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Technologies and policies for GHG emission reductions along the supply chains for the Swedish construction industry

ECEEE2017 Summer Study
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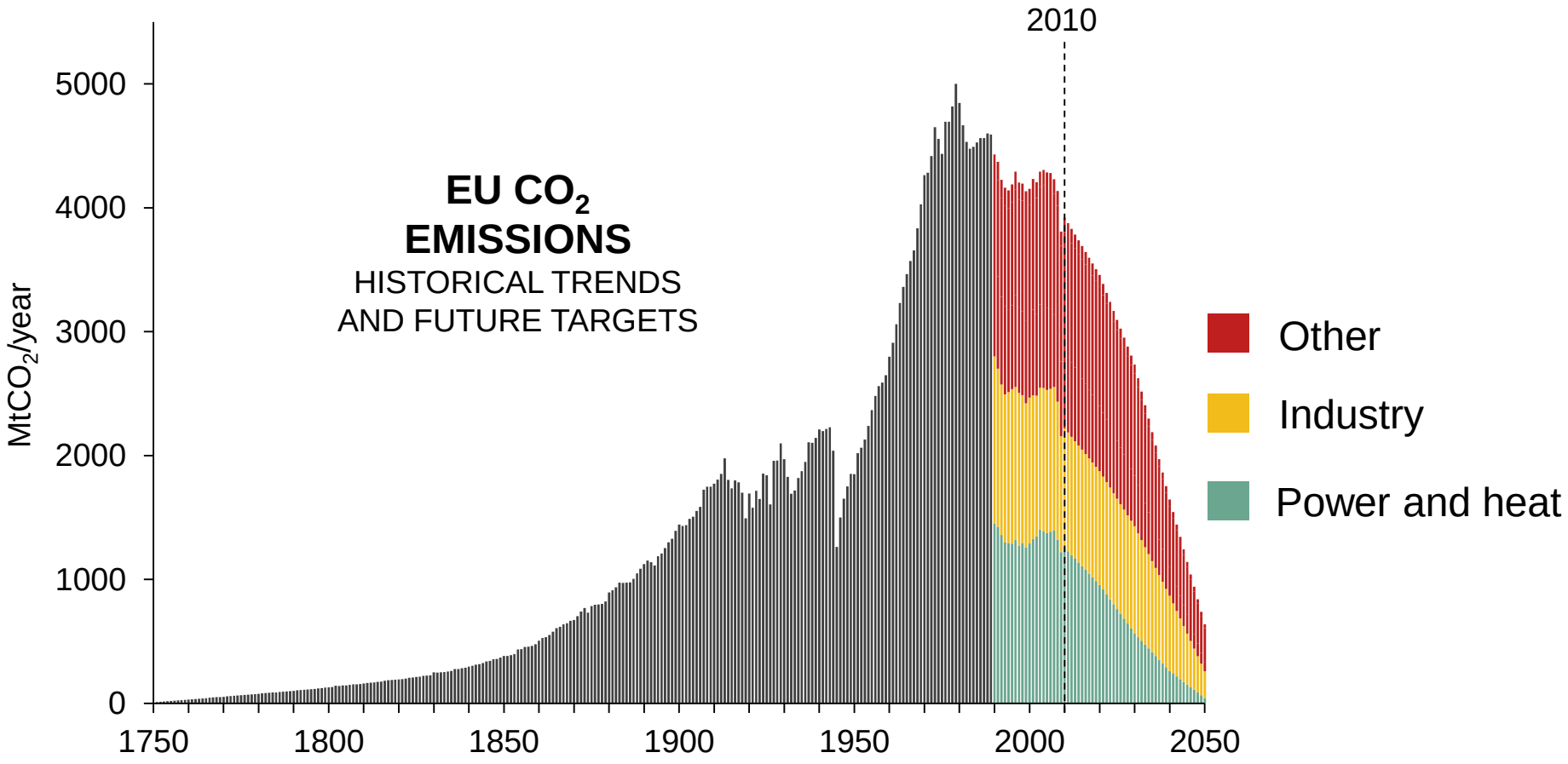
BACKGROUND



Data sources: [Boden et al., 2010; EC-JRC/PBL, 2009; European Commission 2011; EEA, 2015]

INTRODUCTION

THE VISION

- Sweden to become one of the first fossil free welfare states with a target of net zero emissions by the year 2045

DECARBONISING THE CONSTRUCTION INDUSTRY

- As the energy performance of the existing and new built building stock keeps improving **the climate impact of the construction process** becomes increasingly important

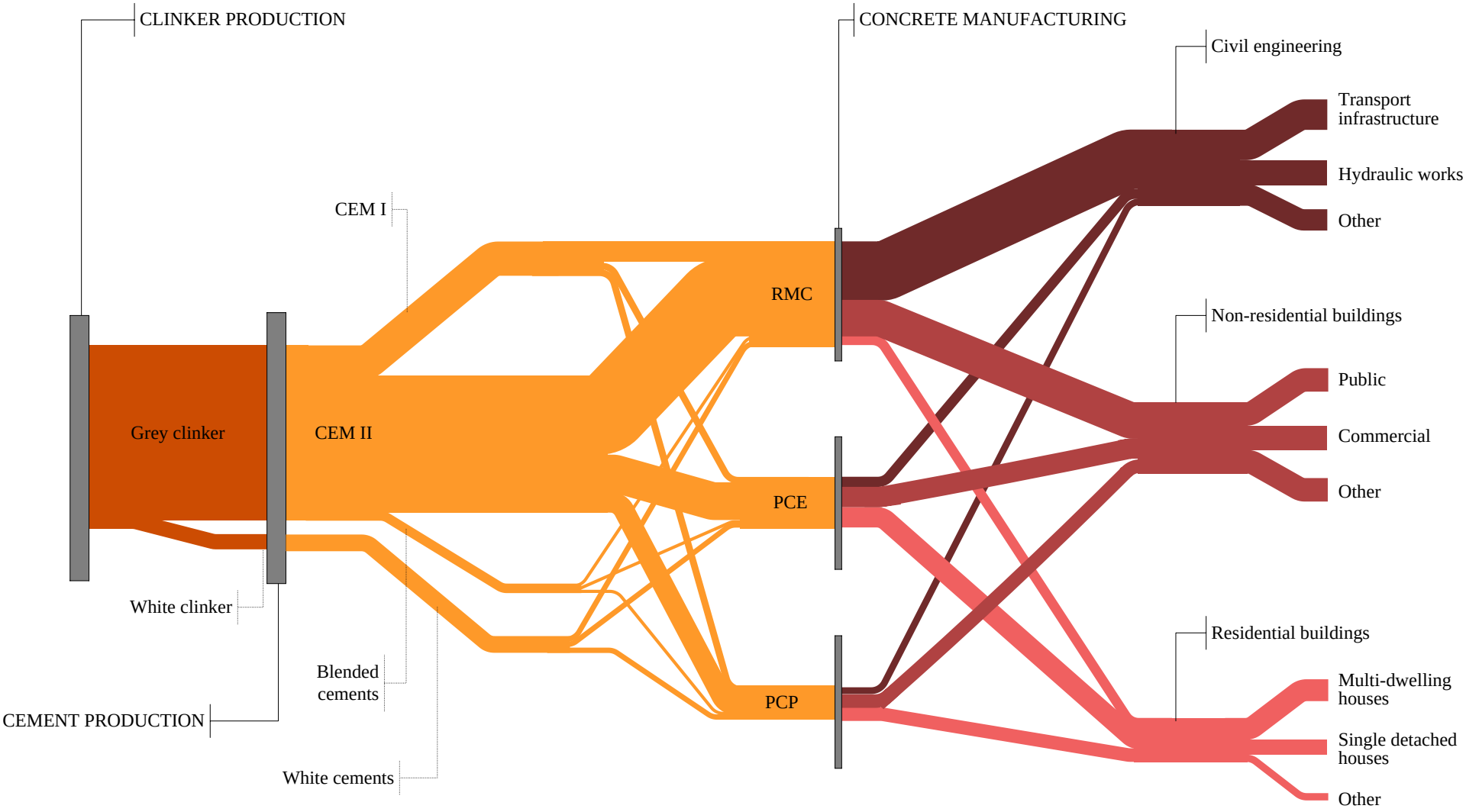
- Total climate impact of building and construction processes in Sweden is around 10 MtCO2-eq per year *(~1/5 of the total Swedish emissions)*

- Carbon dioxide emissions arising from the **primary production of building materials account** for more than half of the carbon footprints of typical construction projects

THE SUPPLY CHAIN APPROACH

PRIMARY PRODUCTION	**Steel producer**	**Cement producer**
FURTHER PROCESSING	Design and manufacturing of steel to, e.g., steel sheets, beams and bars	Concrete manufacturing, include manufacturers of ready-mix and precast concret
CONSTRUCTION	Actors involved in construction and construction planning, e.g. construction companies and consultancy firms	
PLANNING AND PROCUREMENT	Building and/or infrastructure procurer	
END-USE	Public and private business tenants, housing consumers End-users of road-infrastructure	

All sectors matter – supply chain cooperation necessary - Example cement to end products



OUR STUDY IN SHORT

TECHNOLOGIES

- Brief introduction to technological pathways that could enable deep decarbonisation of the supply chains for the Swedish construction industry

POLICIES

(i) a review of existing and possible upcoming support mechanisms and policy requirement, targeting the construction and building materials industry; and

(ii) a proposition for, and discussion on how, a Green Materials Fund could act as a vehicle for transformative change in the industries for the production of basic materials and how actors in the building and construction industry can work together to be forerunners in markets for low-CO2 steel and cement

FINDINGS

TECHNOLOGIES

Reducing CO2 emissions beyond a certain point will involve significant investments in substantial changes to the manufacturing process

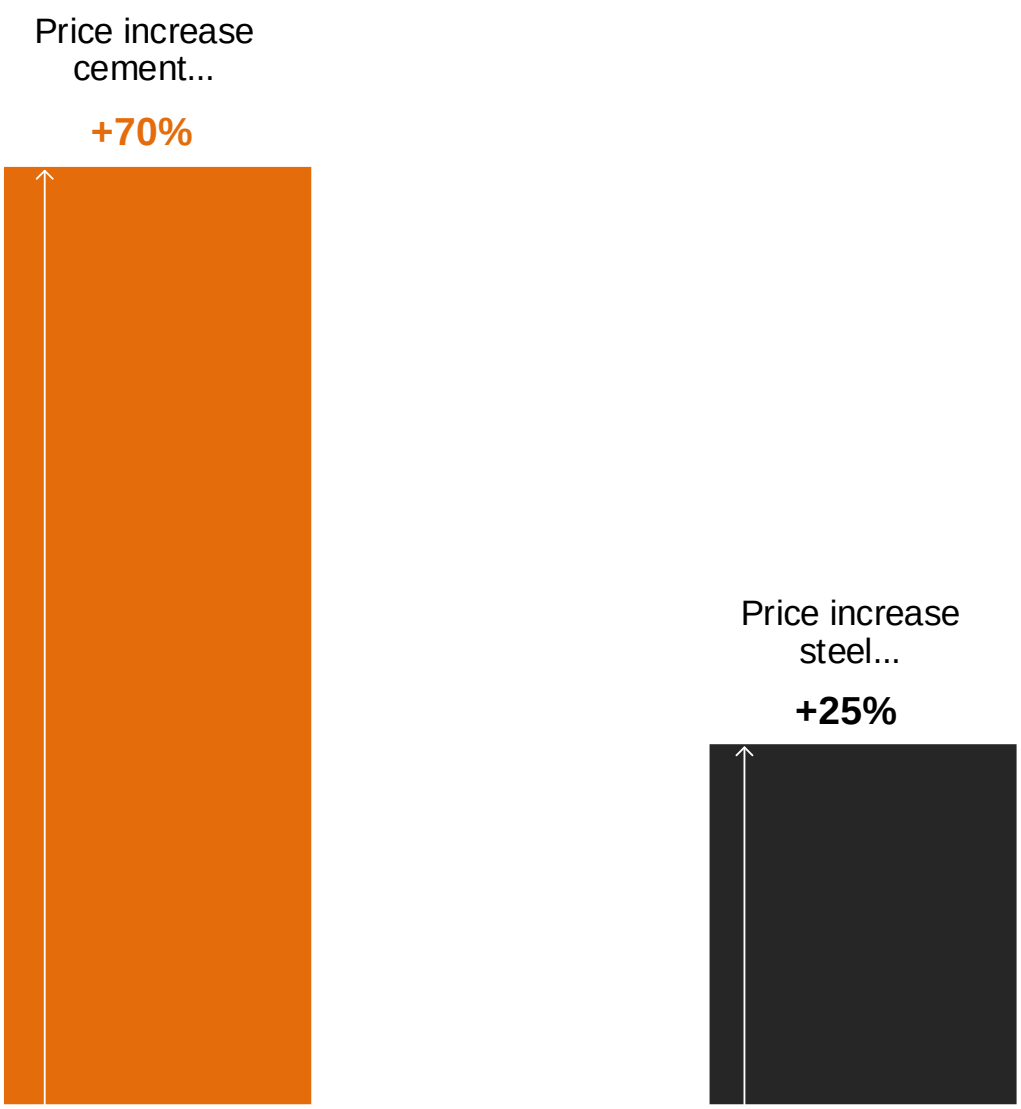
POLICIES

Complementary support mechanisms and policy interventions required.

Investing in new low-CO_2 steel- and cement-making processes would require substantial increases in the selling prices of steel and cement, but the price increase facing a car buyer or a procurer of a building would be marginal...

Cement

Steel



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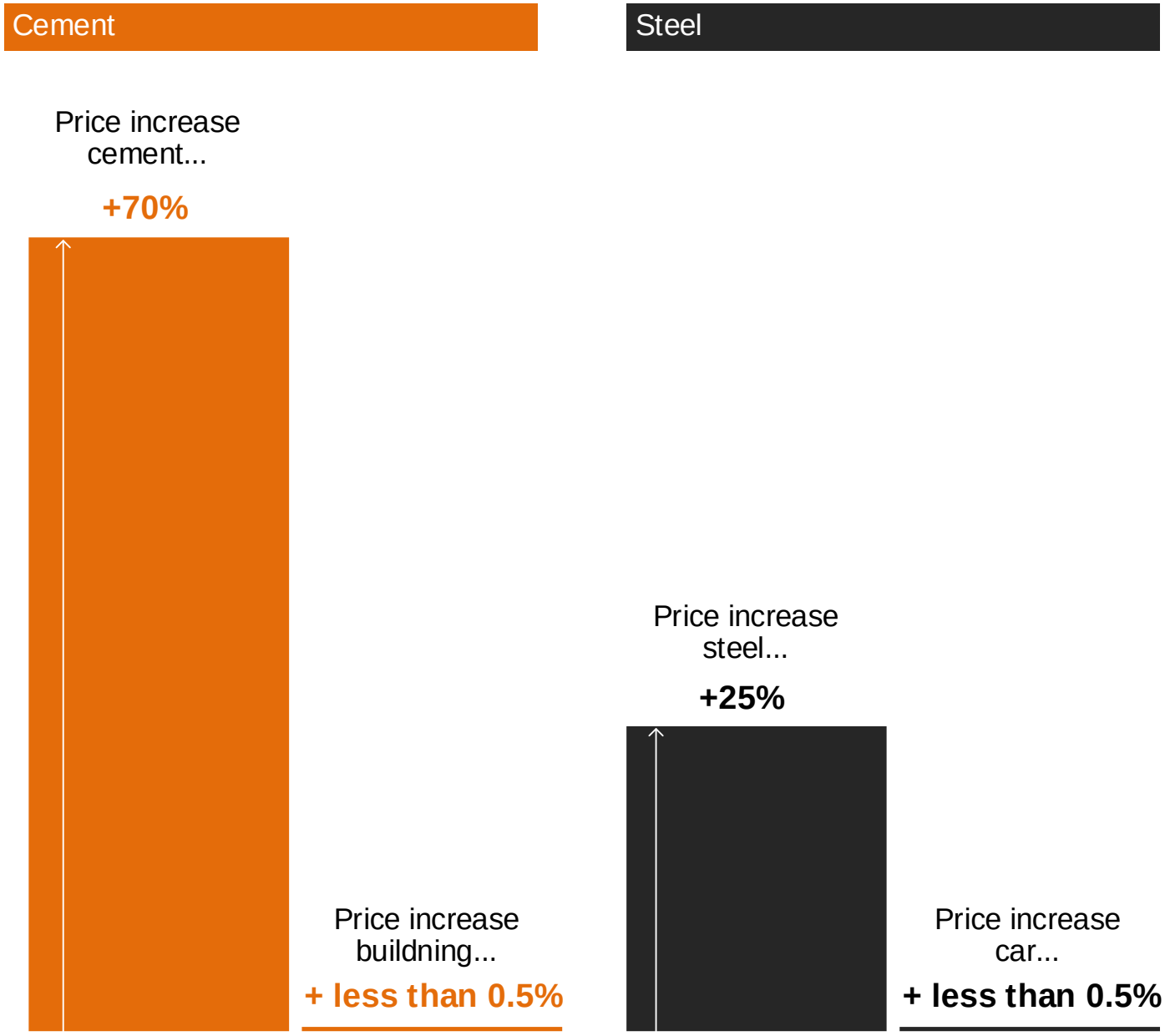

INNOVATIVE SUPPORT MECHANISMS AND POLICY SCHEMES

- Governmental risk sharing and state funding in the early phases of the development and implementation of new technologies *(See e.g. Bennett and Heidung, 2014; Mazzucato, 2015)*

- The use of sustainable procurement as a tool to create niche markets and to guarantee an outlet for low-carbon cement and steel (*See e.g. Chegut et al., 2013; Simcoe and Toffel, 2014; Uppenberg et al., 2015*).

- Innovative business models that create and capture value for the actors involved in the production, refinement, and use of materials, such as steel and cement. (See e.g. Teece, 2010; Chesbrough, 2010)

Proposal:

A Green Materials Fund (GMF)

- Bringing together relevant stakeholders
  - Industries and public agencies along supply chain
- The stakeholders commit to:

(i) Establish a Green Materials Fund by paying a low-carbon levy for each ton of steel or cement consumed; and
(ii) guarantee an outlet for low-CO2 steel and cement through an innovation procurement scheme.

…for funding demonstration and up-scaling of low-CO2 steel-making and cement-making processes

DISCUSSION

- How to handle the risk of being a frontrunner in establishing CO2-free materials? Low profit margins in some branches of industry
- How to ensure that a GMF does not create an additional obstacle to competition on markets that are already characterised by low levels of competition?
- How to make sure that complement rather than undermine the efficiency of existing policy (EU-ETS)?
- Scope?: National imitative or Nordic or European scope
- ….

THANK YOU!

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LESSONS FROM OUR PREVIOUS STUDIES

Existing measures NOT sufficient if to meet 2045 GHG emission targets
Primary production (fuel switching, raw material substitution continued efforts to improve energy efficiency)
Processing and end-use (material effiency, material substitution)

Our work suggest that while covering the costs of investing in new low-CO2 steel- and cement-making processes would require substantial increases in the selling prices of steel and cement
such price increases would neither significantly alter the cost structure nor dramatically increase the price to be paid by a car buyer or a procurer of a building or an infrastructure project

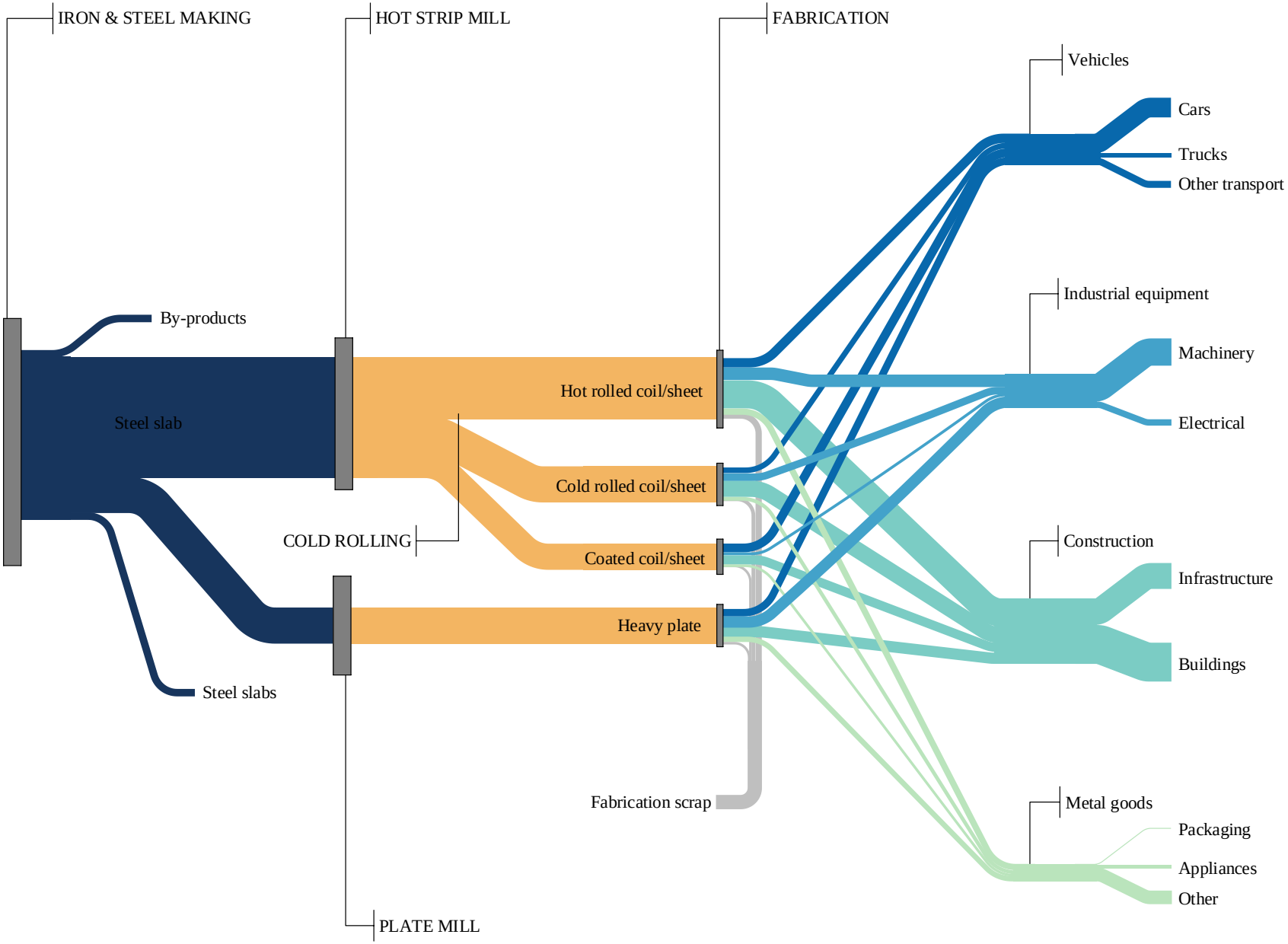
allocating the costs of such investments at the end of the supply chain would only marginally increase the price of steel- or- cement-containing products

SUMMARY

DECARBONISING THE EU BASIC INDUSTRY

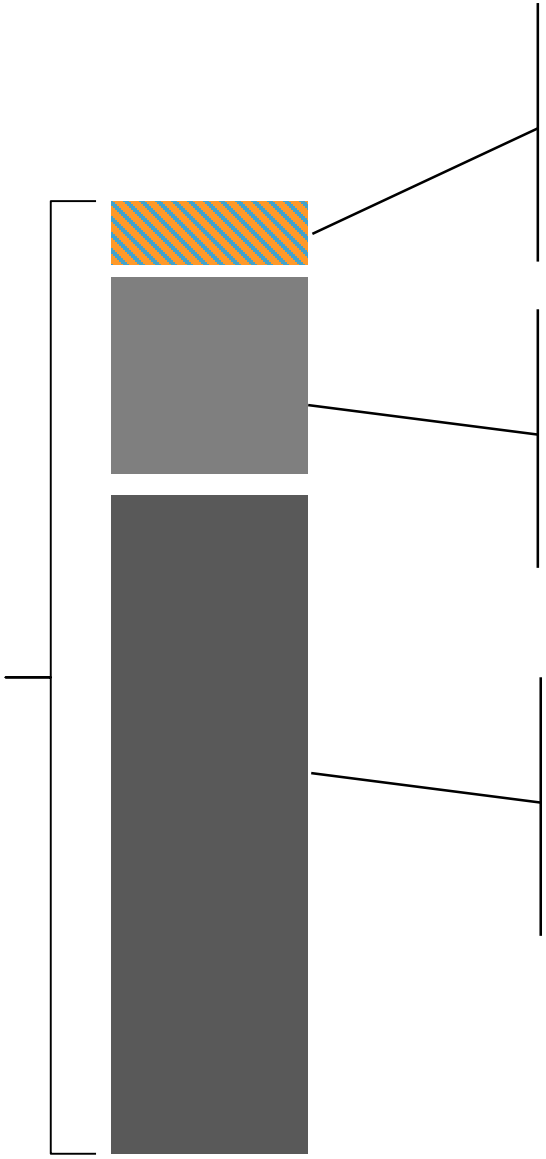
- Available measures will not suffice
- Current market conditions (bleak)
- Climate policy environment (weak)
- Who could/should pay the price of a shift to low-CO_2 production processes in the steel and cement industries?

- We do this by looking beyond current market conditions as if mechanisms that would allow steel producer to pass on parts or all of the added costs were in place


IRON & STEEL MAKING
HOT STRIP MILL
FABRICATION
By-products
Steel slab
Steel slabs
COLD ROLLING
PLATE MILL
Hot rolled coil/sheet
Cold rolled coil/sheet
Coated coil/sheet
Heavy plate
Fabrication scrap
Vehicles
Cars
Trucks
Other transport
Industrial equipment
Machinery
Electrical
Construction
Infrastructure
Buildings
Metal goods
Packaging
Appliances
Other

HYPOTHESIS

Selling price of steel/concrete containing product

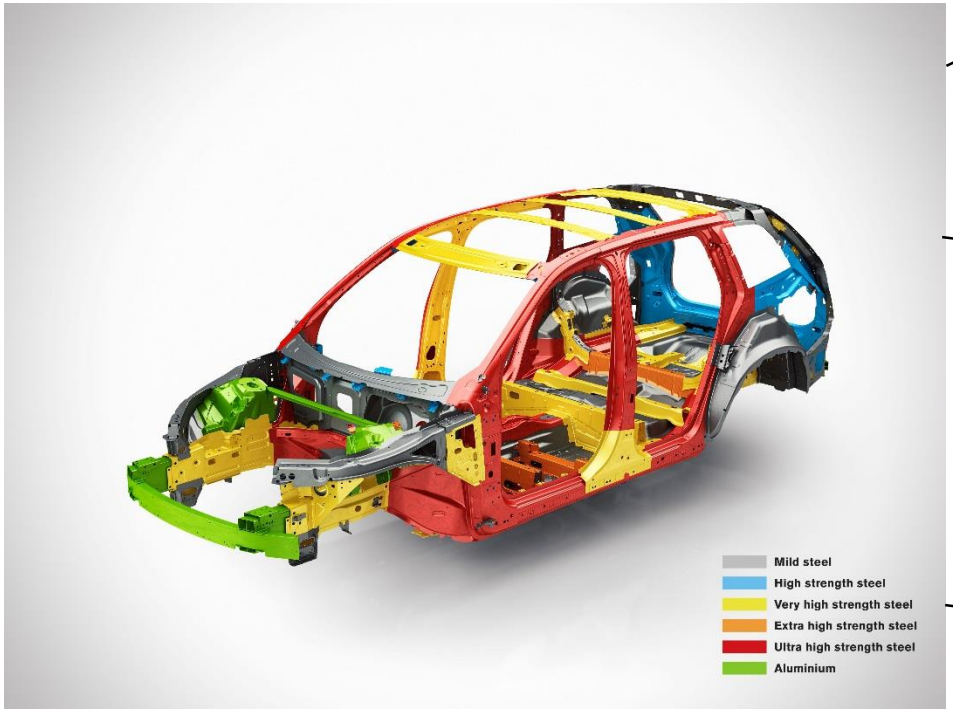


Steel/concrete

Other materials

All other costs

STEEL IN A PASSENGER CAR



~60% of the vehicle mass

~6% of the material costs

~2% of the retail price