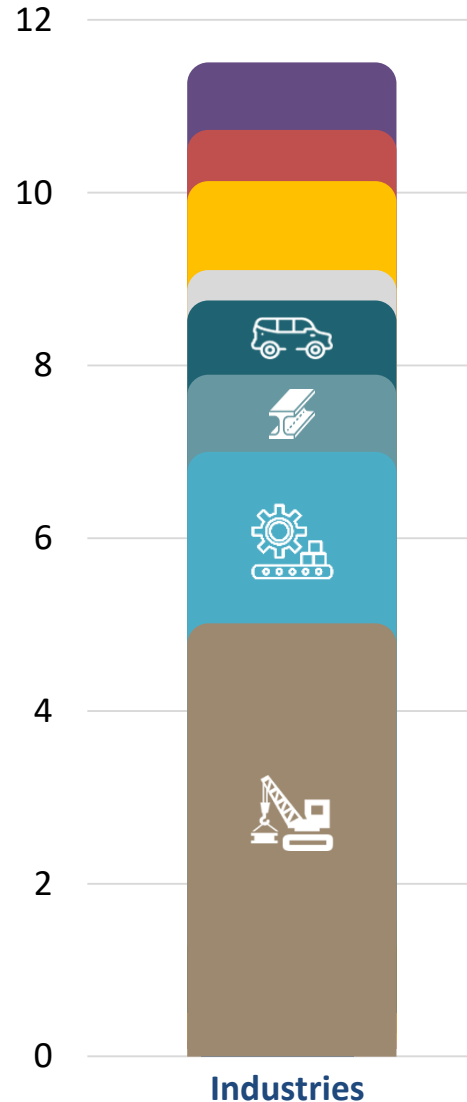
**[bit.ly/35Usl11](https://bit.ly/35Usl11)**

# Report assesses seven crucial Material Efficiency Strategies to reduce emissions





# IRP report focuses on high-relevance housing and cars as examples



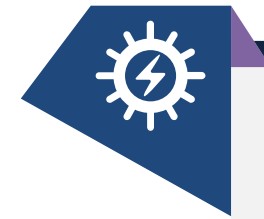
...using large amounts of material



...providing essential services to society



...creating high economic value



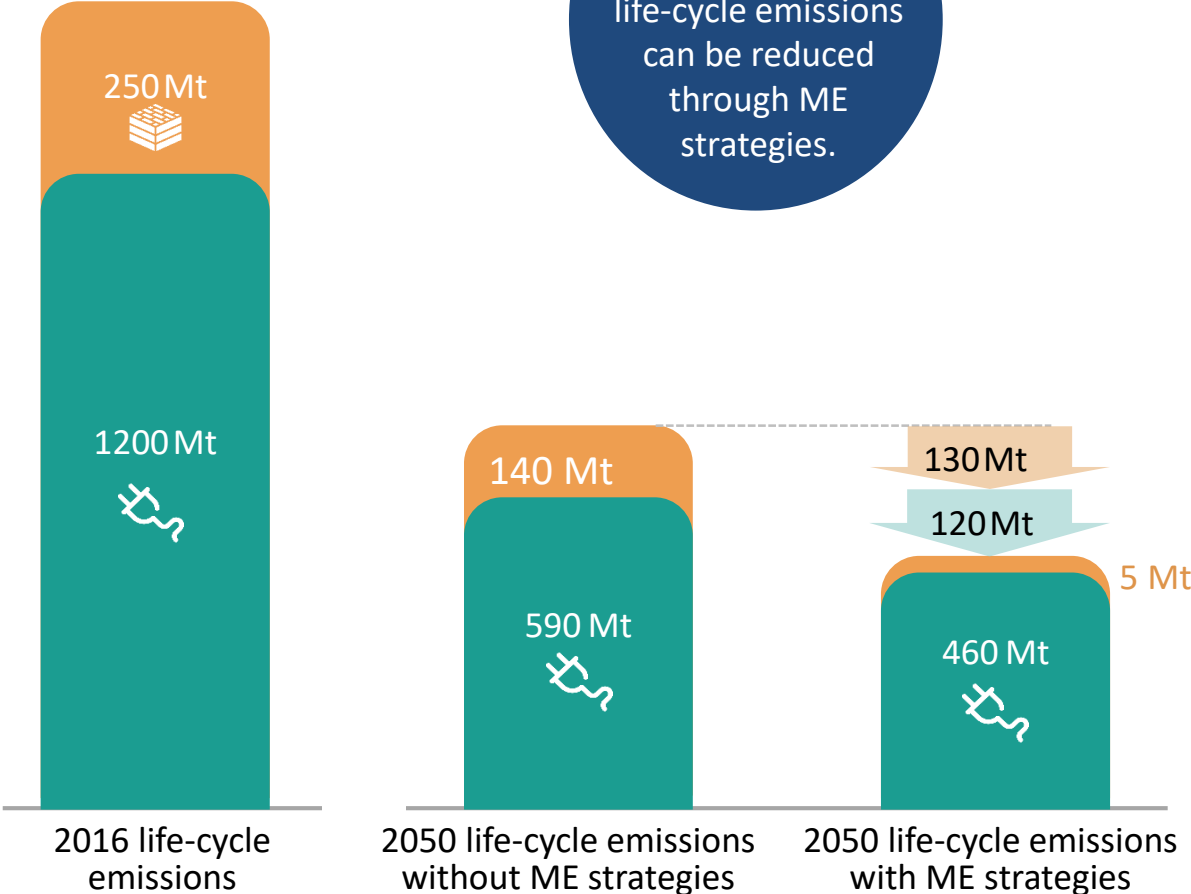
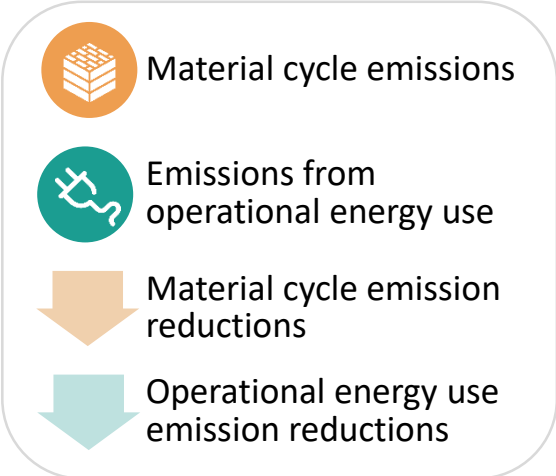
...showing significant potential to increase efficiency



# Material Efficiency Strategies can reduce 35% of lifecycle emissions from homes in G7 countries in 2050

## G7 Countries





**35%**  
life-cycle emissions  
can be reduced  
through ME  
strategies.

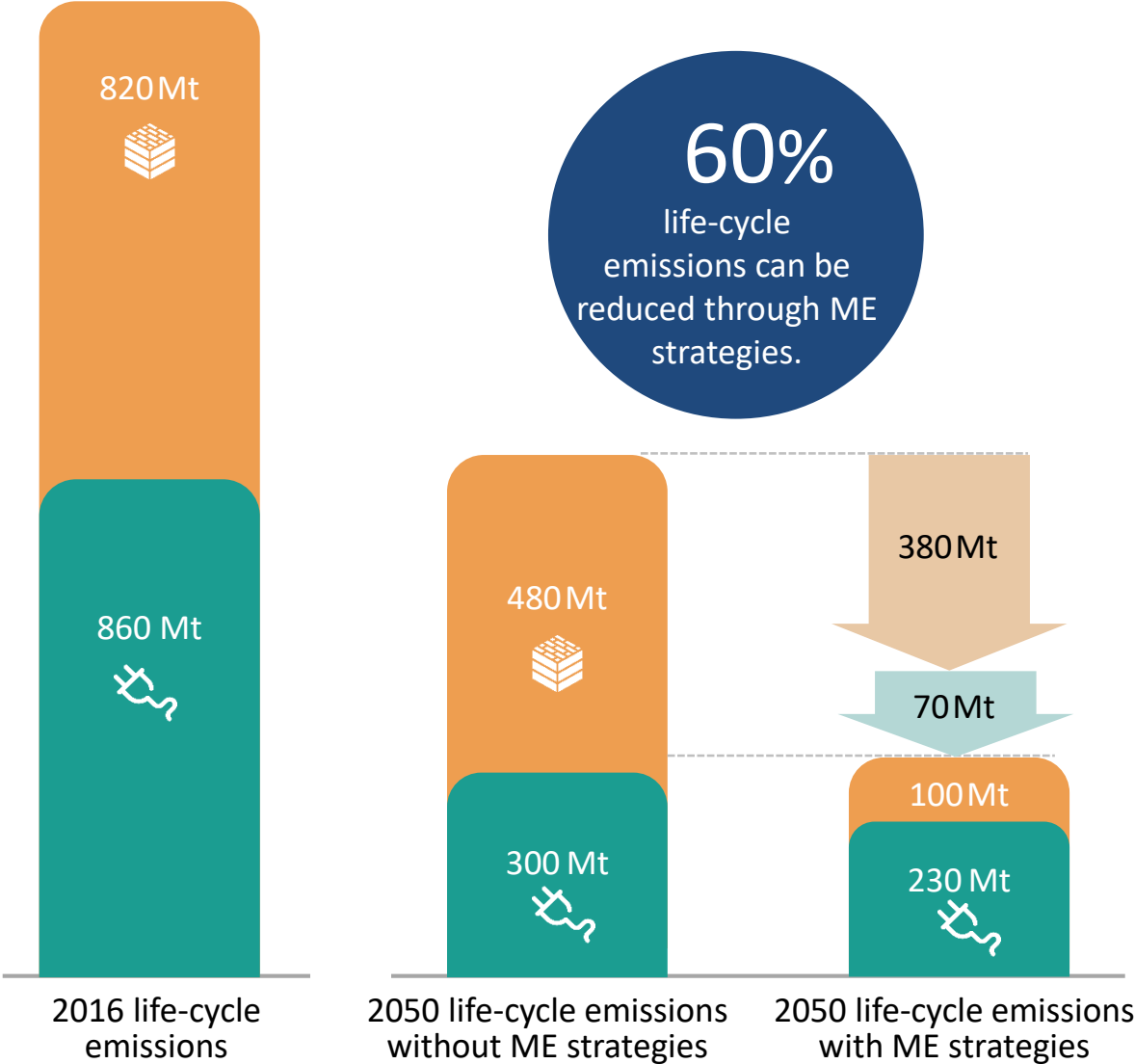


(a) MES=Material Efficiency Strategies

# MES can reduce 60% of lifecycle emissions from homes in China and India in 2050

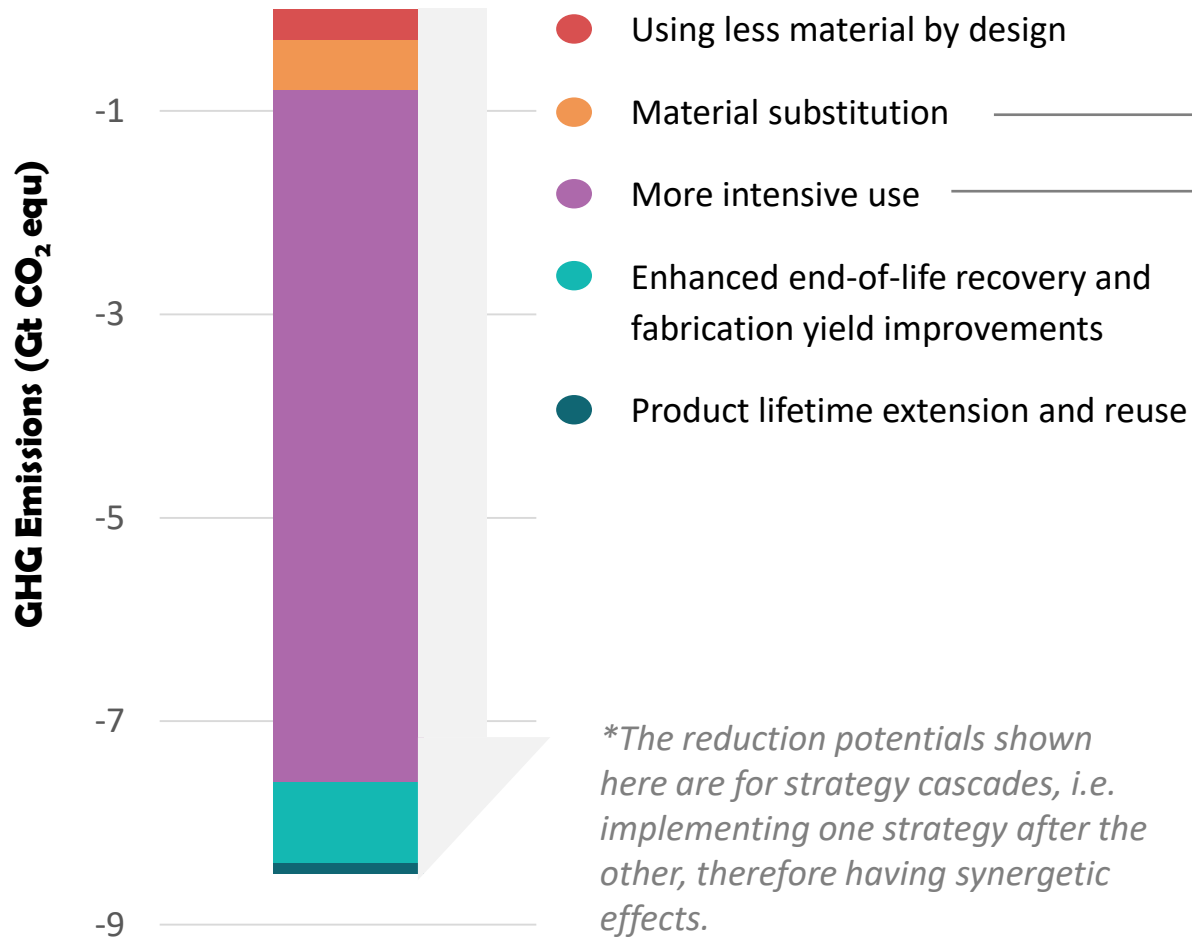
## China and India


-  Material cycle emissions
-  Emissions from operational energy use
-  Material cycle emission reductions
-  Operational energy use emission reductions





# More intensive use and recycling are the most important strategies


## Potential GHG savings from material efficiency strategies for homes in G7 (2016-2060)



Most of the strategies reduce predominantly material related emissions 

Some affect materials and operational energy use  

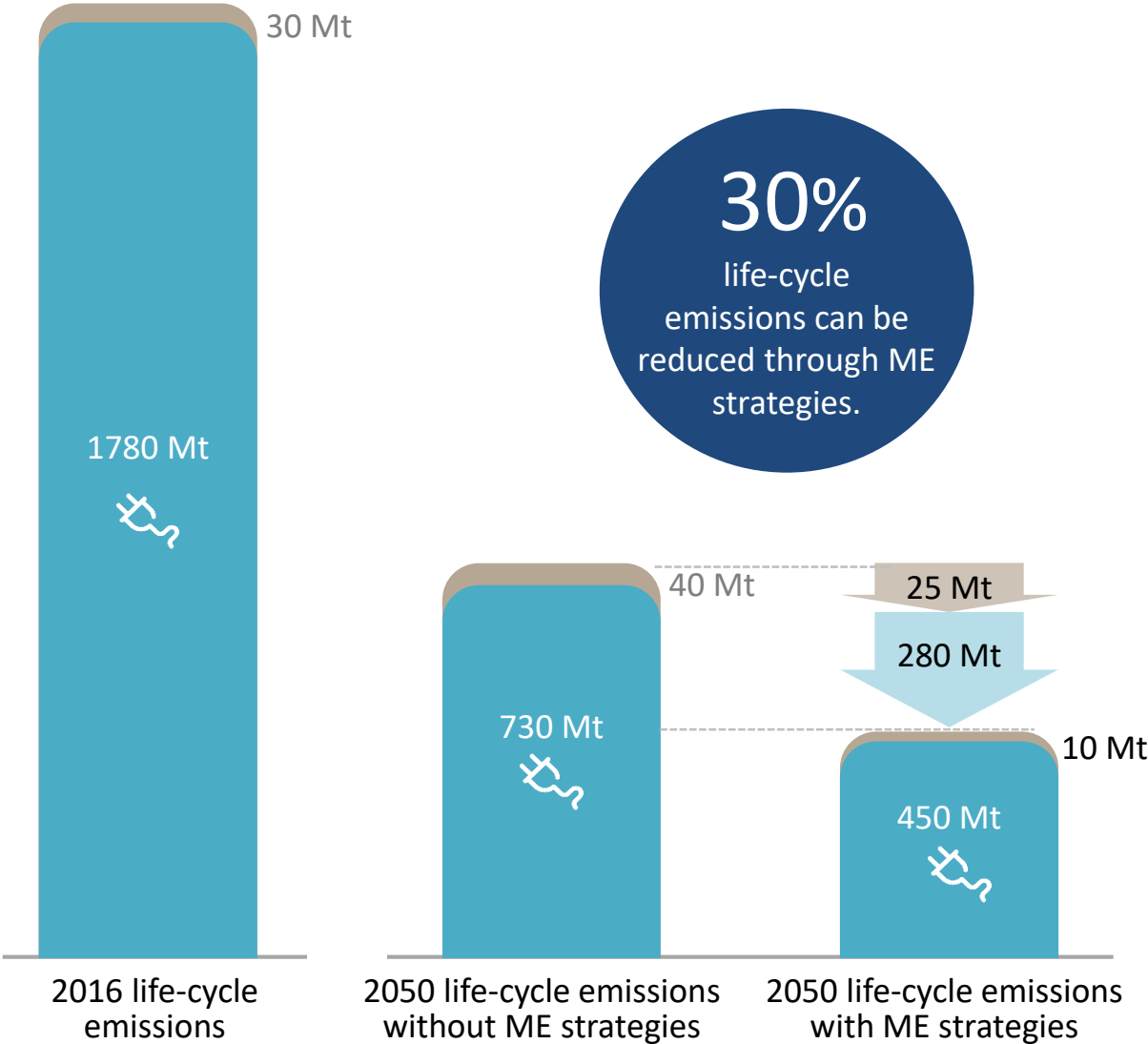
'More intensive use' reduces materials and heating/cooling needs 





'Material substitution' (wood instead of cement) can increase energy use 

**Ca. 20% cumulative savings**

# Material Efficiency Strategies can reduce 30% of lifecycle emissions from cars in G7 countries in 2050





 **G7 Countries**

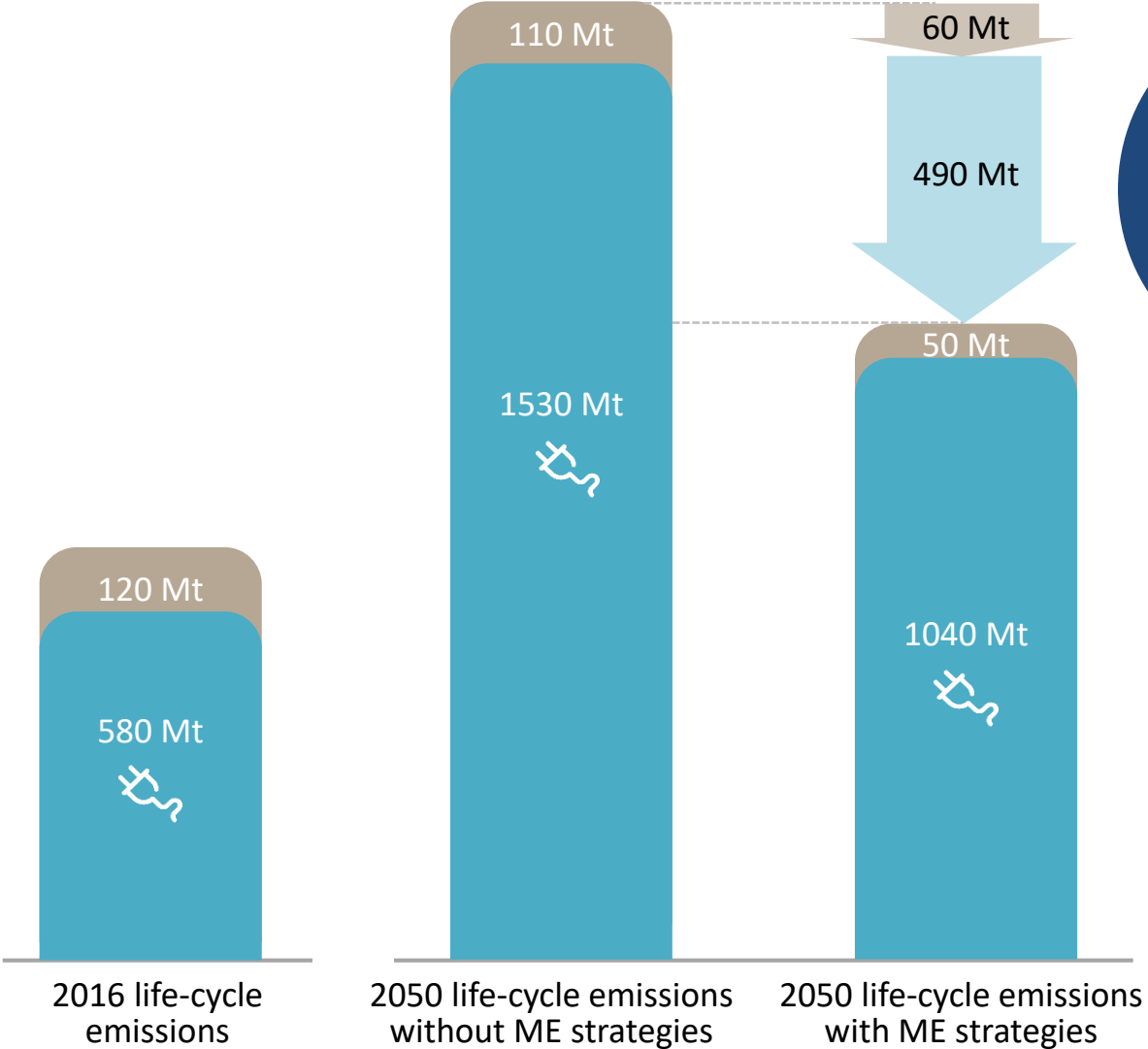


-  Material cycle emissions
-  Emissions from operational energy use
-  Material cycle emission reductions
-  Operational energy use emission reductions

# Material Efficiency Strategies can reduce 35% of lifecycle emissions from cars in China and India in 2050

 **China and India**

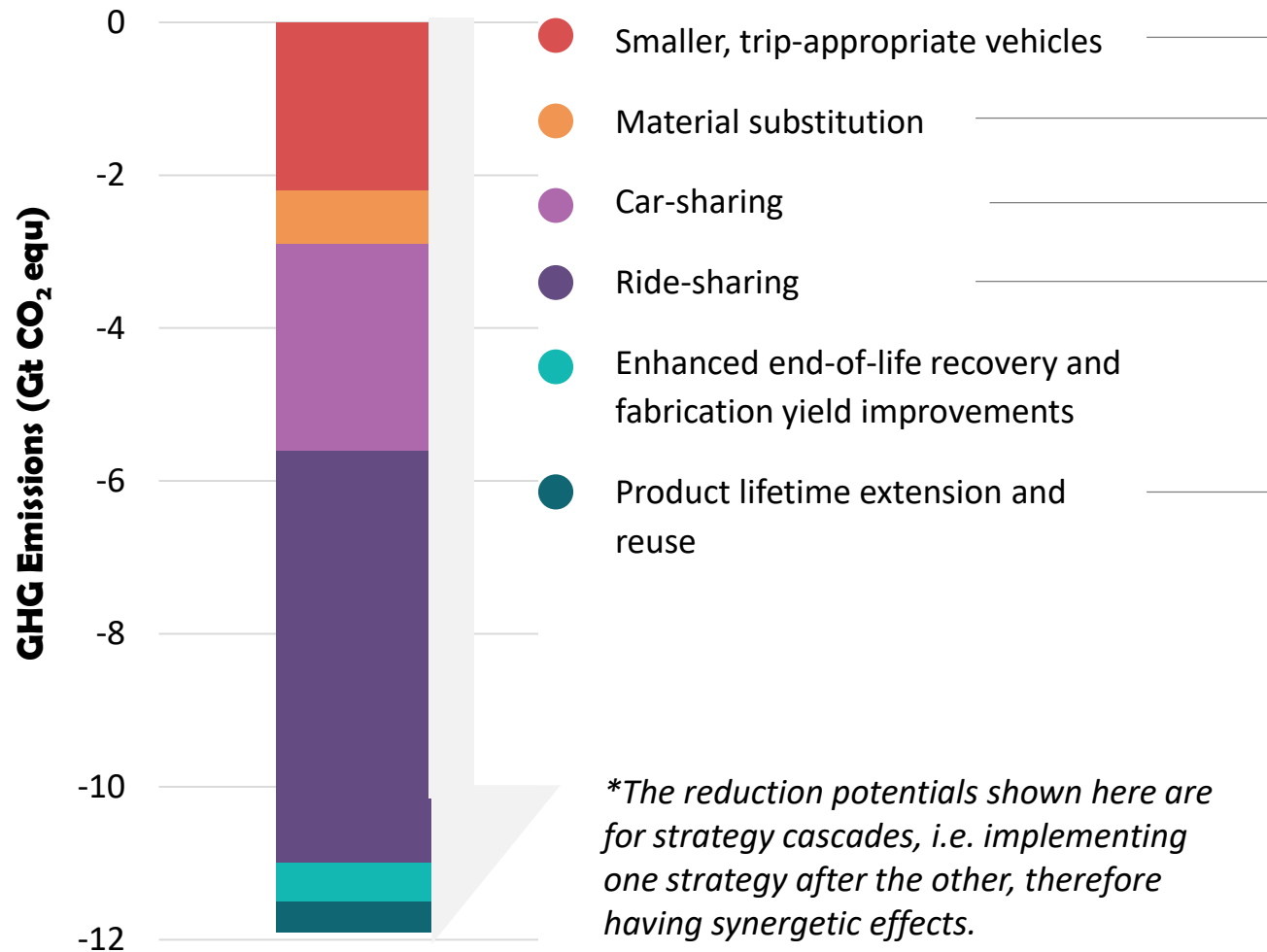
-  Material cycle emissions
-  Emissions from operational energy use
-  Material cycle emission reductions
-  Operational energy use emission reductions



**35%**  
 life-cycle emissions can be reduced through ME strategies.

# More intensive use, leaner vehicles and recycling are crucial

 Potential GHG savings from material efficiency strategies for cars in G7 (2016-2060)



Most promising strategies reduce materials AND operational emissions through

- Reducing the number of vehicles
- Making vehicles lighter



**Ca. 25% cumulative savings**

# Vision

Multifamily, wooden buildings as new construction, NZEB

Shared facilities

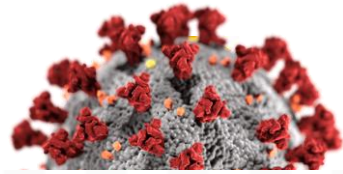
Shared fleets of vehicles of various sizes

Zero emissions material production from 203x



# Our response to COVID-19: A Threat to Resource Efficiency

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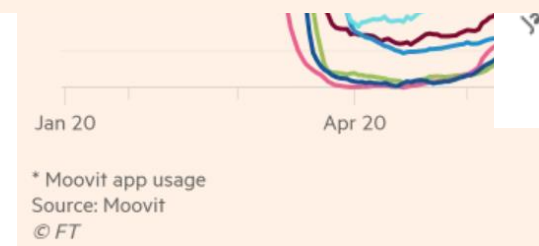
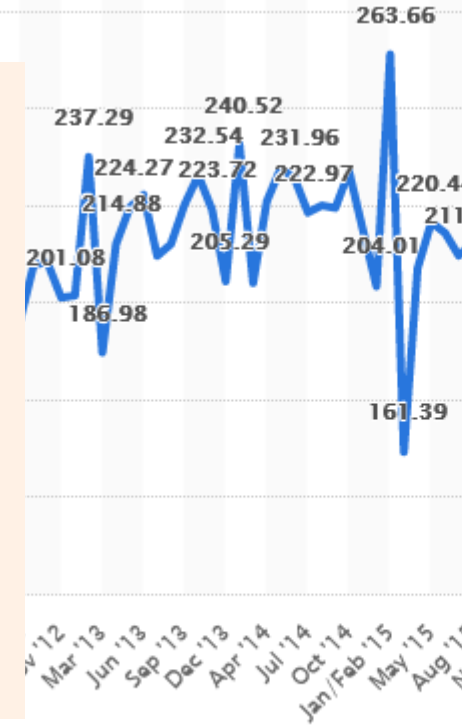


- In response, manufacturers from General Motors to Germany's Daimler poured billions of dollars into new services offering car sharing, taxi services or the option to access vehicles without the hassle of a purchase.

- Covid-19 may have turned the tide.

Indications from China, which came out of lockdown as Europe and the Americas were just entering theirs, are of a sharp rise in individual car use as commuters shun public transport.

- Hesitance to shared mobility



The pandemic has convinced some finally give up on city living.

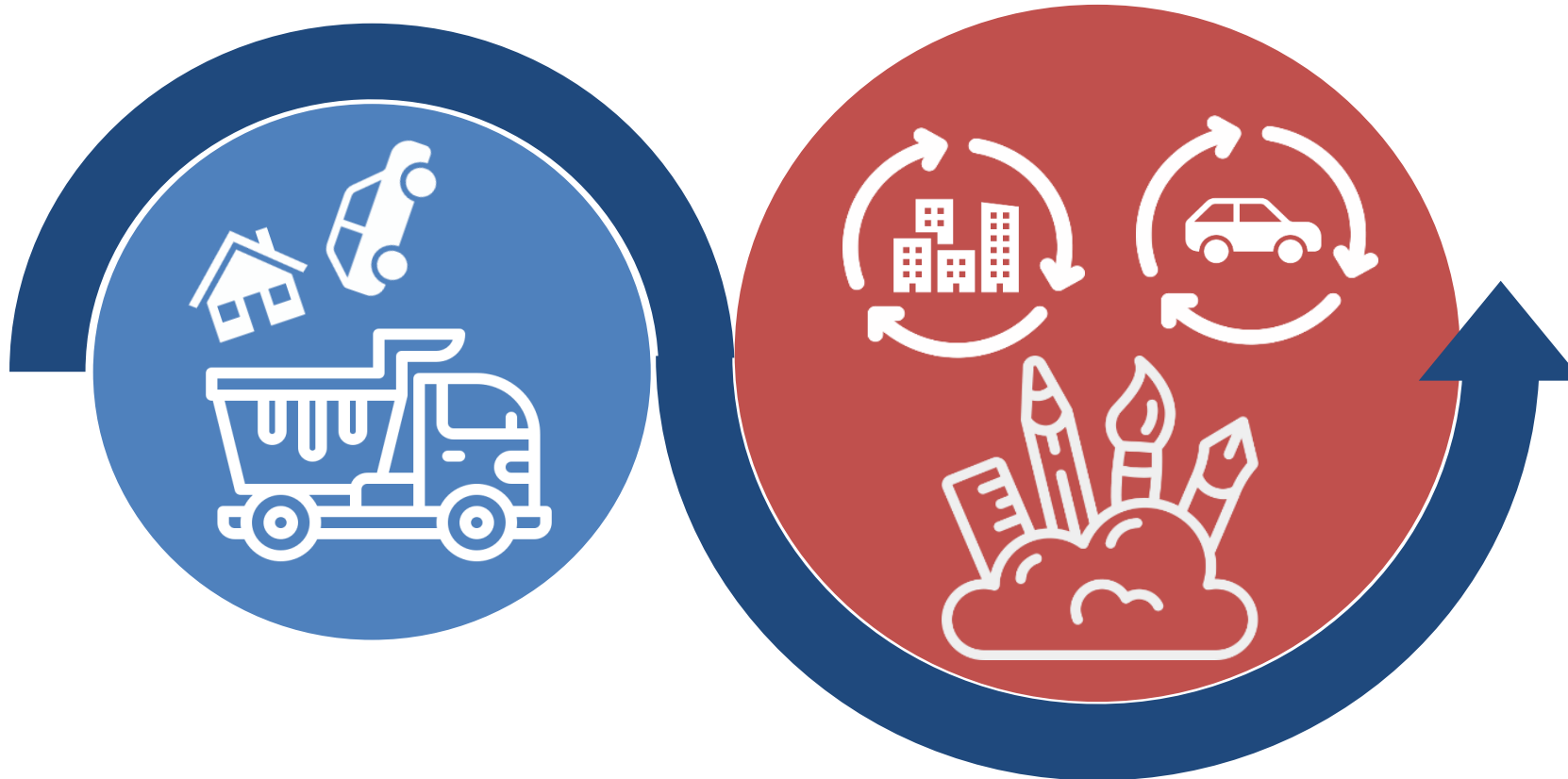




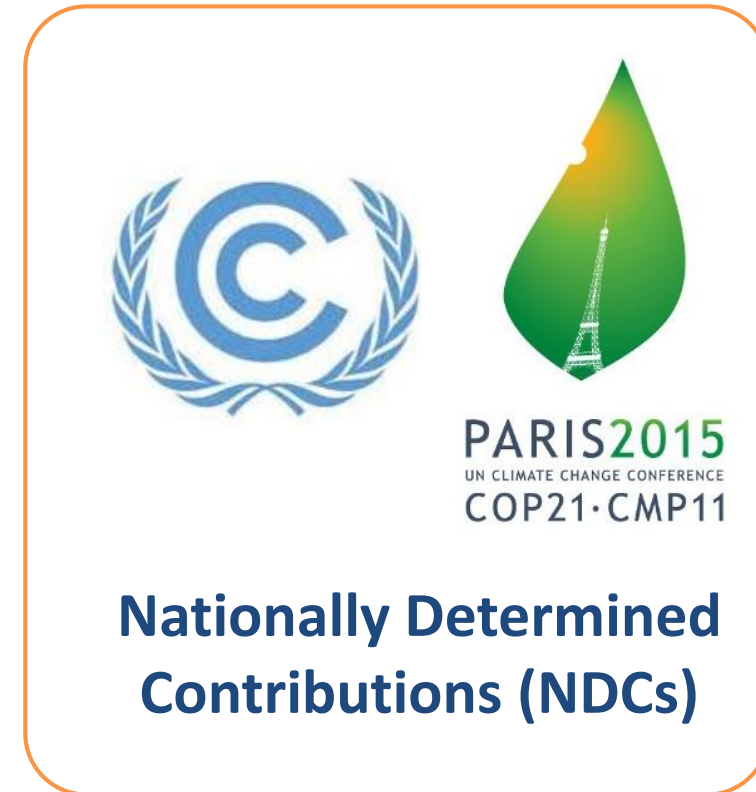
*Current material efficiency policies often lack a climate impact perspective and climate policies often miss the material-efficiency perspective*

Current material-related policies focus mostly on **end-of life** landfill diversion

However, the **design** of houses and vehicles is a key point of leverage for GHG impact



# Policies that apply across sectors may be of equal importance





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# THANK YOU

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Download the summary and other material at:

[www.resourcepanel.org](http://www.resourcepanel.org)

<https://environmentalfootprints.org/>



For questions and engagement please contact [edgar.hertwich@ntnu.no](mailto:edgar.hertwich@ntnu.no)