

Energy Use Plan - “Energienutzungsplan (ENP)”

Dipl.-Ing. (Univ.) Dipl.-Ing. (FH) Oliver Zadow, Architect



City of Munich
Department of Urban Planning
and Building Regulation

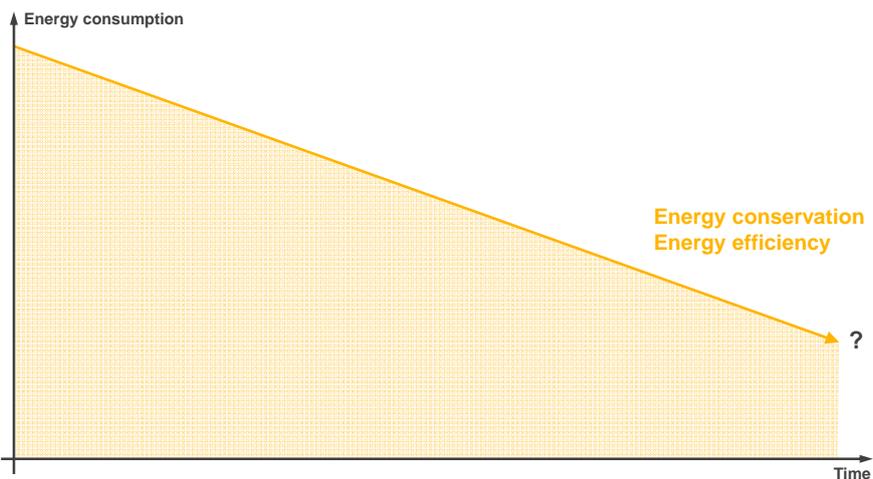


Technical University of Munich
Chair of Building Technology and Climate Responsive Design
Prof. Dipl.-Ing. Thomas Auer

former
Chair of Building Climatology and Building Services
Prof. Dr.-Ing. Dr. h.c. Gerhard Hausladen

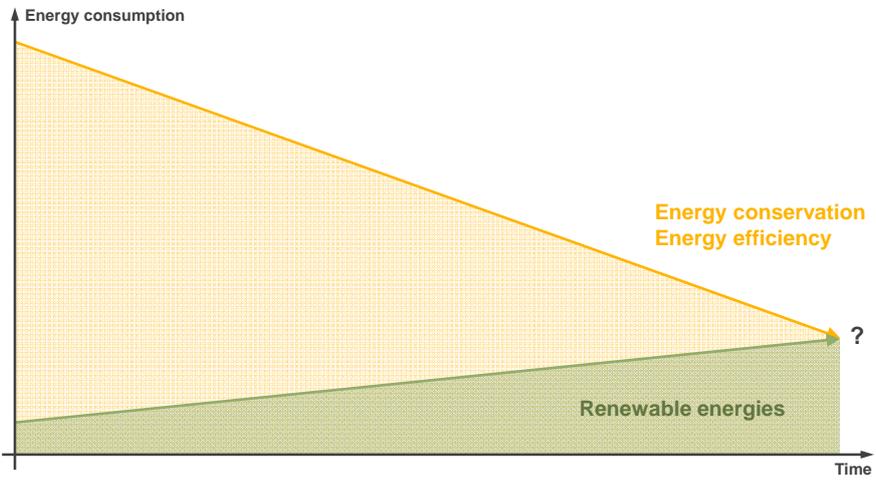
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The Energy Transition (“Energiewende”)

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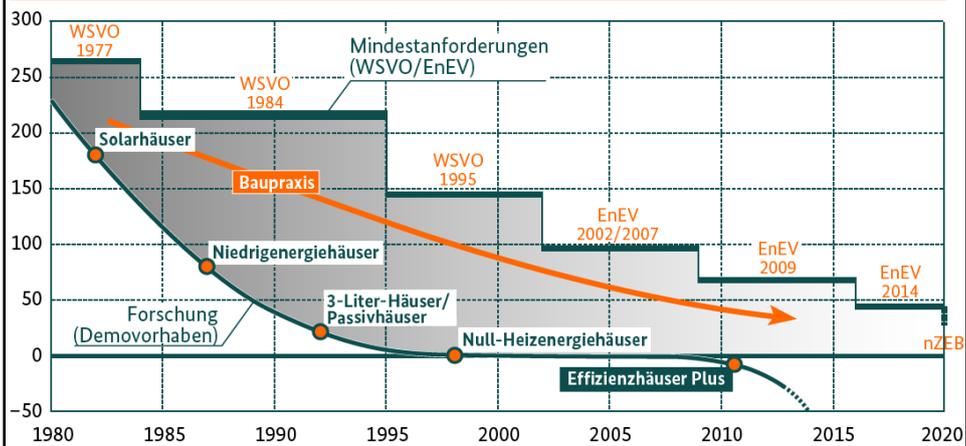


The Energy Transition (“Energiewende”)

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[Fraunhofer IBP]

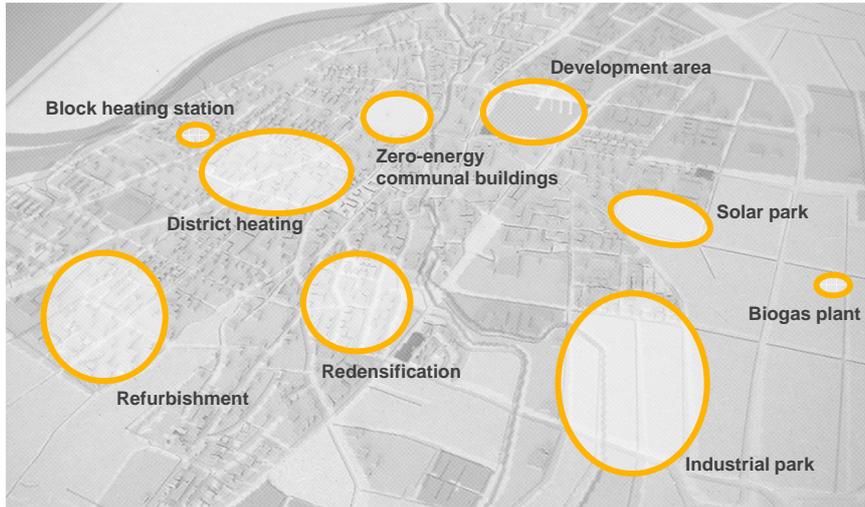
Primary Energy Demand of a Semi-Detached House – Heat [kWh/m²a]



Plus Energy - Building

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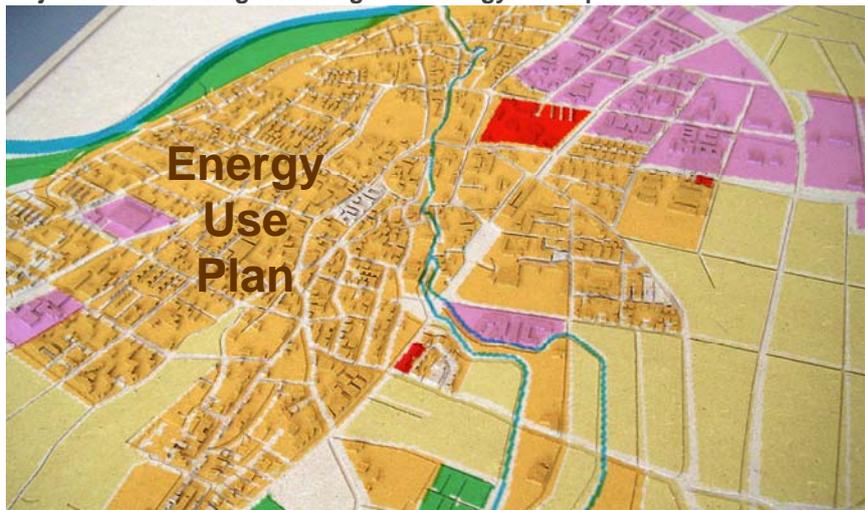
Initial situation: Individual and non-coordinated measures



Energy Use Plan

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Objective: Overriding and integrated energy concept

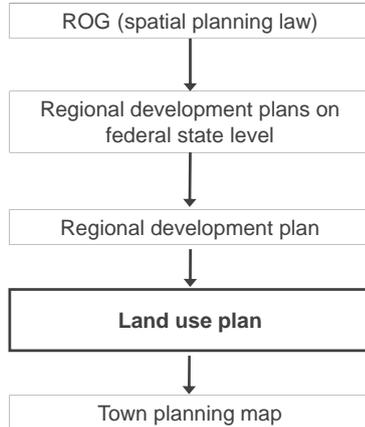


Energy Use Plan

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Scale

Germany's system of spatial planning:



**Energy Use Plan /
 Energy development plan**

Energy Use Plan

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Step 4: Concept development

→ **Energy Use Plan**

Step 3: Energy Potential

Locally / regionally available
 renewable energy sources +
 waste heat / material

Step 2: Energy Infrastructure

Plants, networks etc.

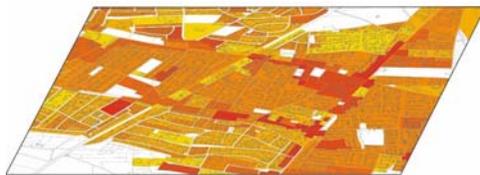
Step 1: Energy Demand

Space-related heat demand
 + electricity demand

Stocktaking

Energy Use Plan - Approach

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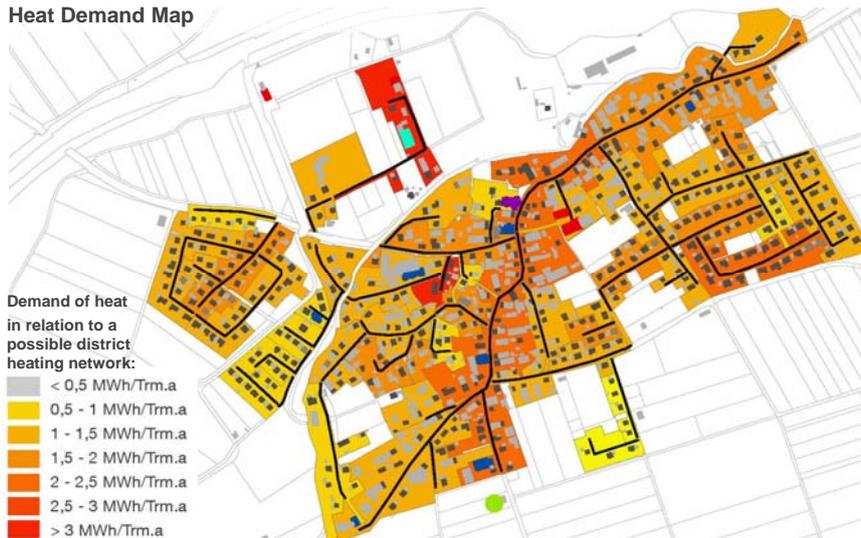


Step 1: Energy Demand
Space-related heat demand
+ electricity demand

Energy Use Plan - Approach

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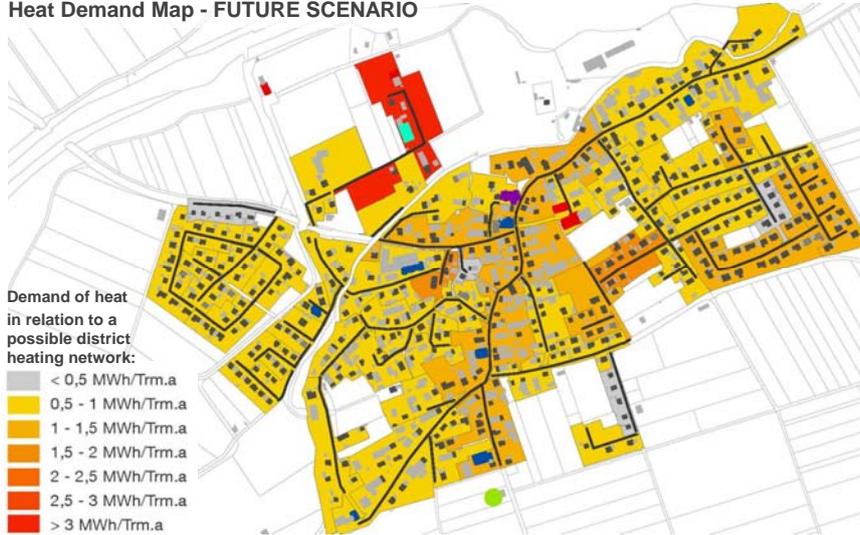
Heat Demand Map



Energy Demand - Heat

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Heat Demand Map - FUTURE SCENARIO



Energy Demand - Heat

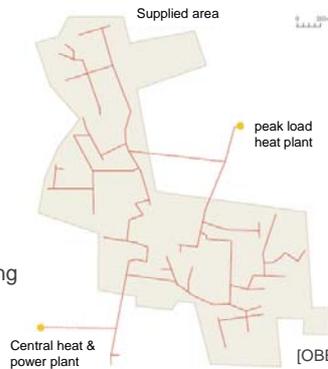
District heating / cooling

Possible advantages :

- More efficient energy use (cogeneration)
- Use of renewable energies which could not be used in each building individually (waste heat, deep geothermal energy)

Requirements:

- **Sufficient density of heating or cooling demand**



Energy Demand - Heat



1. Consumption data



2. Estimated / calculated / simulated demand based on single buildings according to use, typology and time of construction

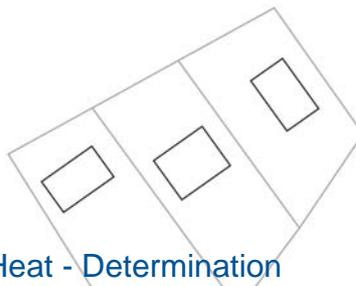
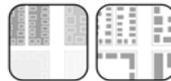


3. Estimated / calculated / simulated demand based on urban typologies

Energy demand - Heat - Determination

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Digital cadastral map
(„DFK“)



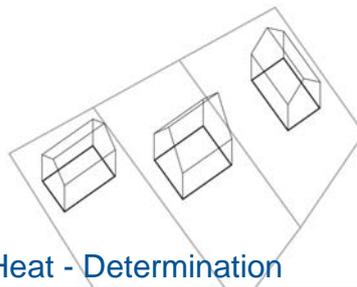
Energy demand - Heat - Determination

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Digital cadastral map
(„DFK“)



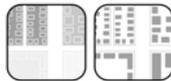
Building geometry



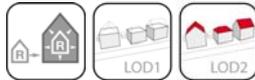
Energy demand - Heat - Determination

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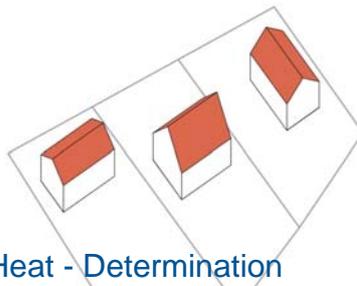
Digital cadastral map
(„DFK“)



Building geometry

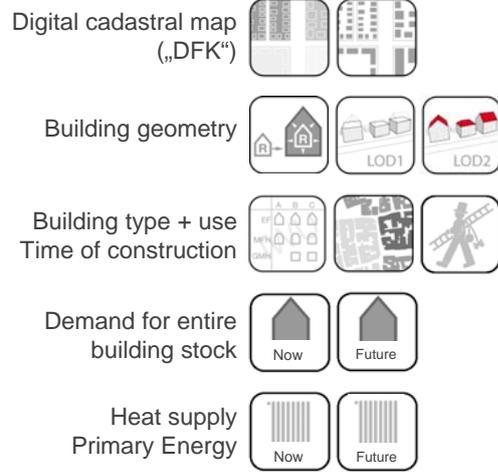


Building type + use
Time of construction
(+ refurbishment state)



Energy demand - Heat - Determination

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Energy demand - Heat - Determination

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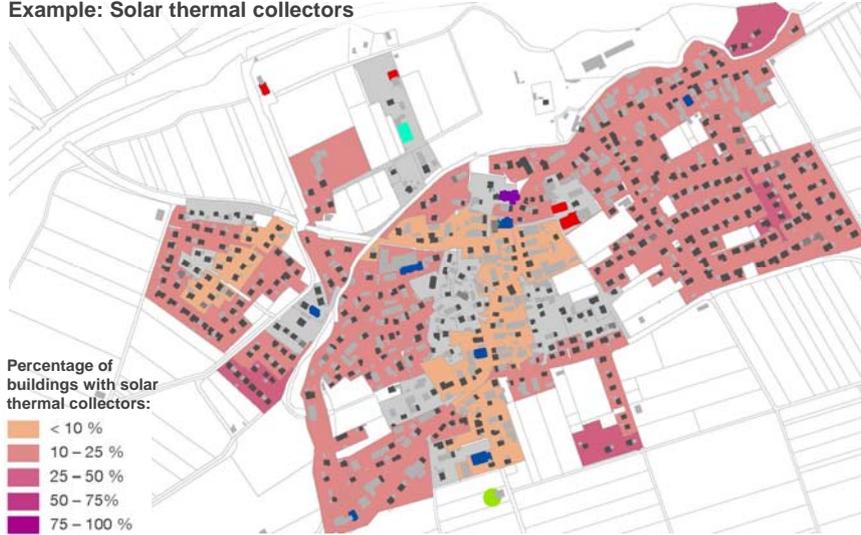
Step 2: Energy Infrastructure
Plants, networks etc.

Step 1: Energy Demand
Space-related heat demand
+ electricity demand

Energy Use Plan - Approach

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Example: Solar thermal collectors



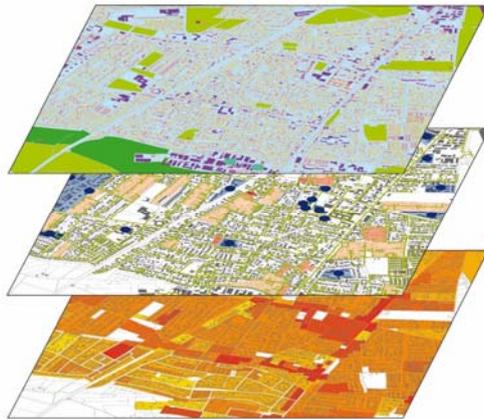
Energy Infrastructure

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Energy Infrastructure

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Step 3: Energy Potential

Locally / regionally available
 renewable energy sources +
 waste heat / material

Step 2: Energy Infrastructure

Plants, networks etc.

Step 1: Energy Demand

Space-related heat demand
 + electricity demand

Energy Use Plan - Approach

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Balance of the available energy potentials



3. Energy approach at regional / metropolitan level

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Step 4: Concept development

→ **Energy Use Plan**

Step 3: Energy Potential

Locally / regionally available
 renewable energy sources +
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Step 2: Energy Infrastructure

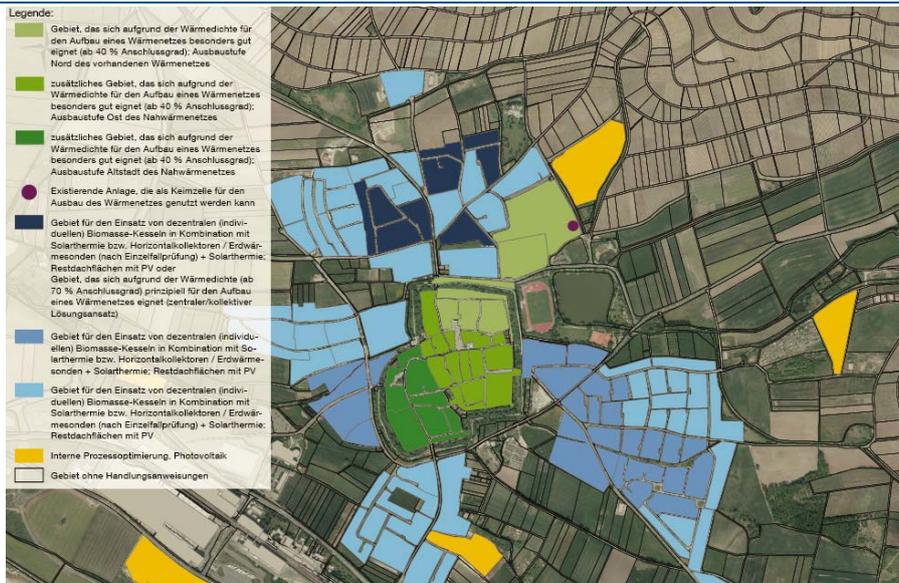
Plants, networks etc.

Step 1: Energy Demand

Space-related heat demand
 + electricity demand

Stocktaking

Approach



Energy Use Plan

Example: Biogas plants without heat use concept (Taufkirchen)



Energy Use Plan - Concept Development

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Energy Use Plan - Concept Development

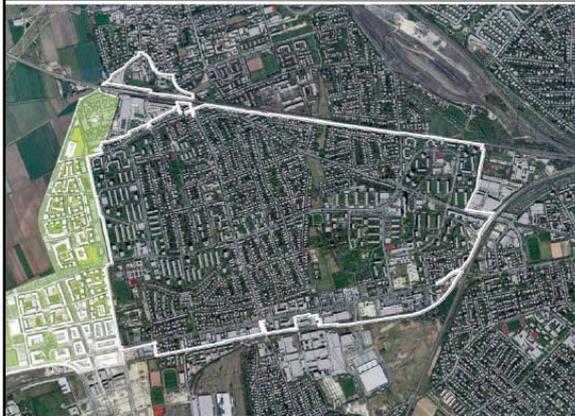
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Download and Contact:

Dipl.-Ing. Oliver Zadow
www.ClimaDesign.de
www.Gem-EB.de
zadow@tum.de

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Redevelopment Area
Neuaußing /Westkreuz

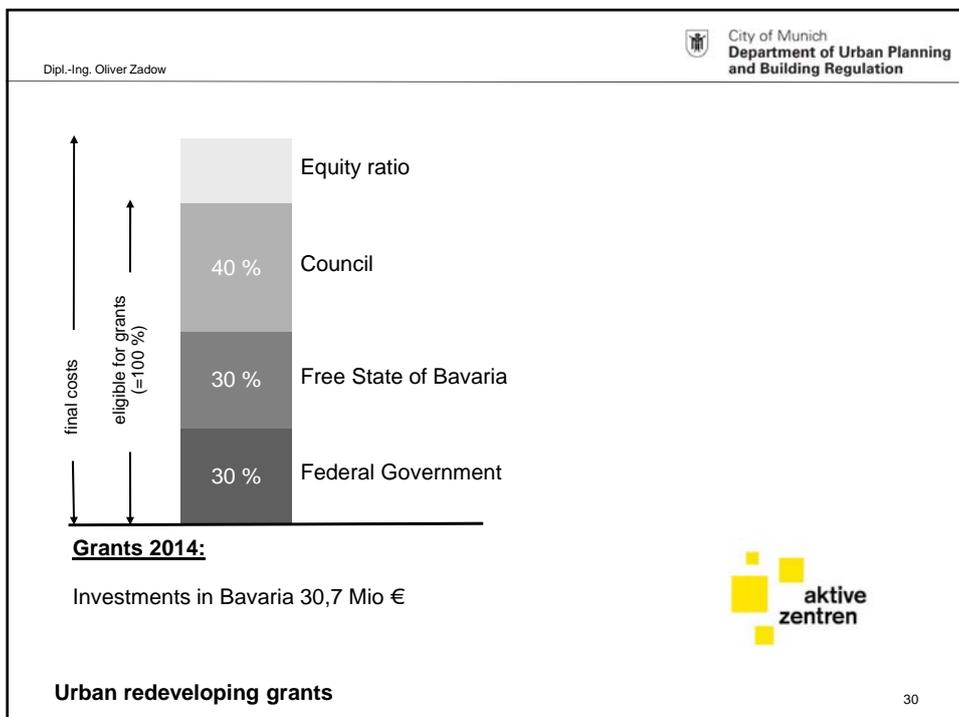
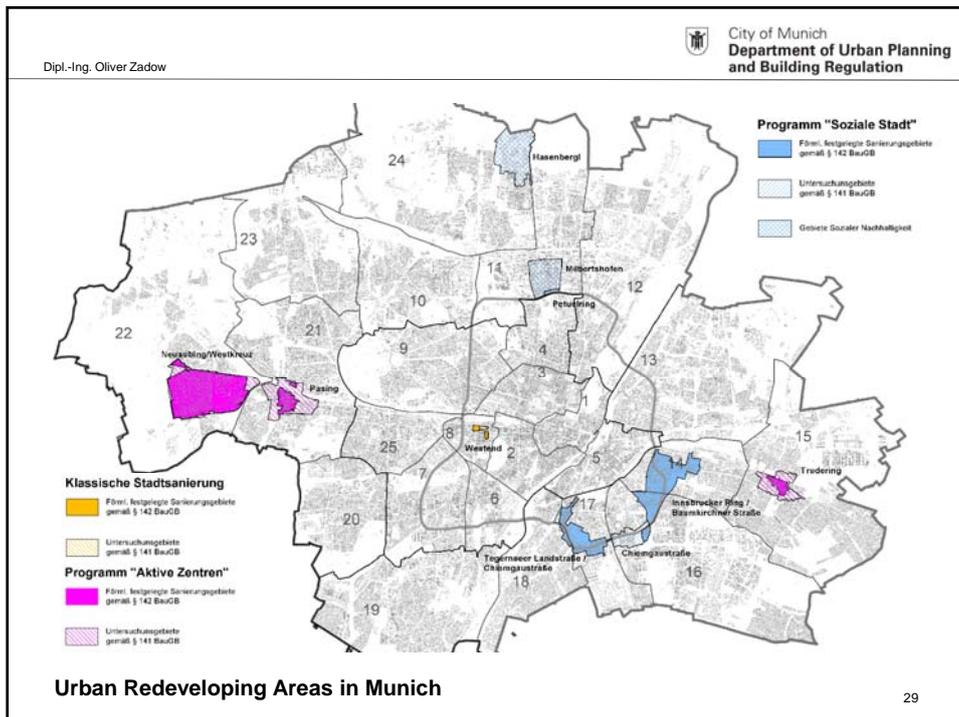
The latest redevelopment area:

- Situated on the western edge of Munich
 - 350 hectare
 - 23,000 residents

Its proximity to Freiham creates opportunities as well as challenges



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Meaning of ISEK:

- Findings of preparatory research
- Urban redevelopment rules and definition
- Fields of action, measures, aims
- Updating while ongoing urban redevelopment work

Preparatory Research

ISEK and + Energy Use Plan Neuaubing-Westkreuz



Level of detail

- Balance (year) Quarter und Cluster

Findings

- Fields of action
- Measures

Integrated Quarter Concept Neuaubing-Westkreuz



Level of detail

Buildings, time graph, building simulation

Findings

- Supply options for single buildings
- Toolkit for refurbishment management



Refurbishment management Neuaubing-Westkreuz



Level of detail

- Single building
- Integrative realization with actors

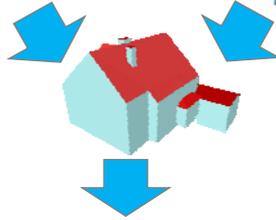
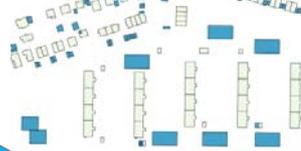
Increasing Level of Detail (LOD)

Different Layers of Energy Planning

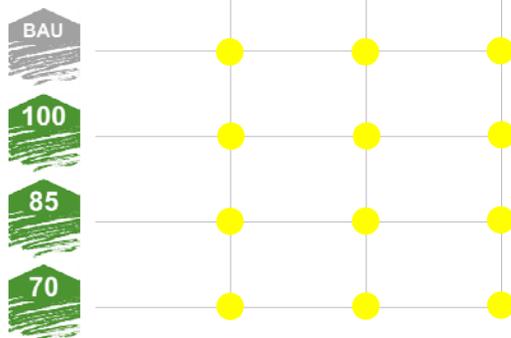
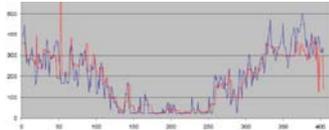
3D-Building Model
Shape out of 3D-Data



Building Database
Building character by typology



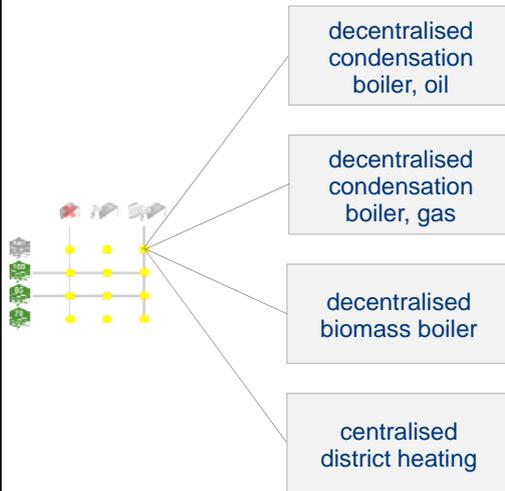
Building Simulation



Supply options solar heat:

- Display of coverage and remain heat demand
- 12 options for each building
 - 4 refurbishment standards
 - 3 supply options

Building Simulation – Findings for different standards



Supply options:

- To cover heatdemand: Solar heat and 4 boiler options
- All together 48 options for every single building
 - 12 refurbishment standards & solar heat options
 - 4 supply options
- Display of energy demand, primary energy and CO₂-emission
- Building database, a toolkit for refurbishment management

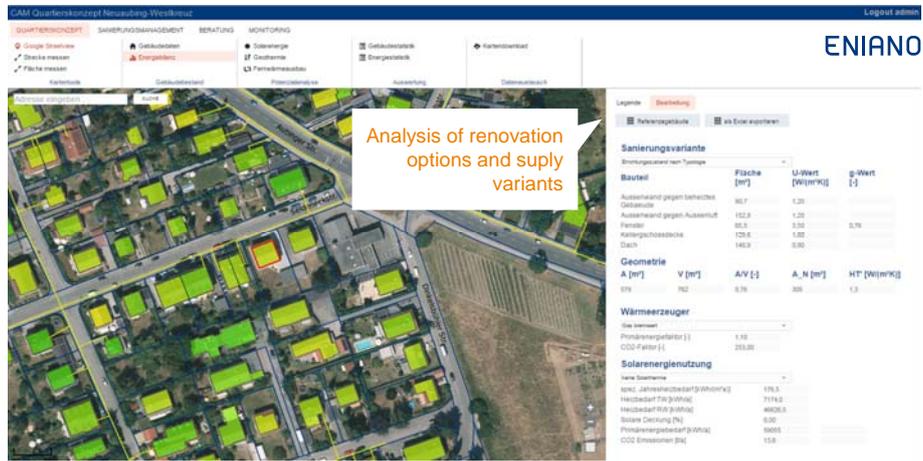
Building Simulation – Findings for different standards – Database

ENIANO

3D-model for every single building

Gebäudedaten	
Lage	
Adresse	Walterstr. 26, 81543 München
QuadratID	0027434
Typisierung	
Nutzung	WOHNEN
Gebäudeart	MFW
Baujahr	2004
Bauverfahrenklasse	2 (September 2002 und 2014)
Geometrie	
Fläche Fundament [m²]	8129.8
Geometrie	2
Gebäude Grundfläche [m²]	116.7
Volumen netto [m³]	1112.1
Volumen brutto [m³]	1112.1
Nutzfläche Erd/Fv [m²]	444.9

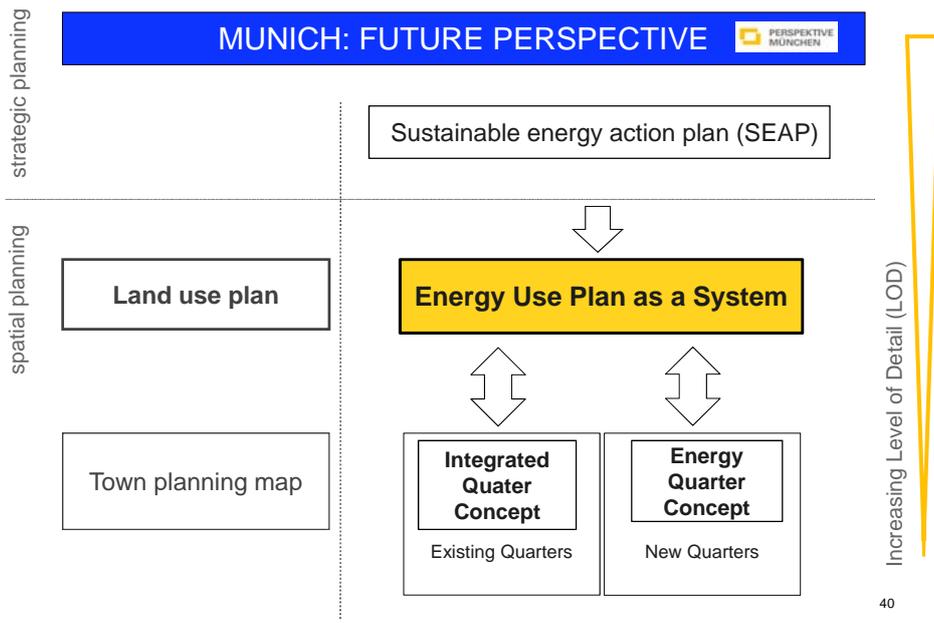
Inventory data for every single building





- **Neighbourhood management and refurbishment management** in one location
- Energy and refurbishment consultig
- Finance and grants consulting

Local Refurbishment Management



Thank you!

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