



### Terms of use

- This slide deck is developed by the Secretariat of the International Resource Panel (IRP) together with Edgar Hertwich and Reid Lifset , lead authors of the IRP report “Resource Efficiency and Climate Change”.
- It is free to use for presenting information related to the IRP report “Resource Efficiency and Climate Change” or in other occasions.
- Please attribute the IRP when using the slide. For example, you can keep the footer credits at the bottom of each slide and include link to the IRP website or the report webpage.
- To download the report and summaries, please visit: <https://www.resourcepanel.org/reports/resource-efficiency-and-climate-change>
- For questions and engagement please contact: [unep-irpsecretariat@un.org](mailto:unep-irpsecretariat@un.org)

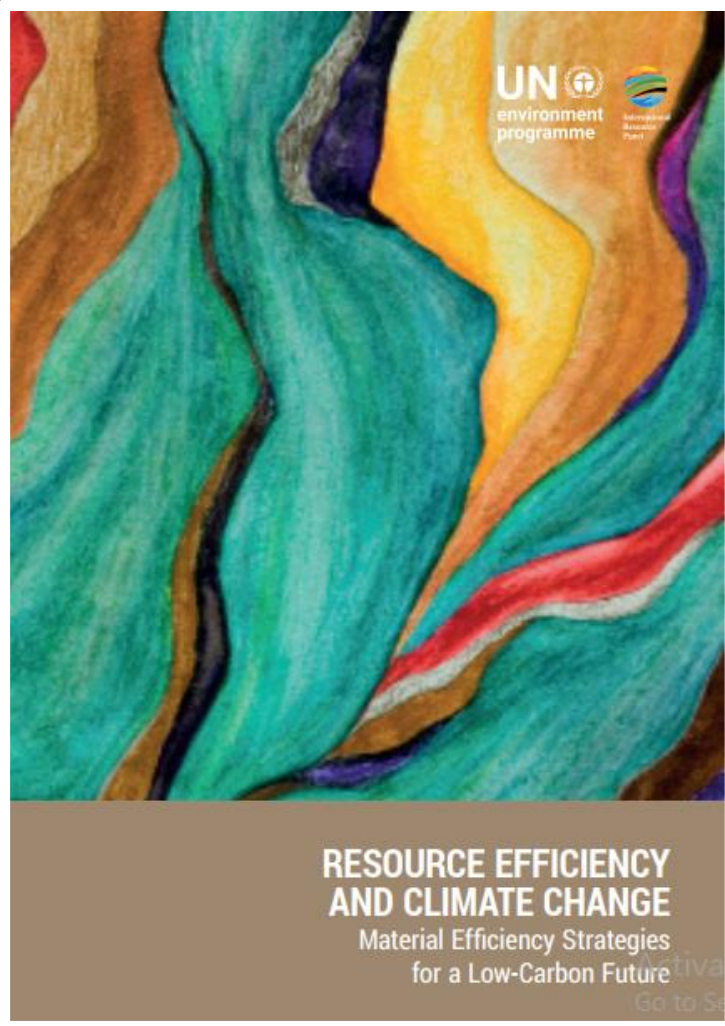
# RESOURCE EFFICIENCY AND CLIMATE CHANGE

## Material Efficiency Strategies for a Low-Carbon Future

### Lead authors

- **Edgar Hertwich**  
Professor at Norwegian University  
of Science and Technology
- **Reid Lifset**  
Research Scholar at Yale University

#ResourceEfficiency4Climate  
@UNEPIRP  
Access: [bit.ly/IRPrecc](https://bit.ly/IRPrecc)





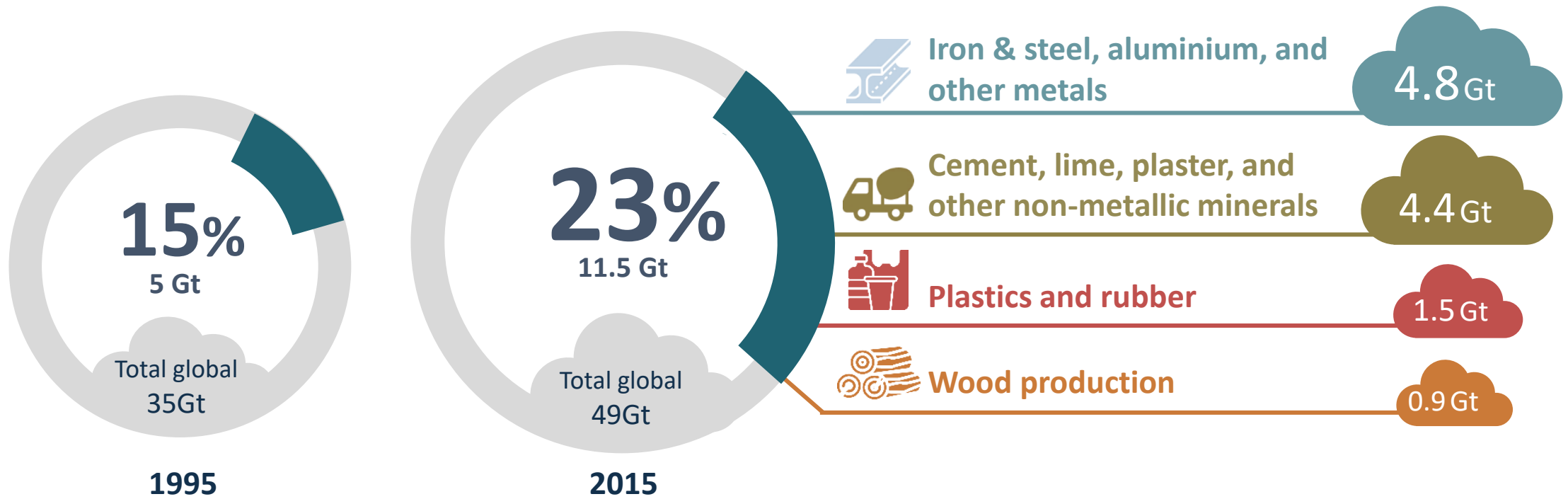


# **Insights from science for business leaders**



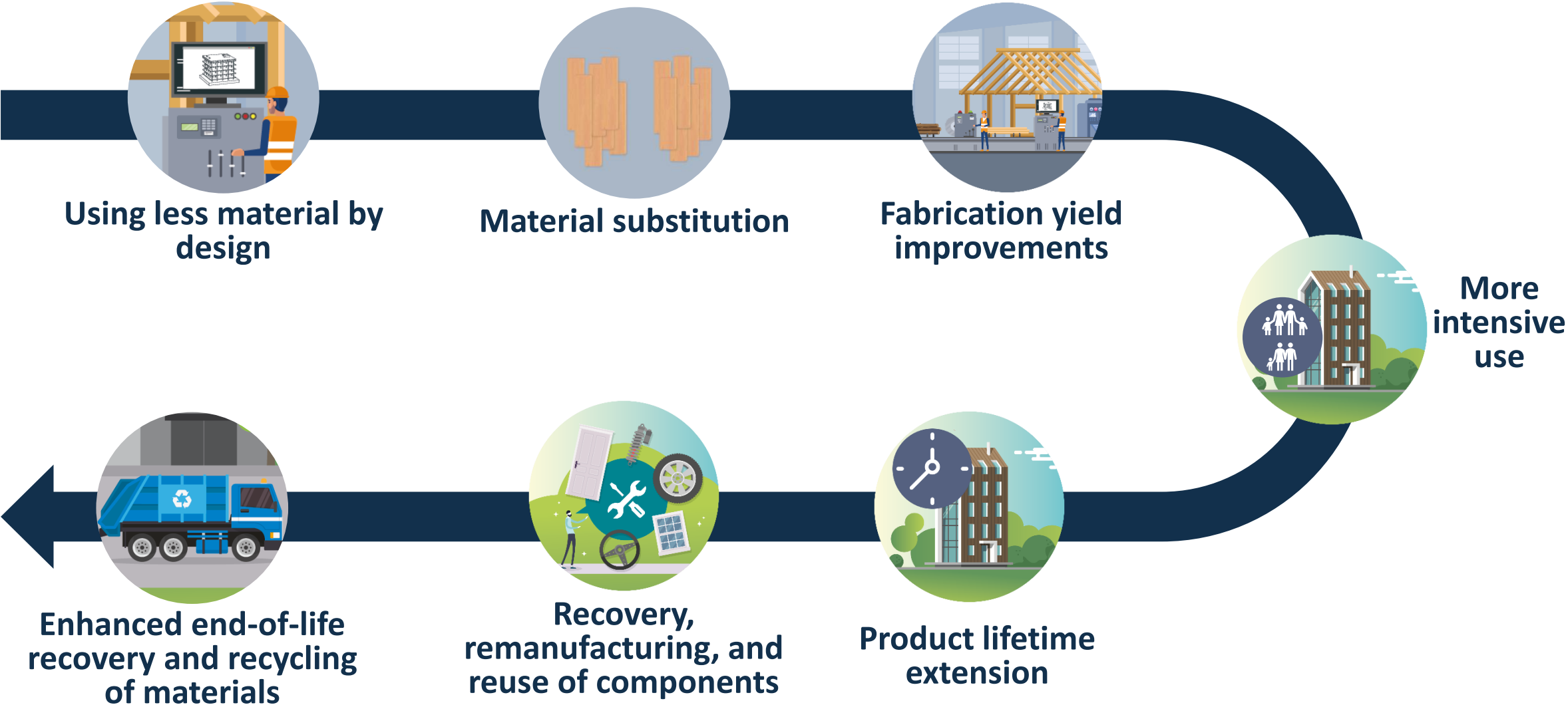
# The production of materials causes 23% of global GHG emissions

## Global GHG emissions from a value-chain perspective





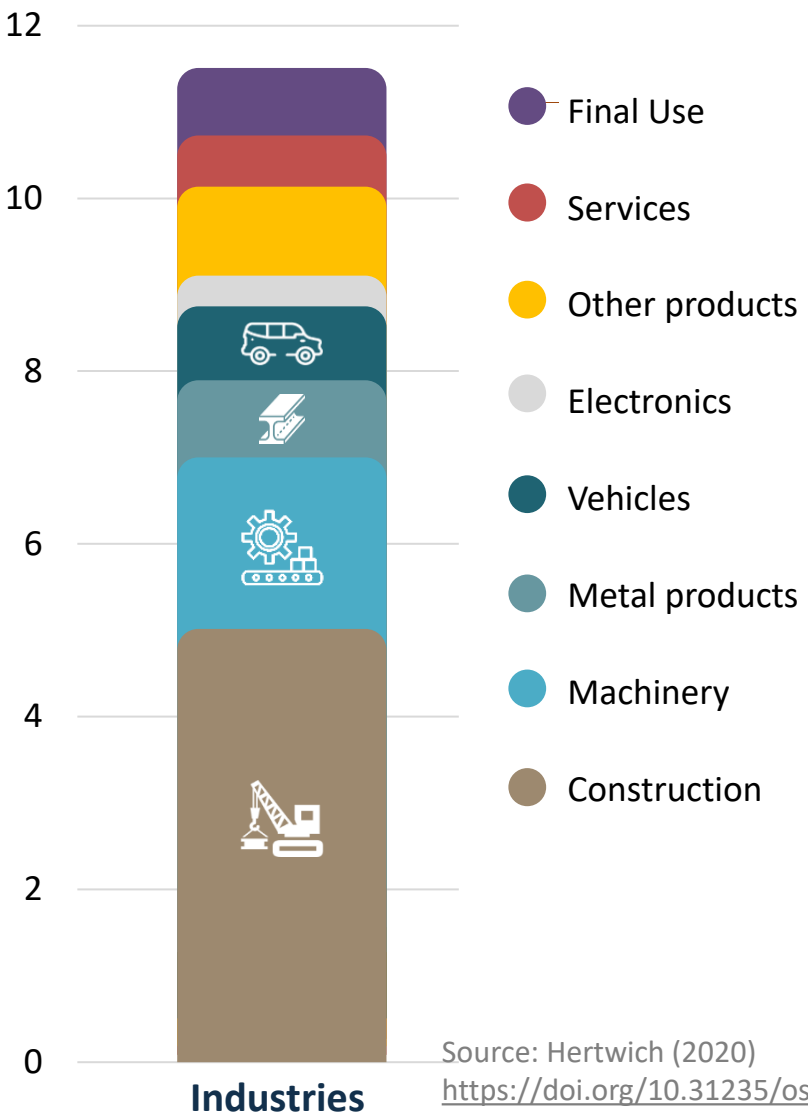
# Report assesses seven crucial Material Efficiency Strategies to reduce emissions







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

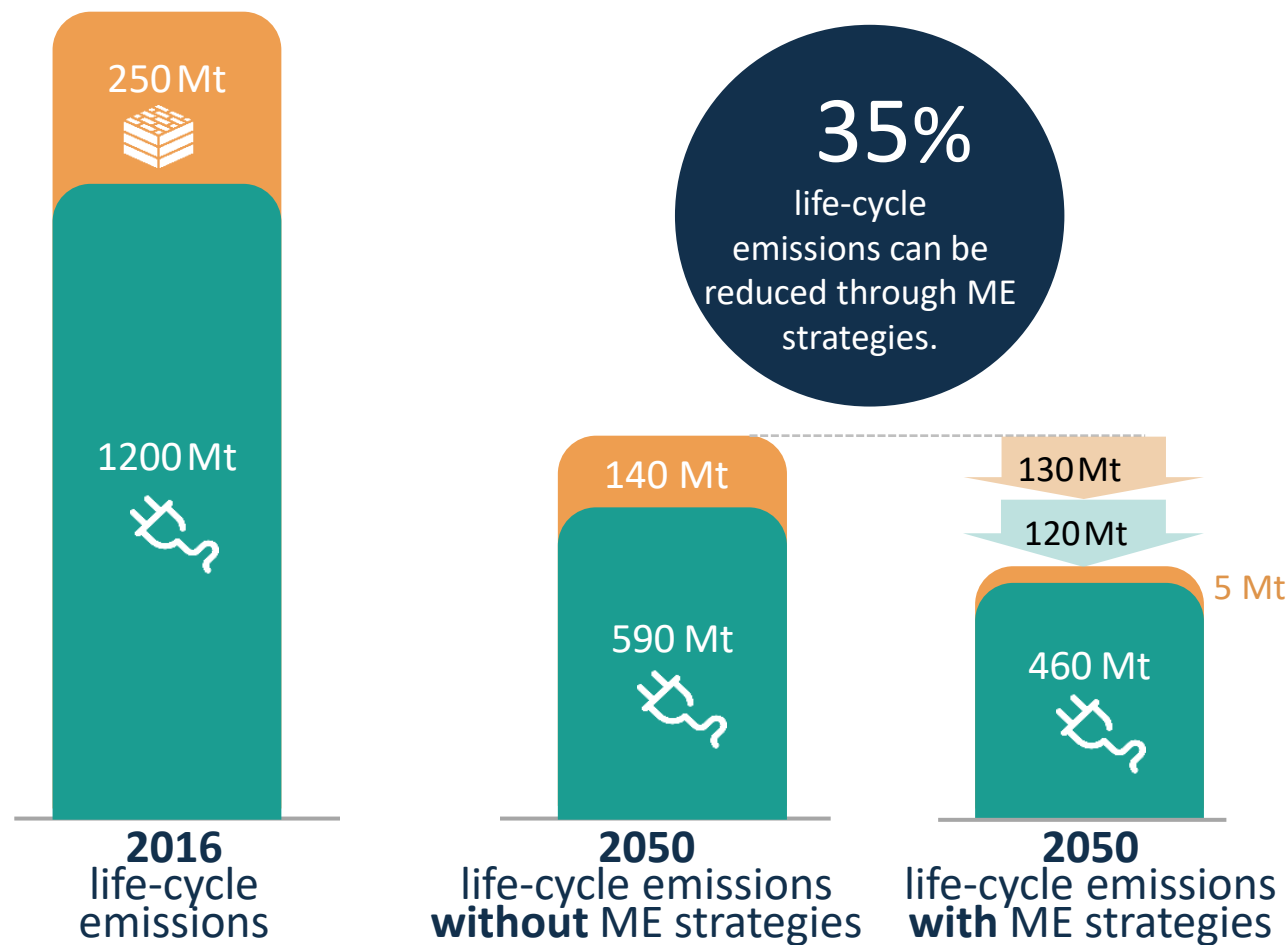
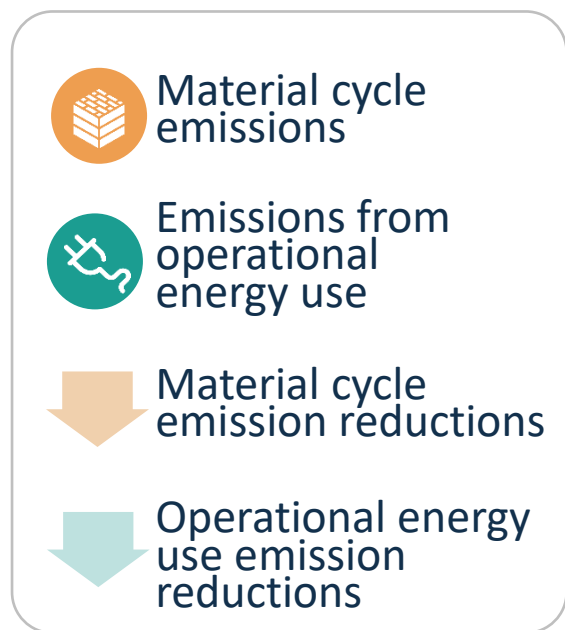


Source: Hertwich (2020)  
<https://doi.org/10.31235/osf.io/n9ecw>





# Material Efficiency Strategies can reduce **35-40%** of lifecycle emissions from homes in **G7 countries** in 2050



# Material Efficiency Strategies can reduce 60-70% of lifecycle emissions from homes in China and India in 2050



Material cycle emissions



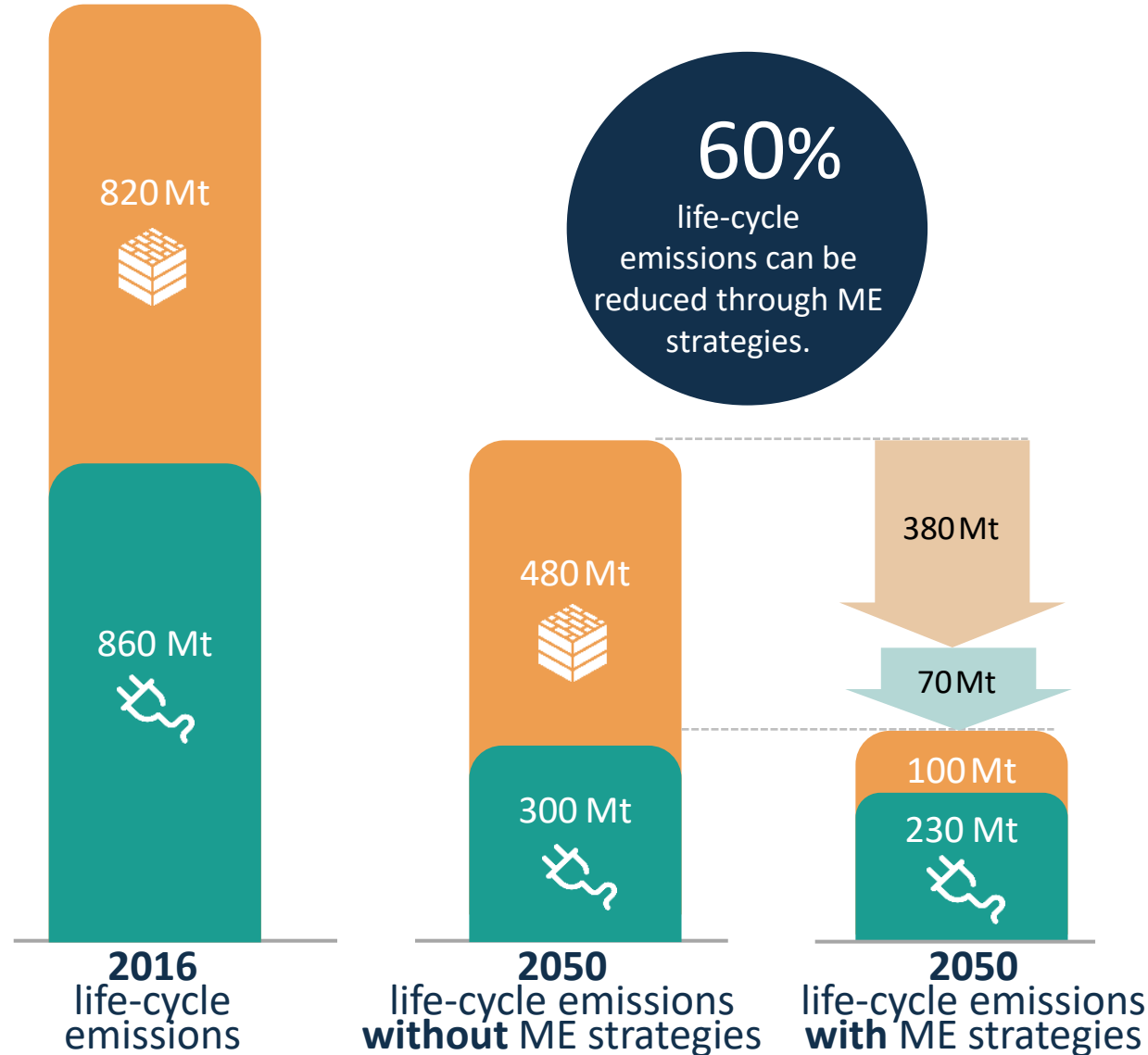
Emissions from operational energy use



Material cycle emission reductions



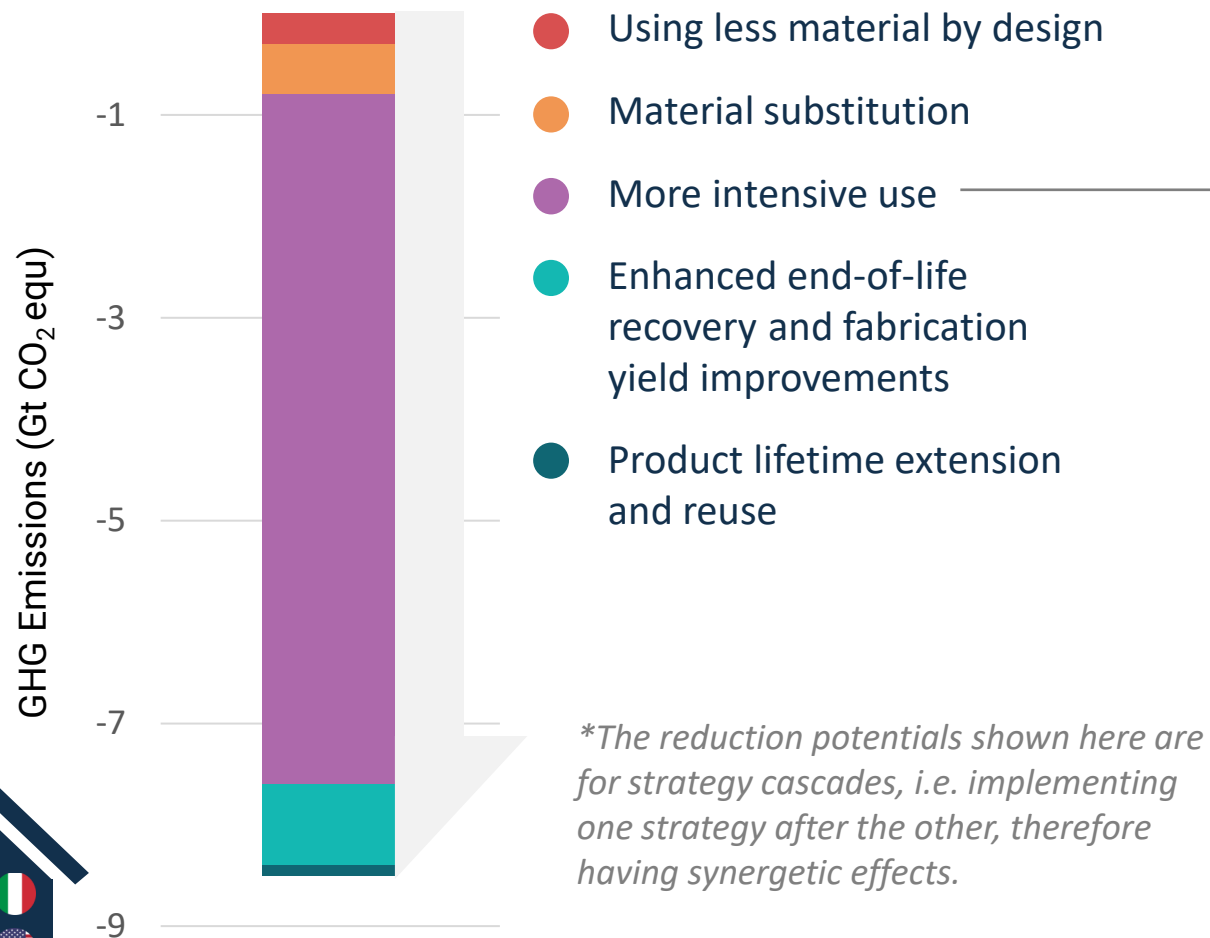
Operational energy use emission reductions





# 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

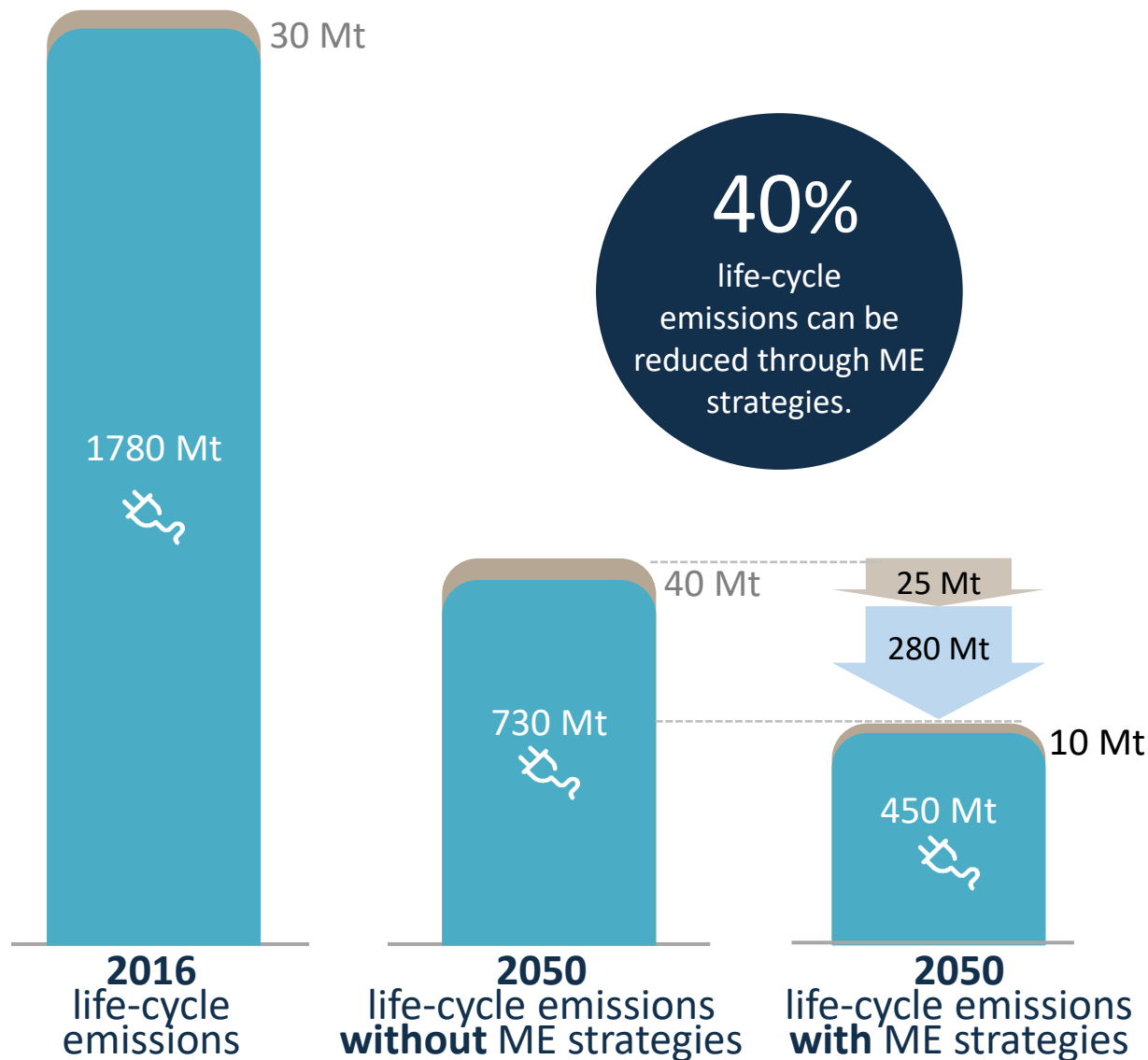
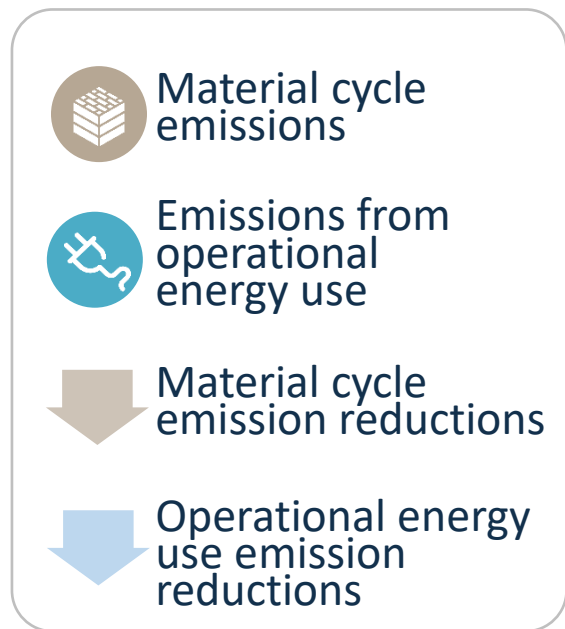
Some affect materials and operational energy use

✓ Particularly More intensive use reduces materials and heating/cooling needs





# Material Efficiency Strategies can reduce **40%** of lifecycle emissions from **cars** in **G7 countries** in 2050







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



Material cycle emissions



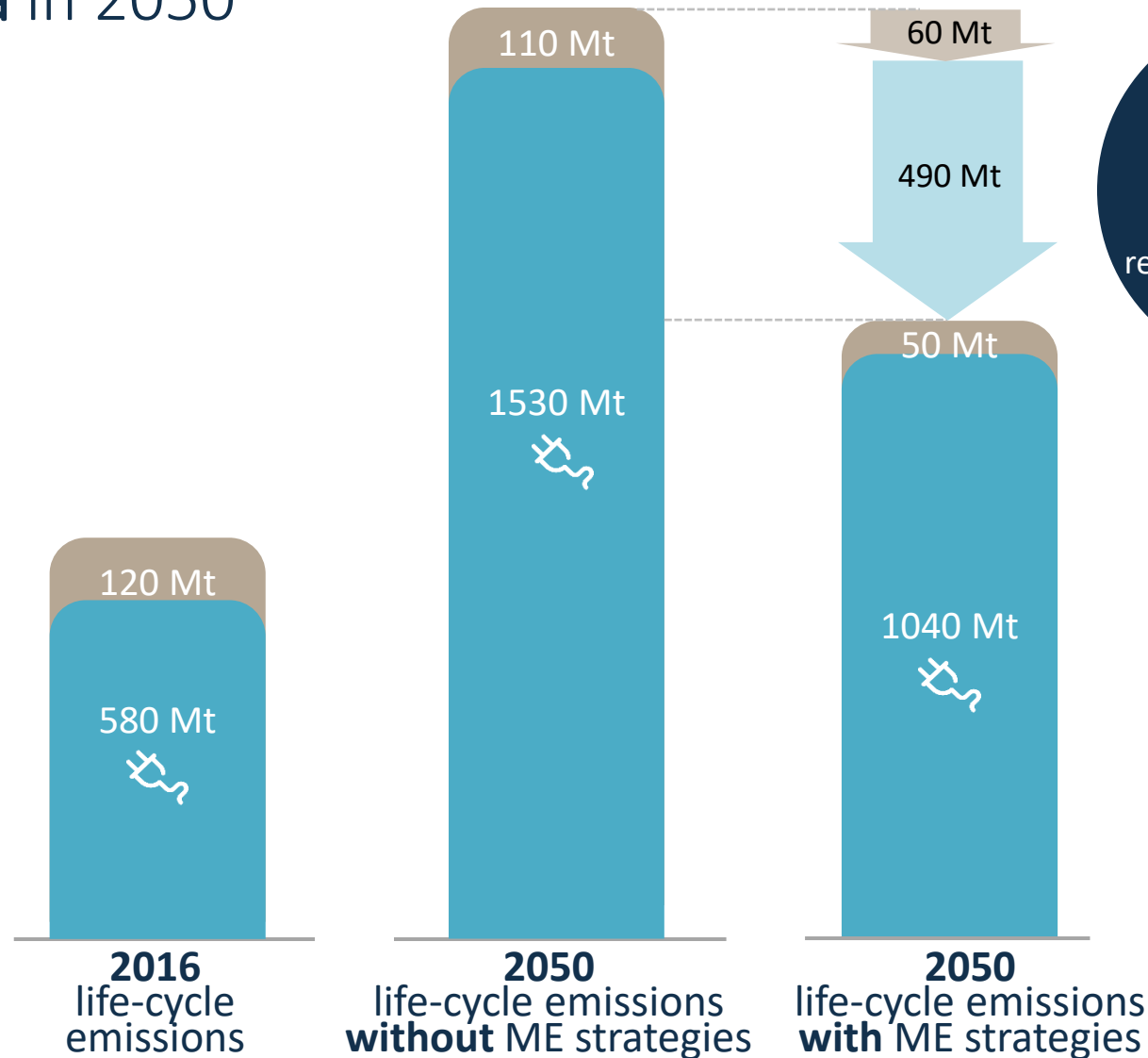
Emissions from operational energy use



Material cycle emission reductions



Operational energy use emission reductions



**35%**

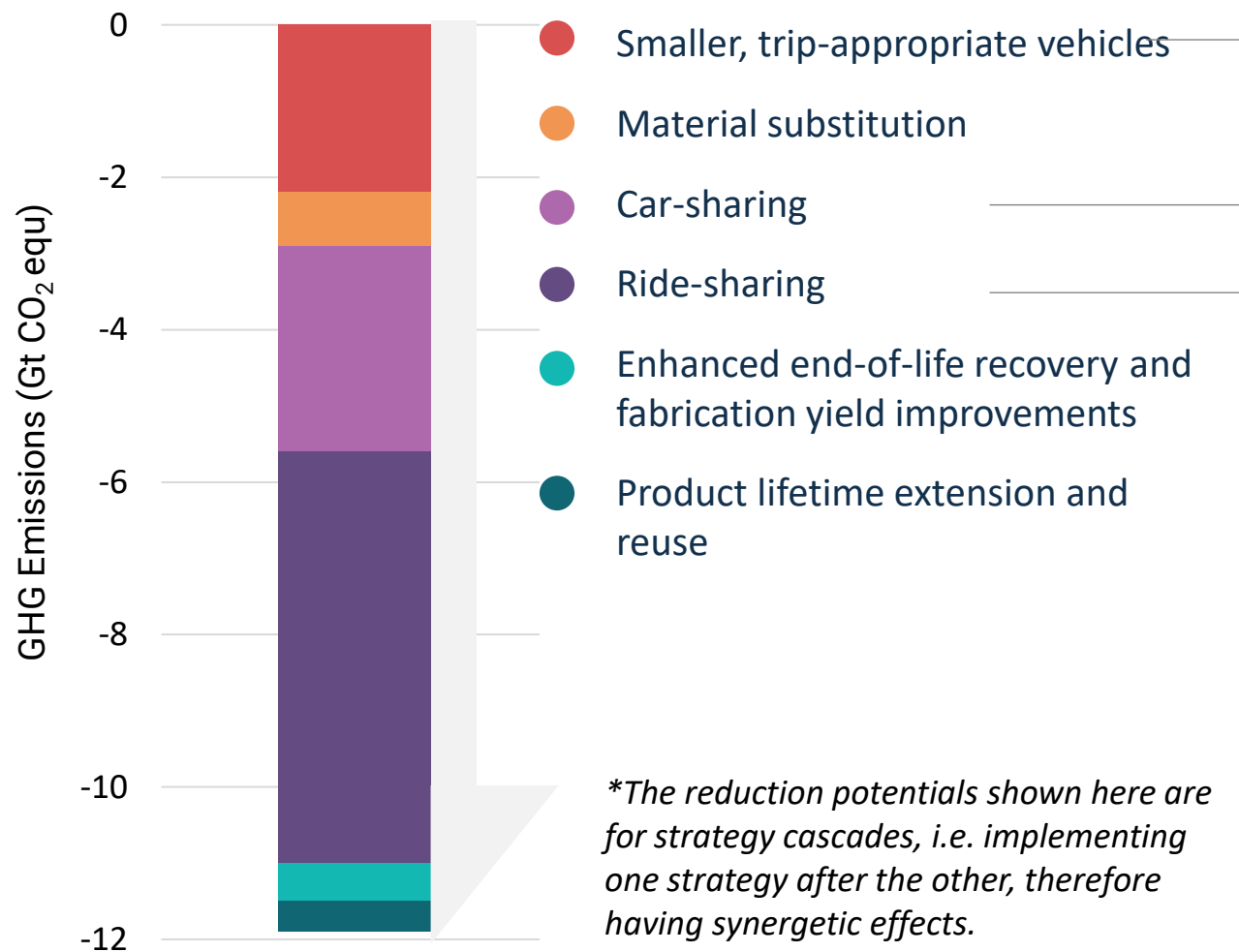
life-cycle emissions can be reduced through ME strategies.





# 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**

Intensive Use



Making vehicles lighter



**Ca. 25% cumulative savings**







# Cumulative savings from both sectors are 20Gt -36Gt

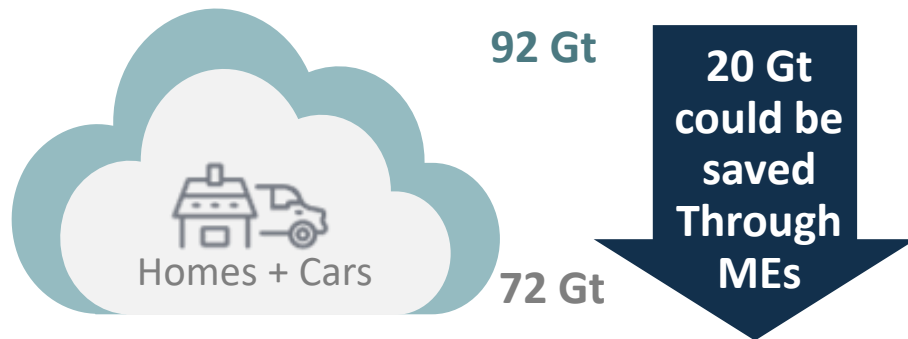


2016-2060 cumulative emissions  
**with energy measures** but **without**  
Material Efficiency (ME) strategies

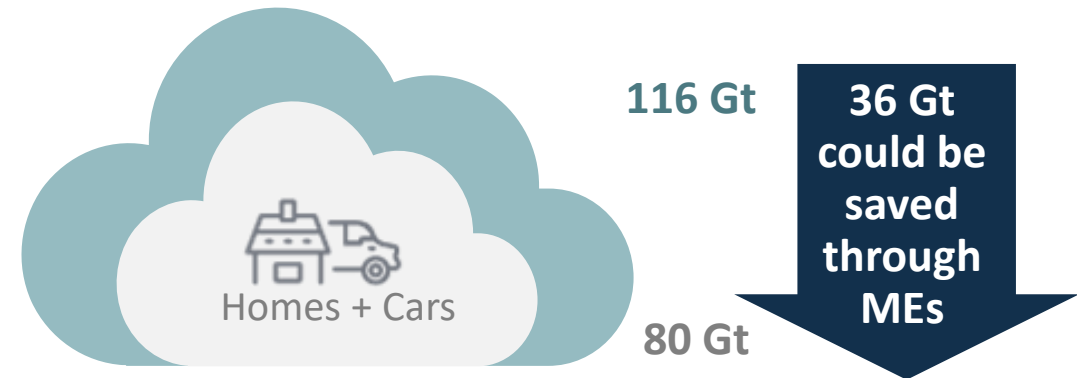


2016-2060 cumulative emissions if  
**Material Efficiency (ME)** strategies are  
applied **on top of energy measures**

## G7 countries



## China and India



To stay within a 1.5°C increase scenario, **all Material Efficiency Strategies need to be implemented as fast and extensively as possible**. These must be combined with other ambitious measures like deep-energy retrofits of buildings, shift from private to public transport, fast introduction of electric vehicles and clean energy, or innovation in the production of low-carbon materials.

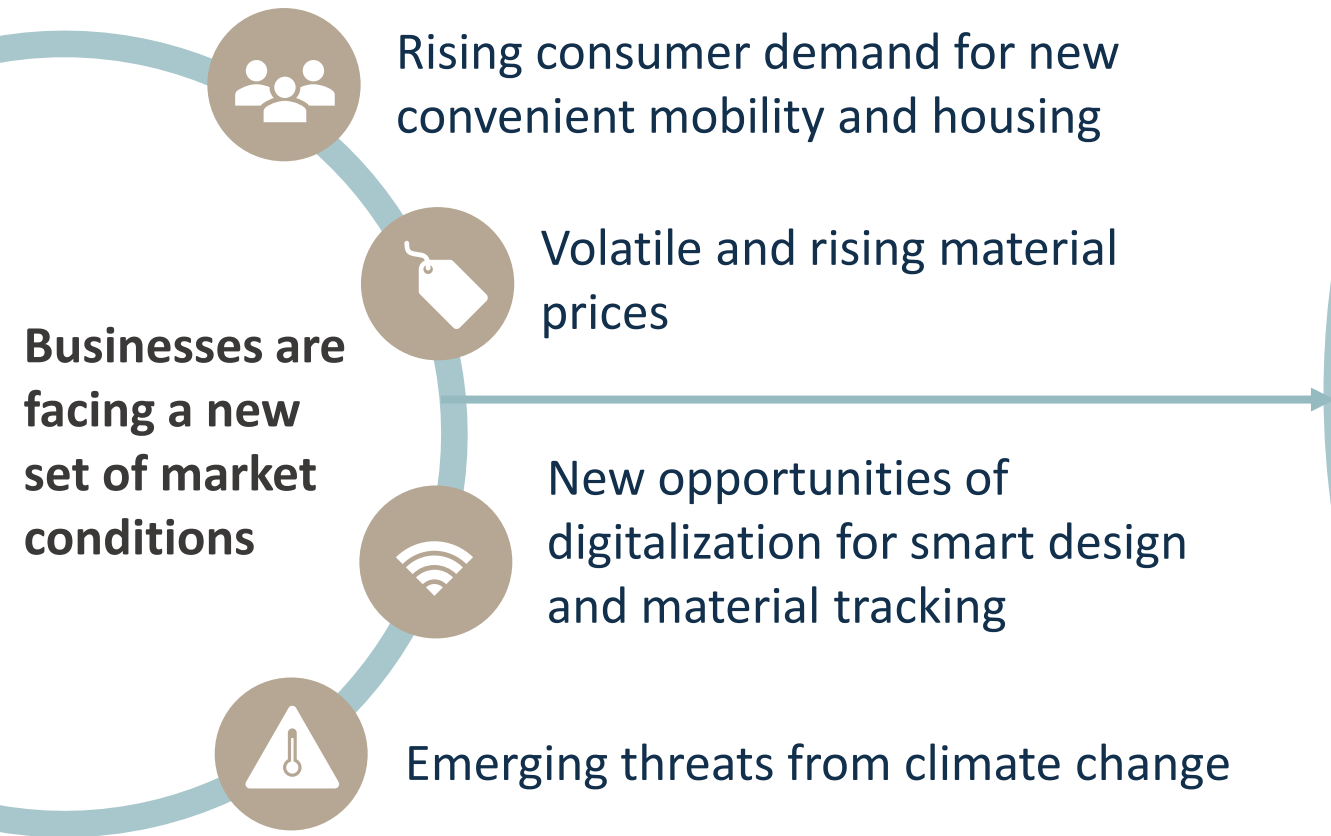


**Ideas from business  
for business**





# Material efficiency strategies can guide durable business success





# Business opportunities for material-efficient housing: Examples

Ideas from IRP partners  
and business stakeholders



High quality and  
space-efficient  
residences in  
multi-unit  
buildings



Enabling  
downsizing in new  
service models



Modular and  
prefabricated  
components and  
flexible design



Sustainably  
harvested timber



Efficient design and  
production with  
tools like building  
information  
modelling (BIM)





# Business opportunities for material-efficient mobility: Examples

Ideas from IRP partners  
and business stakeholders



Reduce trip cost  
and ownership  
efforts through  
shared mobility.



Increased  
investment in  
technology  
through higher  
utilization and  
shorter product  
cycles .



As manufacturers,  
provide efficient,  
durable, easy-to-  
maintain and  
designs for fleets



Provide  
integrated  
multi-modal  
services



Facilitate data  
sharing, securing a  
“social license to  
operate”

# Realizing these opportunities needs fundamental business model change and significantly better policies



## Fundamental business model change

Business models that base their revenue on the performance of residential and mobility solutions over their life cycles can **benefit from the savings and more innovative design of material efficiency strategies.**



## Better policies

The extensive IRP RECC policy review identifies **a gap of material efficiency policies** in the G7.

Current policy and market conditions are not incentivizing the uptake of material efficiency strategies, and in some cases even actively disincentivizing them.



An aerial photograph of a winding asphalt road through a dense forest. The road is dark and curves from the upper left towards the right. A small, light-colored car is visible on the right side of the road, moving away from the viewer. The surrounding forest is lush green, with some areas appearing darker, possibly due to shadows or different types of trees. The overall tone of the image is somewhat muted, with a dark blue/green overlay.

# **Material efficiency policies**





Policy intervention and policy evaluation is required if full benefits are to be achieved

Policy



Material  
Efficiency  
strategies



Material  
Efficiency  
outcomes



GHG  
impacts



A **life-cycle perspective** ensures best impact:  
more synergies and less burden-shifting



Policy makers need to plan **more and better evaluation** of existing and new policies to  
inform best GHG impact of future policies

Icons/FreePik



Material efficiency policies are scarce and mostly lack the climate impact perspective



However, **use and design** are key points of leverage for GHG impact.

For houses, e.g., **building codes and standards** are a central policy instrument for changes in design.

For cars, policies on **shared mobility** are evolving rapidly, but need to emphasize **net climate impacts**.



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



# Some policies pose direct barriers against material efficiency

Current policies typically hinder greater intensity of use



**Zoning and land use regulation** often specify minimum lot and dwelling size.



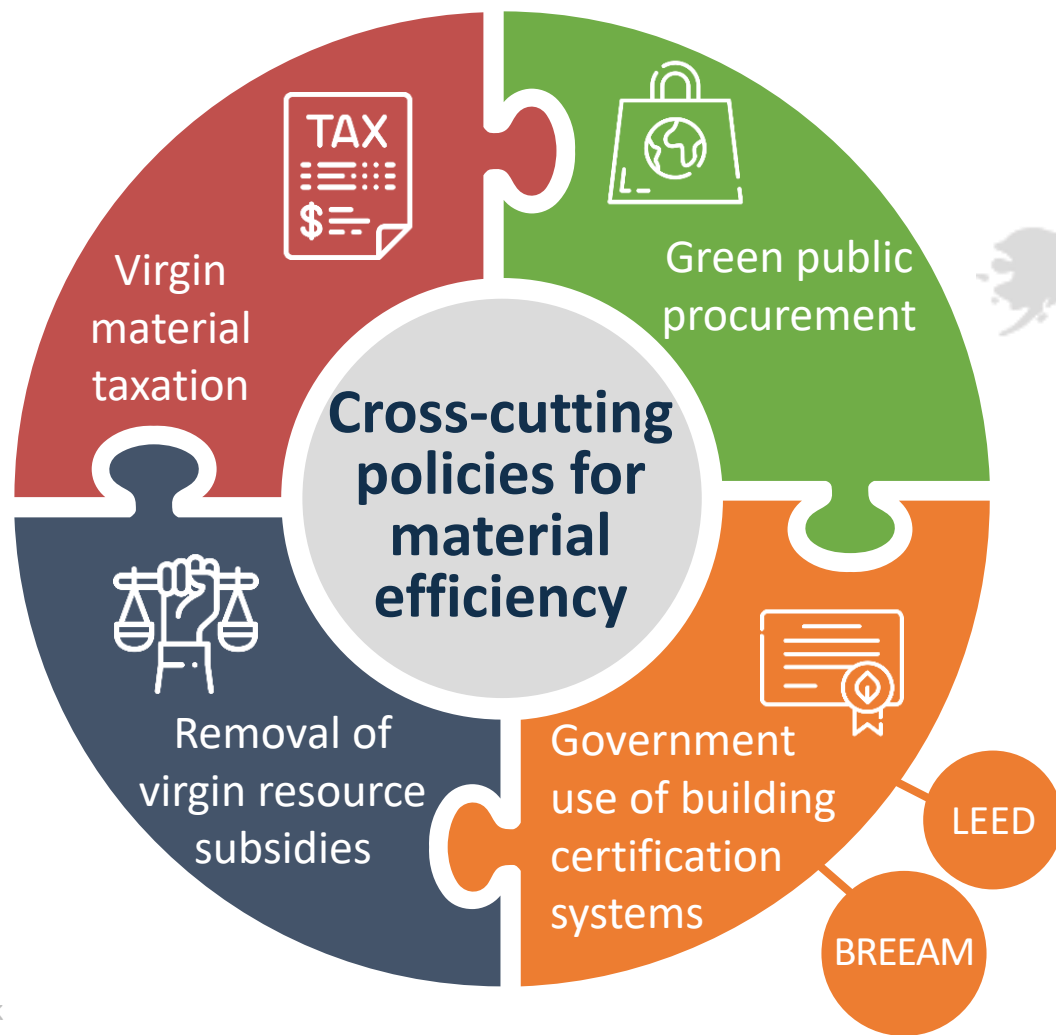
**Tax provisions** incentivize larger homes and slow the shift of households to smaller and larger homes as needed.







Policies that apply across sectors or building life cycle stages may have broader impact than those focusing specifically on one sector



Nationally  
Determined  
Contributions  
(NDCs)



Icons/Freepik



# Next steps for business leaders to turn Material Efficiency opportunities into real benefits

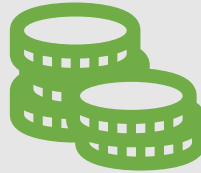
Ideas from IRP partners  
and business stakeholders

1



**Anchor business vision in  
material efficiency and  
climate science**

2



**Invest in innovative pilots**

3



**Demand and support  
policy development**





# THANK YOU

Download the report and summaries at:

<https://www.resourcepanel.org/reports/resource-efficiency-and-climate-change>



For questions and engagement please contact

[unep-irpsecretariat@un.org](mailto:unep-irpsecretariat@un.org)