



**BEYOND2020** NOV 2-4  
WORLD SUSTAINABLE BUILT ENVIRONMENT ONLINE CONFERENCE

# Sustainable development of climate-neutral buildings and neighbourhoods

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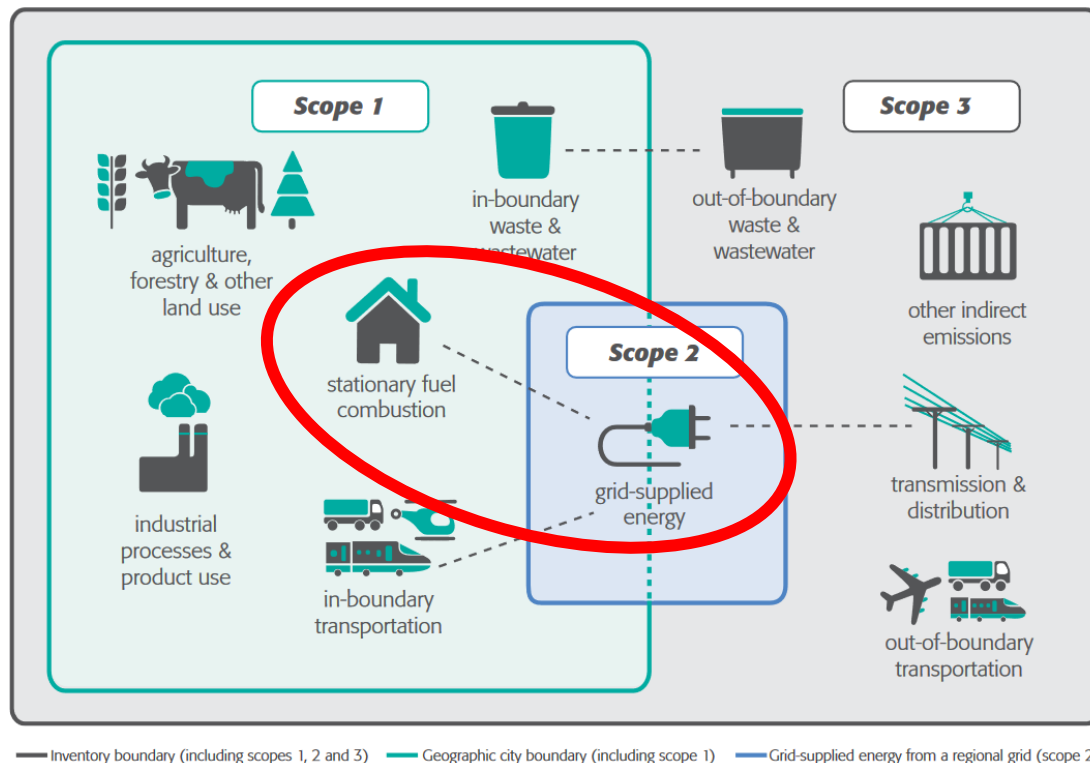
# Introduction

- Results shown from project on „Sustainable Neighbourhoods“ (NEK Quartiere) funded by German EPA (Umweltbundesamt)
- Project start: October 2017
- Main aim to show how not only individual buildings, but also entire neighbourhoods can achieve climate neutrality by 2050
- Project partners: Öko-Institut & Fraunhofer Institute for Solar Energy Systems
- Co-workers: Sibylle Braungardt, Jürgen Sutter, Benjamin Köhler, Christian Winger

# How can neighbourhoods be defined and their system boundaries be determined?

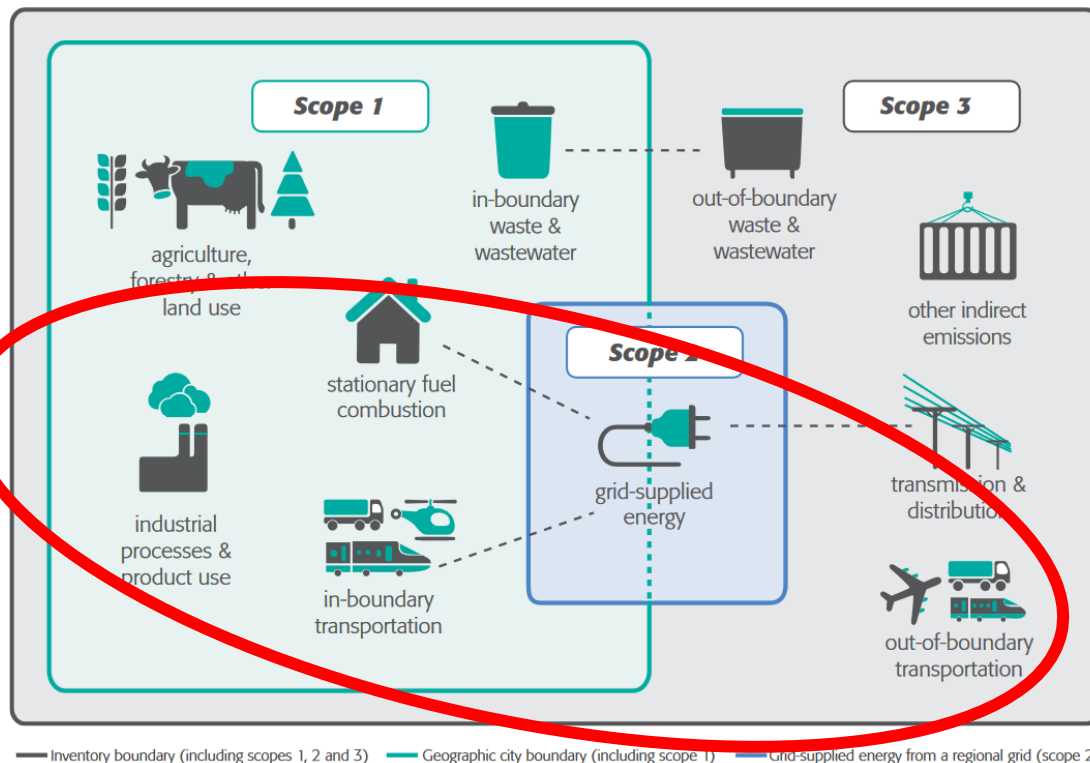
- Lots of leeway in defining neighbourhoods, no strict definitions
- new GEG (German building energy law) defines a neighbourhood as two or more buildings
- Approach taken in on-going project: sub-units of city districts with similar physical building characteristics (typically 100s of buildings included, but may be smaller)
- System boundaries at first seem to be established relatively simply, but as soon as cross-boundary themes such as flow of electricity, flow of district heat, flow of people (mobility), flow of goods (industrial production) are considered, choices have to be made (see following slides)

# Production- vs. consumption-based approach to counting emissions



Scope	Definition
Scope 1	GHG emissions from sources located within the city boundary.
Scope 2	GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam and/or cooling within the city boundary.
Scope 3	All other GHG emissions that occur outside the city boundary as a result of activities taking place within the city boundary.

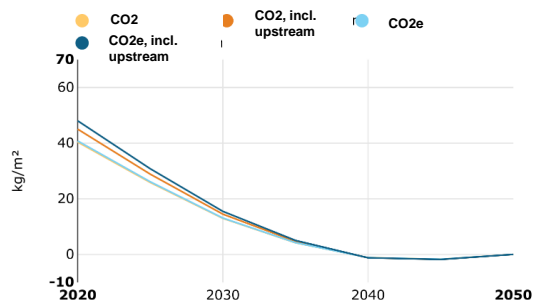
# Production- vs. consumption-based approach to counting emissions



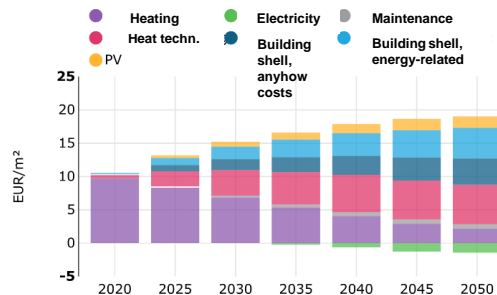
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# Handling exported energy: Results from „Sustainable neighbourhoods“ project

## Efficiency pathway



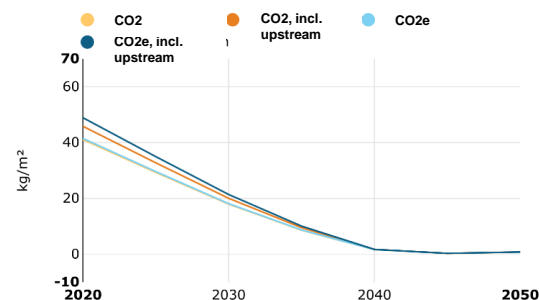
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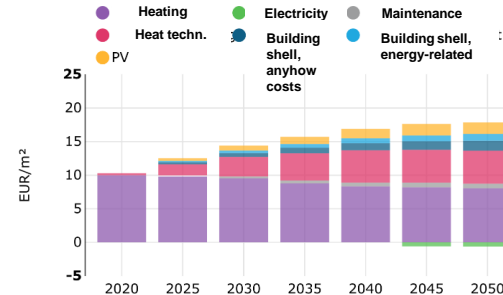
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GHG-  
emissions

## Renewable energies pathway



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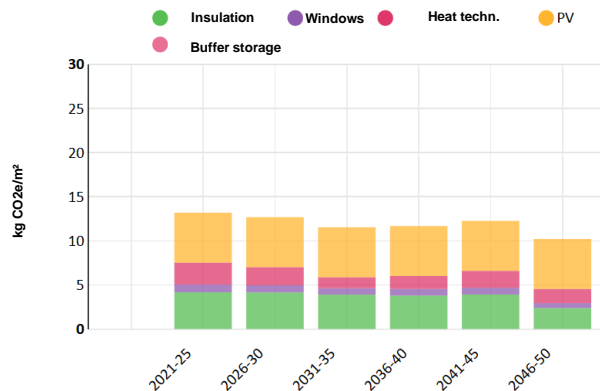


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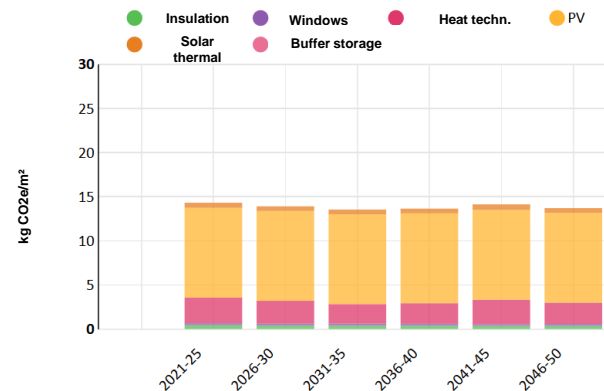
costs

# Handling embodied emissions: Results from „Sustainable neighbourhoods“ project

## Efficiency pathway



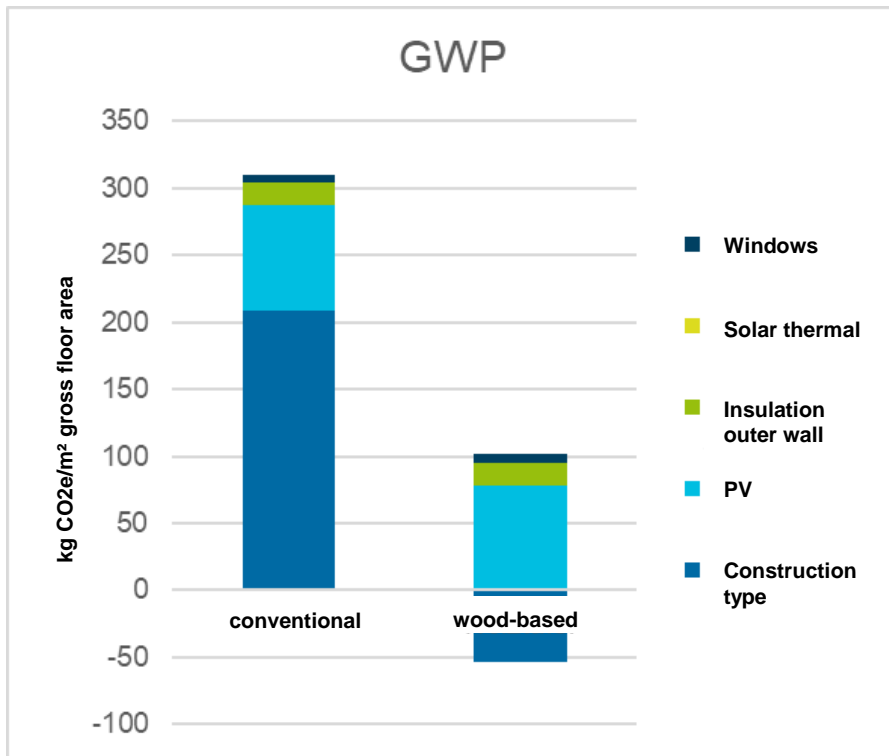
## Renewable energies pathway



GWP

Challenge: whereas there are useful projections for the evolution of emission factors for electricity up until 2050, those factors do not currently exist for industrial production processes such as those for solar PV panels

# Can climate-neutral neighbourhoods be achieved with the means of sustainable construction and renovation?

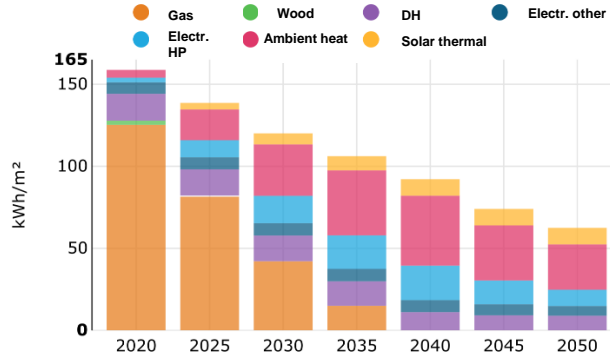


- Type of insulating material not as important as type of building material
- In terms of embodied emissions, refurbishing is mostly preferable to demolishing and rebuilding



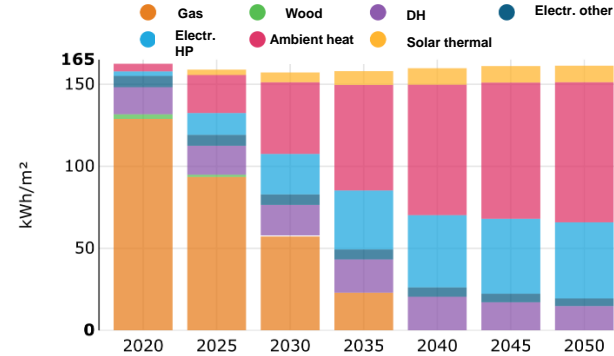
# Can climate-neutral neighbourhoods be achieved with the means of sustainable construction and renovation?

## Efficiency pathway



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## Renewable energies pathway



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Final energy  
consumption

- Energy efficiency measures do have an important impact
- Renewable energy sources pose more problems in urban areas compared to rural areas – simply a question of space!
- District heating systems might sometimes be the only way to supply renewable energies into densely populated cities – city surroundings as supplier that has less pressure on land?