Core services of the building sector – for more sustainability

UBA Workshop

Decarbonisation – 100% Renewable Energy and more

Prof. Dr.-Ing. Lamia Messari-Becker

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Decarbonisation: transitions & goals

Aus dem Klimaschutzplan, BR

2020
shutdown the last nuclear power plants (phase-out)

40-45%
Share of renewable energies in electricity consumption by 2025

20%
less primary energy consumption by 2020 compared to 2008

40%
less greenhouse gas emissions by 2020 compared to 1990

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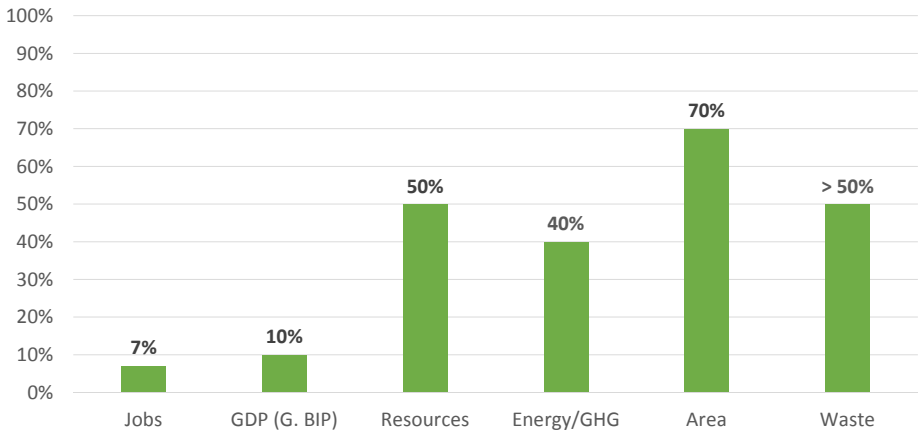
Figures building sector – more than „carbon“

worldwide figures: building, society, economy and environment



www.destatis.de / Statistisches Bundesamt Deutschland

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Strategy - reform of the development plans

http://www.schaller-sternagel.de/01_projekte/012001_rotkreuzstrasse/rotkreuzstrasse_01.html, http://www.sonnenhaus-institut.de/guenstig-heizen-mediathek/heizen-mit-solarenergie-bildmaterial.html

Green areas for social and air quality

Green area (per person) as planing requirements

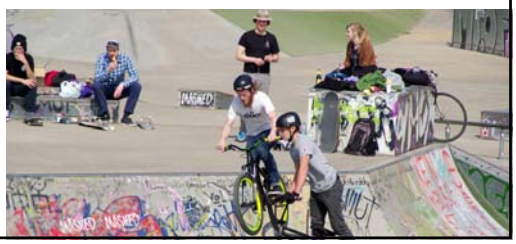
More focus on the space between building and city-quarter

Building for multi-functional and long-term-usage

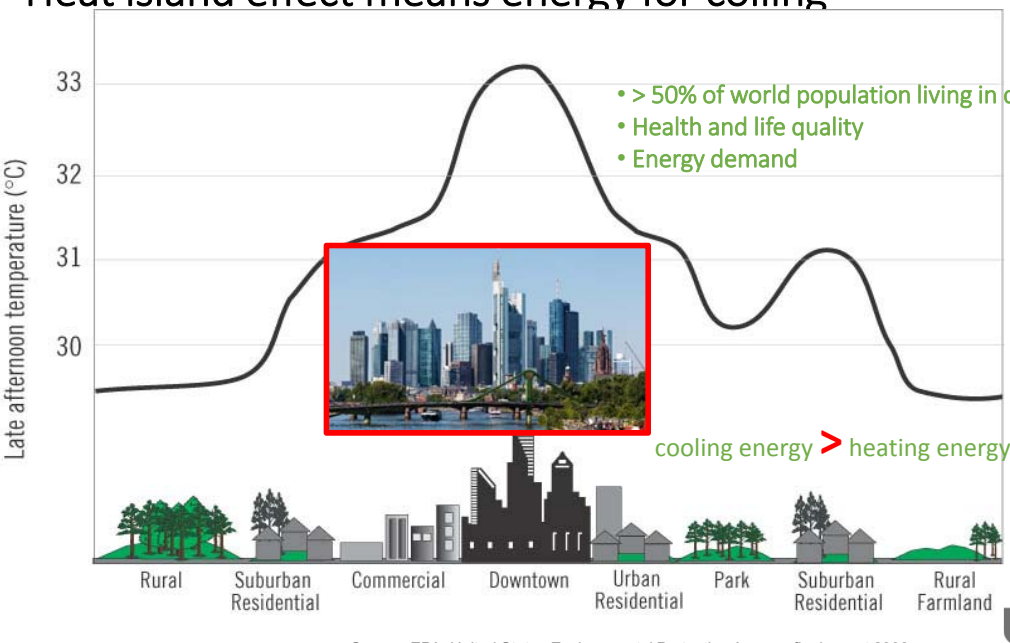
Todays kindergarden or school = Tomorrows retirement home

www.bmub.bund.de

Multi-functionale areas: e.g. green, social interaction and sport activities



Heat island effect means energy for colling



- > 50% of world population living in dense urban centers
- Health and life quality
- Energy demand

cooling energy > heating energy

Source: EPA, United States Environmental Protection Agency, final report 2008

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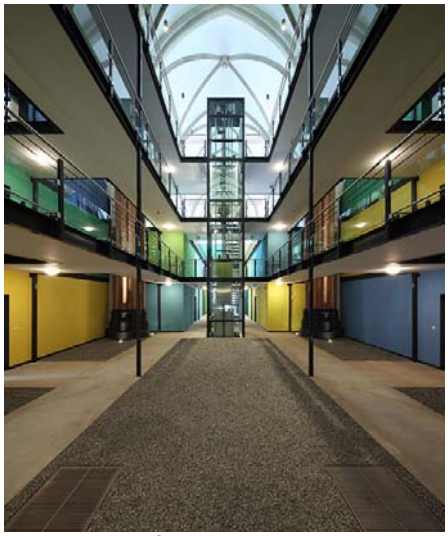
Building for multi-functional and long-term-usage

office building → residential building



church → residential building

http://www.jabuka.de/kreative-gebaeude-umnutzung-im-wettbewerb/, http://www.bbr.bund.de/BBSR/DE/Veroeffentlichungen/BMVBS/KostenguenstigQualitaetsbewusstBauen/Downloads/Umnutzung.pdf?

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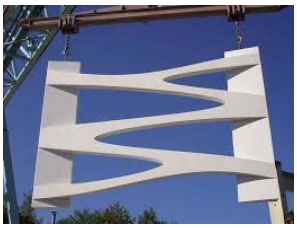
Technology: pre-fabrication and modularity as a standard

Betonwerk ventschow

dicad



Kleinertz systembau

Mapa architects

Leonardo finotti

Goehlbau

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Technology: pre-fabrication and modularity as a standard

Quellen: http://blog.dudek-koenig.de/modularesbauen, https://www.cash-online.de/immobilien/2016/modulare-bauweise-erstmals-in-serie/353853

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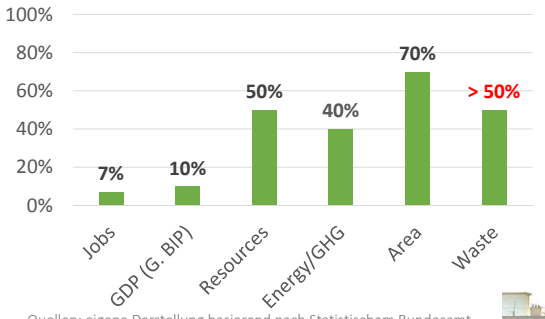
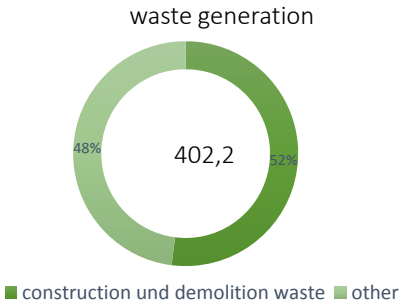
Technology: waste reduction and recycling



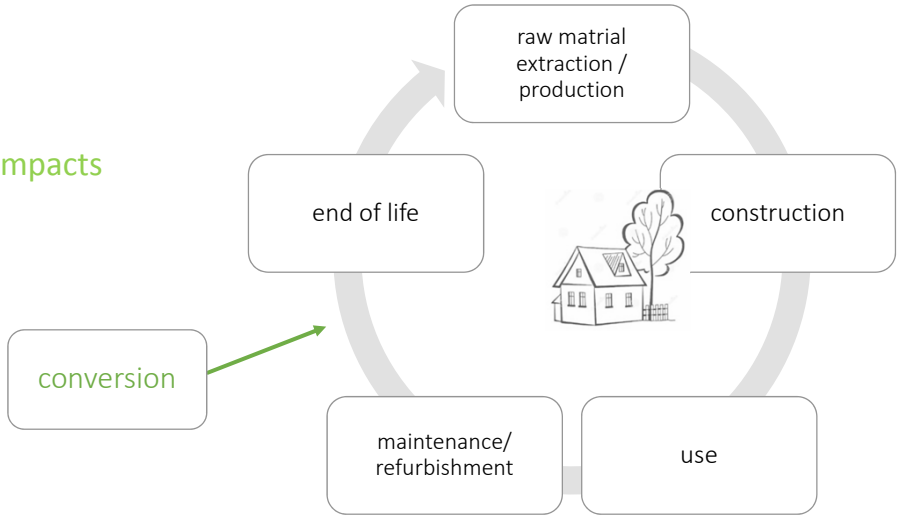
Quellen: eigene Darstellung basierend nach Statistischem Bundesamt



http://www.abfallratgeber.bayern.de/haushalte/abfallentsorgung/gebaeuderueckbau/index.htm

Technology: Life Cycle on focus – for less impacts

life cycle = cycle of impacts



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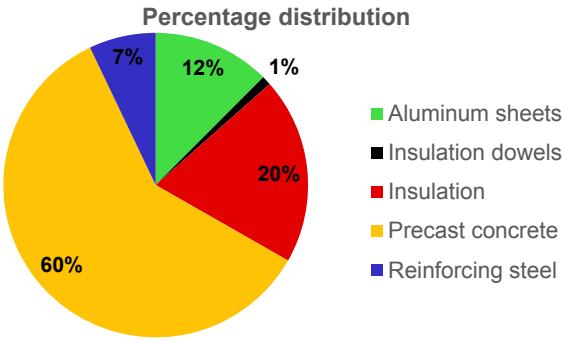
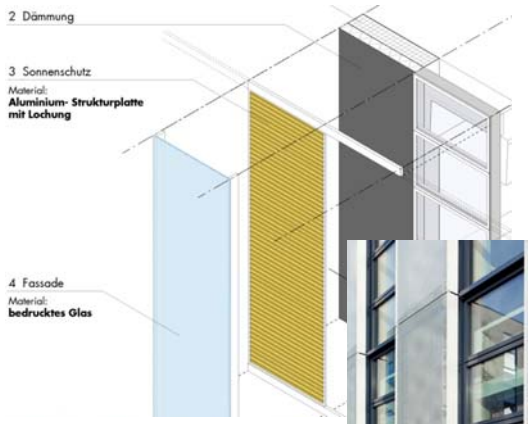
Technology: Life Cycle on focus – for less impacts



Messari-Becker, 2015/16



Schneider + Schumacher Architekten

Technology: Recycling of carbon-intensive materials

2000: Recycling concrete Hundertwasserhaus – Darmstadt
bauverein Darmstadt

2010: Recycling concrete, Ludwigshafen
Hund und Seepe Architekten

Becker

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Technology: Recycling of carbon-intensive materials

2009: Bank of America – New York
40% carbon reduction (by using slag

http://www.urbansplatter.com/2014/10/history-architecture-bank-america-tower/

1991: The first passivhouse – Feist – Darmstadt

Passivhaus-Institut, Darmstadt

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2009: Worldwide first monolitic passivehouse – Scheffler, FFM

Scheffler + Partner

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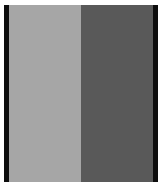
Thinking in Cycles and qualities

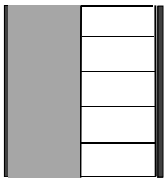


components
20 cm concrete
24 cm insulation WLG 035
Plaster (inside and outside)

U-Value
U= 0,139 W/m²K

(**Life Cycle Costs** (100 a):
ca.240 €/m² (2-3 operations)

Carbon: 130 kgCO$_{2\text{-Äqu.}}$/m²



components
20 cm masonry bricks
24 cm insulation WLG 035
Plaster (inside and outside)

U-Value
U= 0,136 W/m²K

Life Cycle Costs (100 a):
ca.210 €/m² (2-3 operations)

Carbon: 105 kgCO$_{2\text{-Äqu.}}$/m²

components
49 cm monolithisch, Ziegel
WL 0,07 W/mK
Plaster (inside and outside)

U-Value
U= 0,137 W/m²K

Life Cycle Costs (100 a):
ca.130 €/m² (0 operations)

Carbon: 95 kgCO$_{2\text{-Äqu.}}$/m²

Messari-Becker e.l., 2012

Note
U-Value: The heat quantity which flows through 1 m² component surface at a temperature difference of 1K [W/m²K]

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2000: R128 TripleZero – W. Sobek

Werner Sobek, Stuttgart

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2012: F87 EnergyPlus, BMUB, – W. Sobek

www.bmub.bund.de

2009: EnergyPlus – SD 09 – M. Hegger

Manfred Hegger, Darmstadt

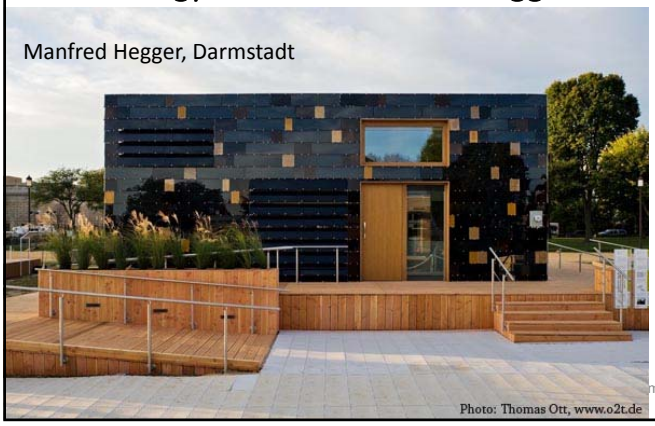

Photo: Thomas Ott, www.o2t.de

mia Messari-Becker

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2015: City-active-house as residential building – ABG - Francort

http://www.aktivplusev.de/portfolio/aktiv-stadthauspreview_id437preview_nonce043eb14b61previewtrue/

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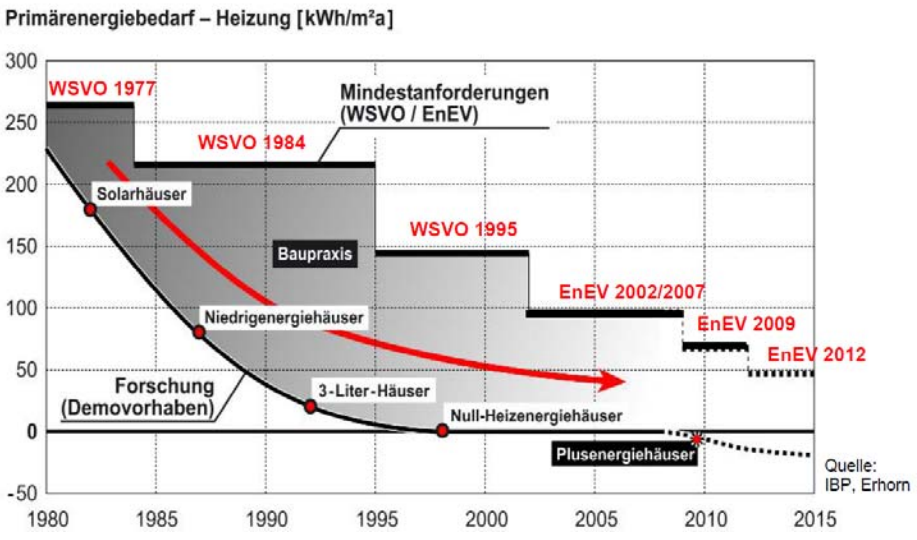
Energy Efficiency of new buildings



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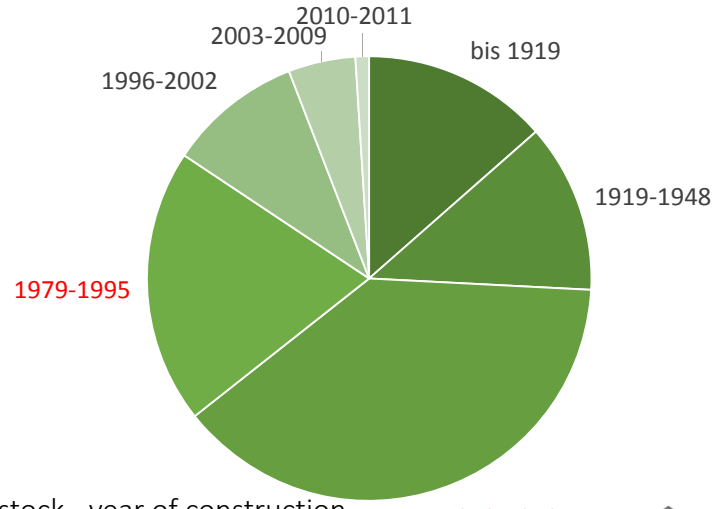
Real challenge: The existing buildings



www.bmwi.bund.de

building stock - year of construction

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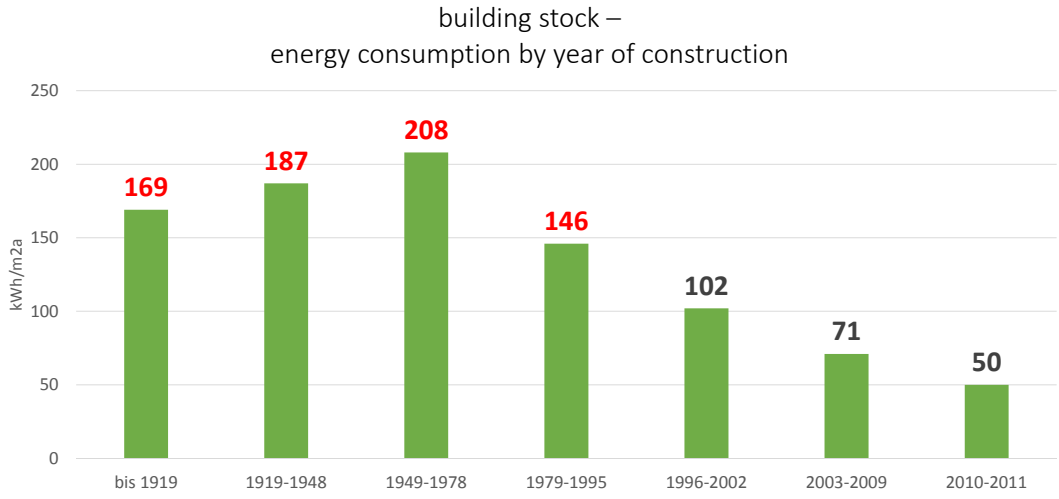
Reale challenge: The existing buildings



www.bmwi.bund.de

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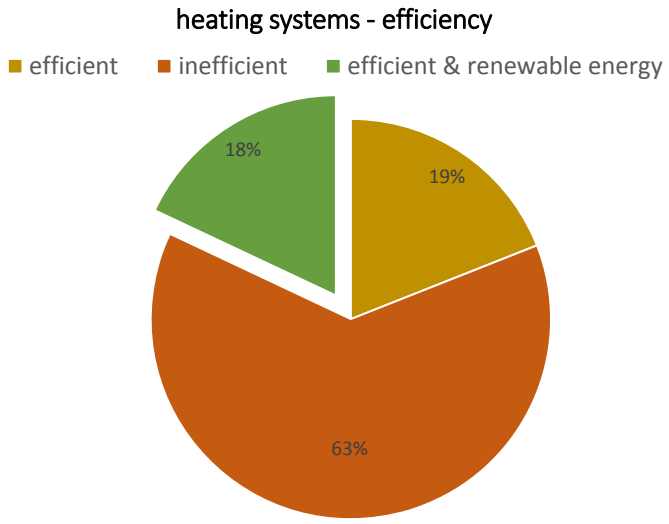
Real challenge: The existing buildings



Quelle: http://www.bdh-koeln.de/presse/daten-fakten.html

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2016: Pluseenegy houses as existing buildings, BMUB, Neu-Ulm

Werner Sobek bzw.
o5 Architekten

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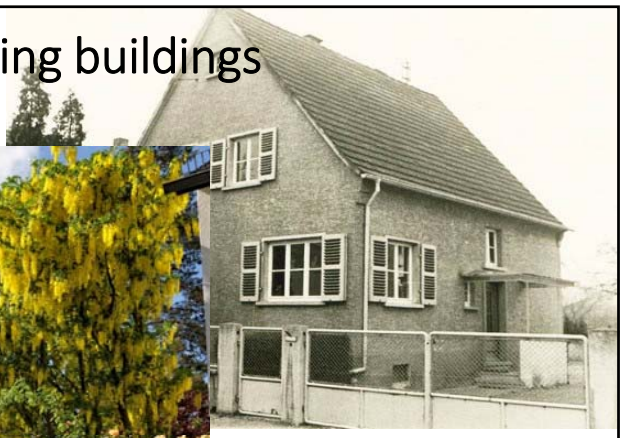
The real challenge: The existing buildings



Messari-Becker, 2013
Hahndorf

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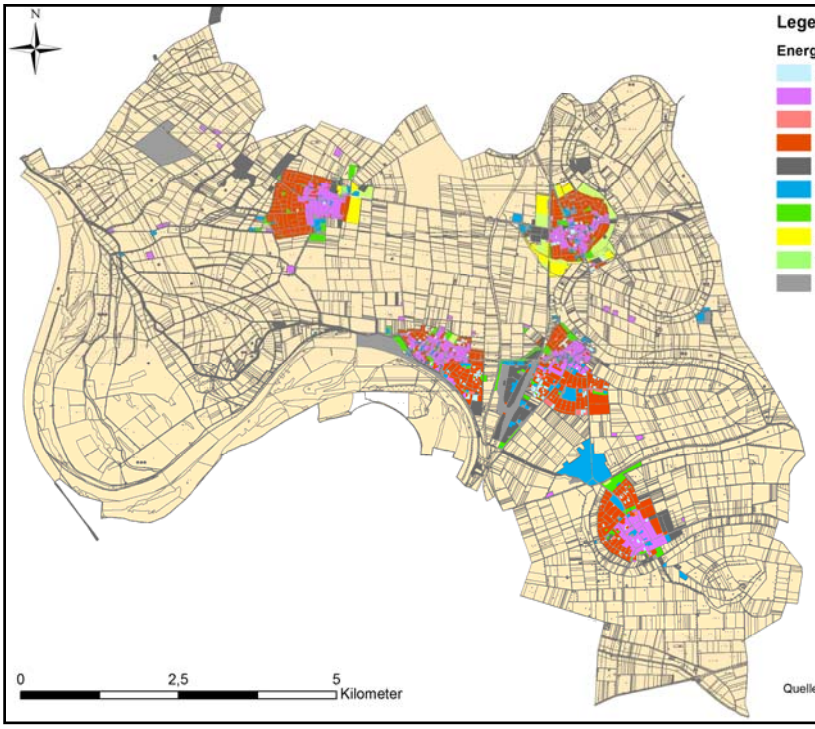

Messari-Becker, 2013

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Heat saving poentials

Messari-Becker, 2013

<= 30
<= 80
<= 100
<= 125
<= 175
> 175

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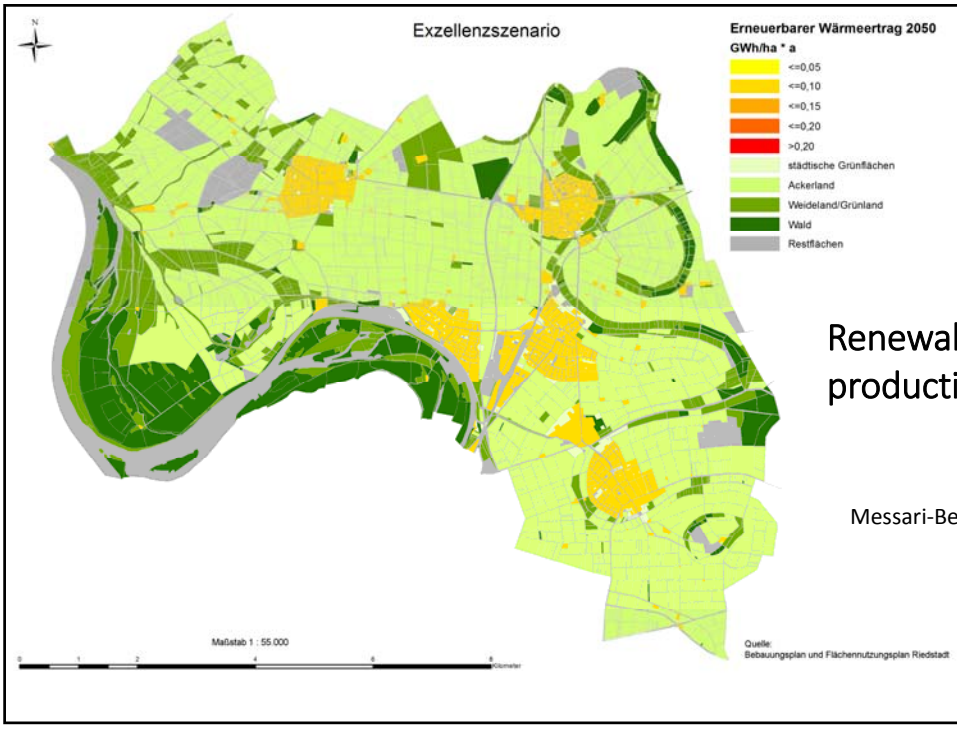

Renewable heat production – Scenario

Messari-Becker, 2013

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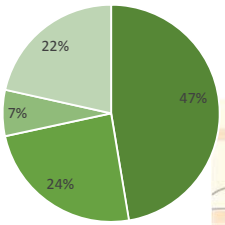
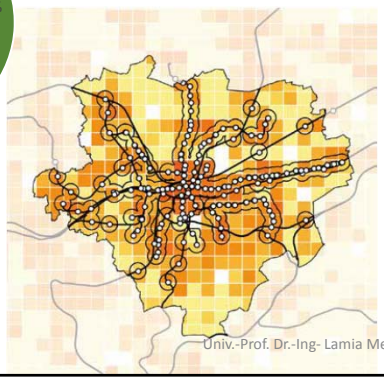
Where to built: an indirect influence of mobility

Mobility in Dortmund

car public transport bicycle on foot

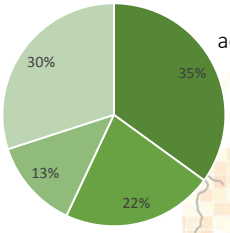


accessibility of rail traffic: 57%

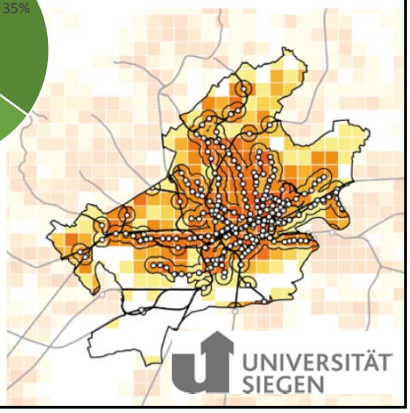


Mobility in Francfort

car public transport



accessibility of rail traffic: 75%



Quellen:
https://www.greenpeace.de/verkehrswende,
Städte Ranking zur nachhaltigen Mobilität

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Thank you!

messari-becker@architektur.uni-siegen.de

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