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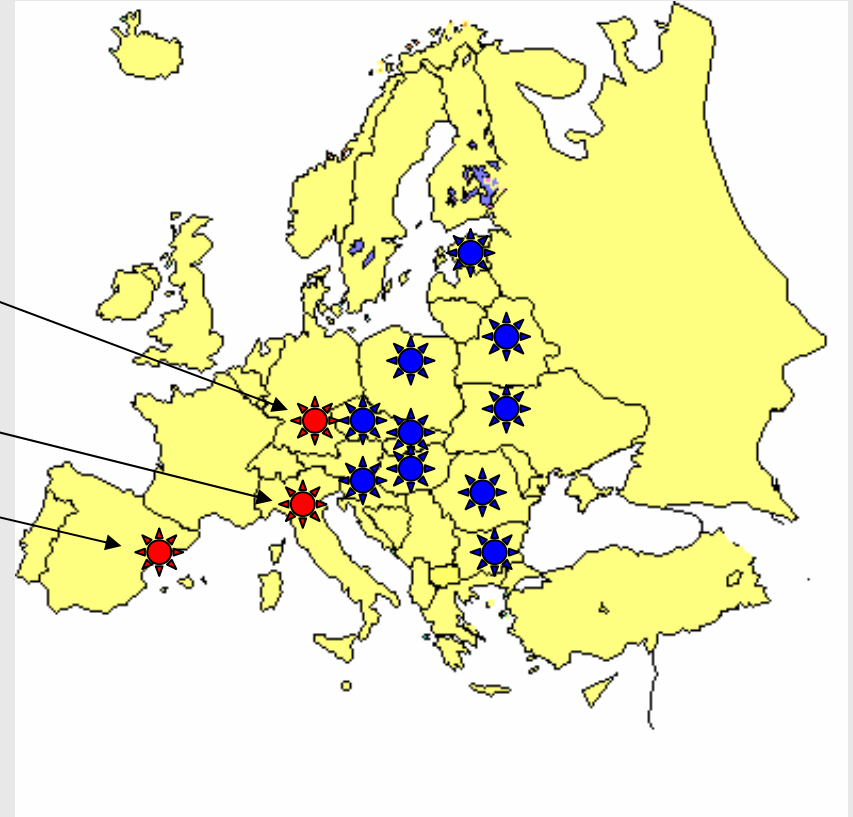


POLYCITY PROJECT

3 cities cooperate in the sustainable energy supply of urban development projects:

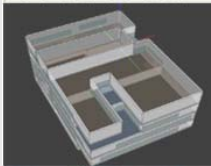
1. Ostfildern/Stuttgart
2. Torino
3. Cerdanyola/Barcelona

Further associated communities share the experiences



Workshop
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U.Eicker

Basel 2006
zentrum für angewandte forschung an fachhochschulen
Stuttgart University of Applied Science



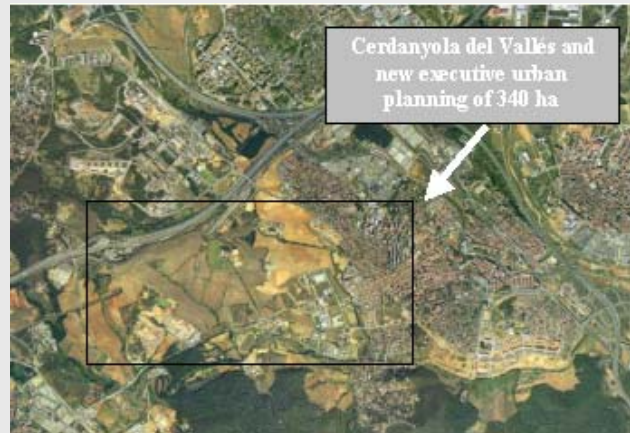
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Scharnhauser Park/Ostfildern Germany

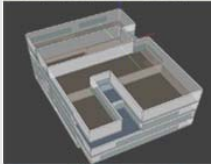


Cerdanyola del Vallès, Barcelona Spain



Arquata, Turin Italy





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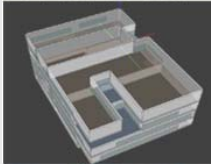
Scharnhauser Park/Ostfildern

Renewable energy supply: 80%

Thermal power Biomass	6.3 MW
Electrical power ORC-Module	1 MW
CO2 Reduction	10.000 t/a
Fossil energy saving	3,5 Mio m ³ Gas/a

- Combined power, heat and cooling generation
- Decentralised heat storage
- 70 kW of building integrated photovoltaics
- 80 kW hydro power
- Low energy residential buildings
 - First development phase: 16.000 m²
- Commercial buildings, 18.000 m²
- Pilot building Elektror:
 - main features: thermal cooling,
 - improved façade design,
 - innovative distribution





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Cerdanyola del Vallès

Reduction in conventional energy consumption: 54%
Renewable Energy supply: 33%

- District heating and cooling network
- 1-2 MWe1 Biomass plant
- Gas co-generation
- 2.000 m² solar collectors
- Ecobuildings – office buildings:

Sincrotron

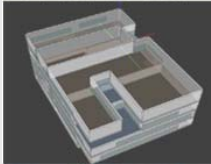
Laboratory of light/particles accelerator
improved façade design, higher isolation standards, improved sunshading and daylighting, connection to the district heating and cooling network

NaturCentre

Geothermal energy system, cross-ventilation,
35 kWp PV pant, solar thermal collectors

- Ecobuildings – residential buildings:
1.200 social dwellings, 156.000 m²
2.100 private promotion dwellings, 273.000 m²





Arquata

Reduction in conventional energy consumption: 46 %

- **Photovoltaic system**

 - 50 kW integrated in the façade of ATC building
 - 100 KW on the roofs of the council buildings

- **Natural gas cogeneration plant**

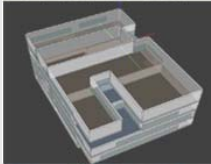
 - 0.9 MWeI, 1.1 MWth

- **Innovative façade with PV, shading**

- **Buildings:**

 - 30 residential buildings
 - One high rise commercial building (ATC)





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Energy management and benchmarking

1. MEASUREMENT

What data has to be documented ?

- Consumption, clima, etc.

2. COMMUNICATION

How can the data be transmitted to a central point ?

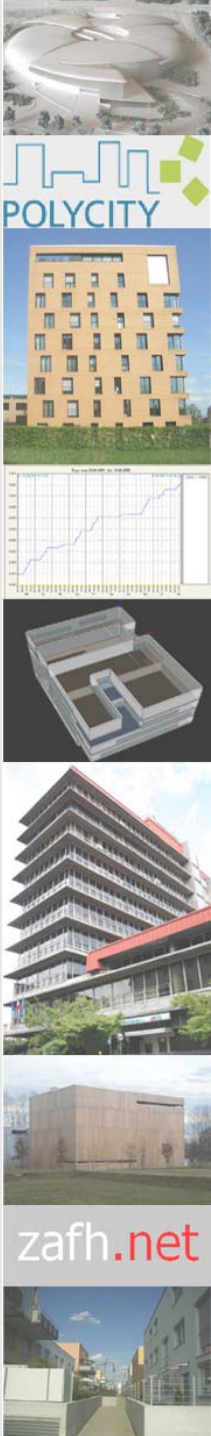
- Internet communication

3. VISUALISATION

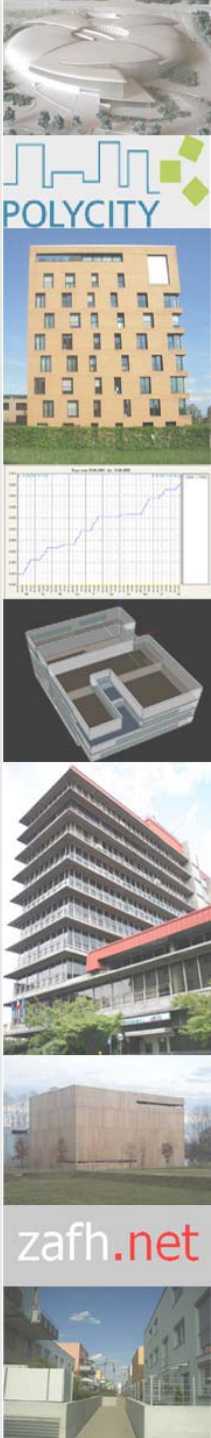
How can the data be processed ?

- Geoinformation system
- Simulation tools
- Facility management

Different Results Case Study: Berlaymont building (Brussels)



	Austria ▼	France ▼	Germany ▼	Netherlands ▼	Poland ▼	Portugal ▼
No. of Zones ▶	19(144)	2	8	3	10	58
Net Energy (specify units) ▶	127,1 kWh/m ² a		120,38 kWh/m ² a		129,7 kWh/m ² a	139,5 kWh/m ² year
Final Energy (specify units) ▶	198,2 kWh/m ² a		182,69 kWh/m ² a		170,9 kWh/m ² a	155,6 kWh/m ² year
Primary Energy (sp. units) ▶		101 kWh/m ² a	217,64 kWh/m ² a	71.285.029 MJ/year	223,4 kWh/m ² a	3.933.038 kgep/year
Net Energy (specify units)						
Heating ▶	63,12 kWh/m ² a		65,31 kWh/m ² a		35,8 kWh/m ² a	1,1 kWh/m ² year
Cooling ▶	13,24 kWh/m ² a		12,72 kWh/m ² a		30,1 kWh/m ² a	50,6 kWh/m ² year
AC moisture/humidifying ▶	7,39 kWh/m ² a		2,68 kWh/m ² a		7,4 kWh/m ² a	(included in cooling)
Ventilation (mechanical) ▶	16,55 kWh/m ² a		12,12 kWh/m ² a		5,9 kWh/m ² a	(included in heating and cooling)
Lighting ▶	18,19 kWh/m ² a		18,69 kWh/m ² a		13,4 kWh/m ² a	14,5 kWh/m ² year
Domestic Hot Water ▶	8,57 kWh/m ² a		8,86 kWh/m ² a		8,7 kWh/m ² a	-
Solar Energy ▶			n.a.			-
Cogeneration ▶			Included in primary energy conversion		74,7 kWh _e /m ² a	Included in primary energy conversion
Equipment (if included) ▶			n.a.		23,2 kWh/m ² a	34,7 kWh/m ² year
Pumps and Fans ▶			4,6 kWh/m ² a		3,3 kWh/m ² a	27,2 kWh/m ² year
Lifts and Parking ▶			5,57 kWh/m ² a (net parking energy)			11,4 kWh/m ² year



Benchmarking question 1

What needs to be monitored?

Minimum requirements:

- Energy counters:

- Heating energy
- Cooling energy
- Electricity for building services (ventilation devices, heating pumps etc.)
- Electricity for Lighting and for other applications
- If possible: energy input storage



- Climate data:

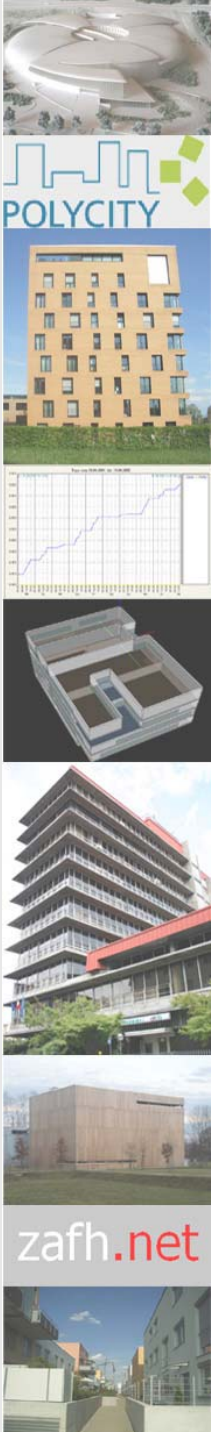
- Temperature ambient air
- If possible: Global solar irradiation on horizontal level



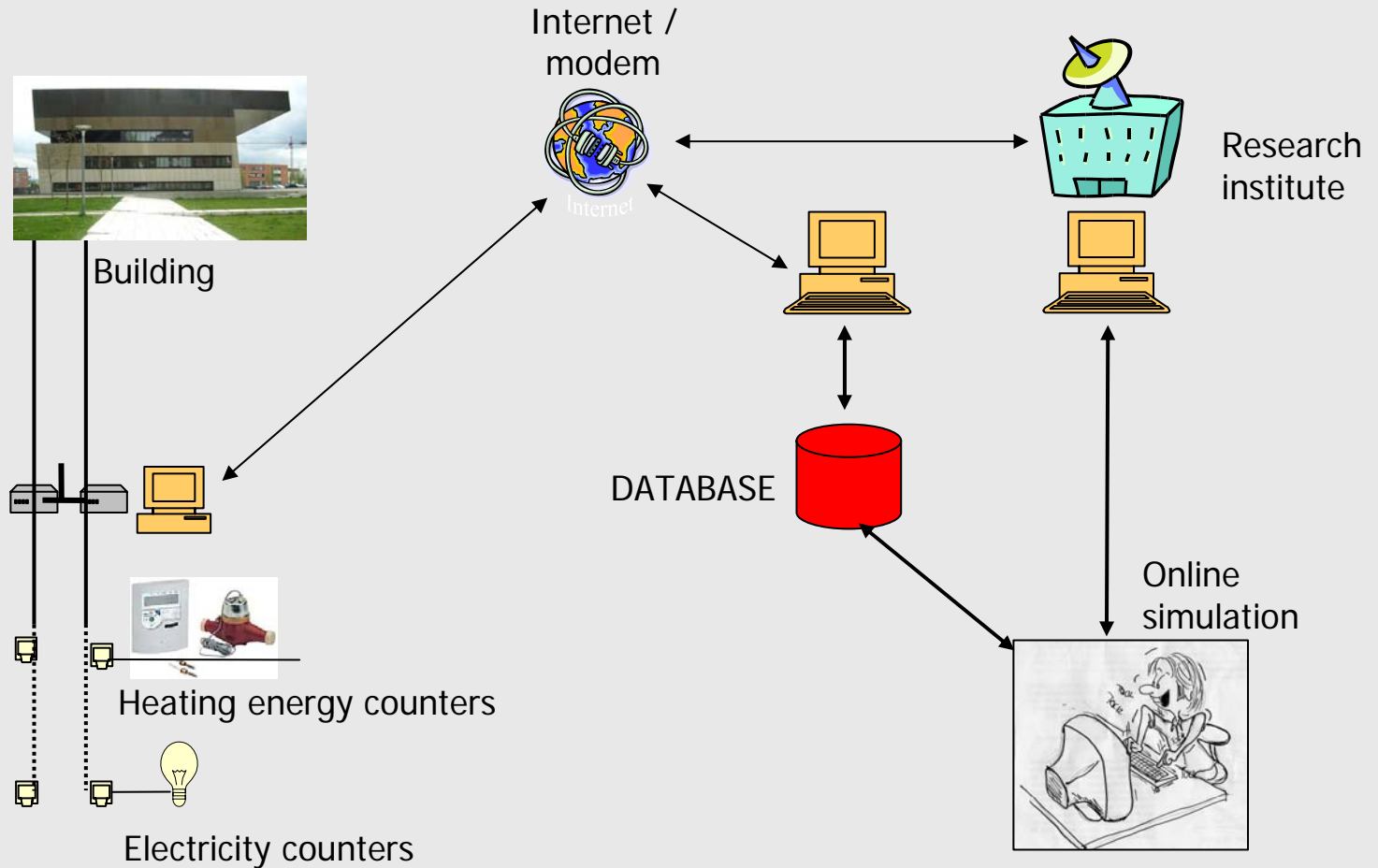
- Renewable Energies:

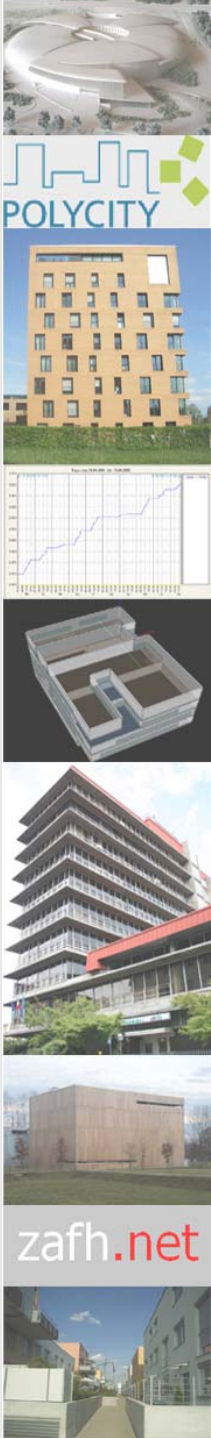
- Solar thermal energy, Photovoltaic produced electricity
- Geothermal energy, Biomass etc





2. How is data transmitted? Communication infrastructure and online simulation





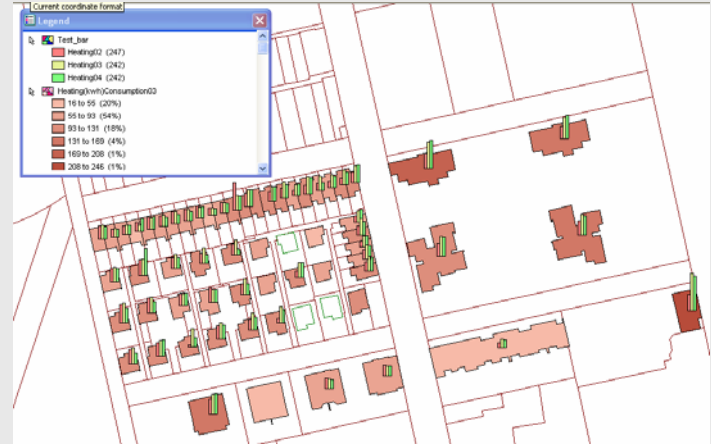
3. How is consumption visualised?

Example: Geoinformation system

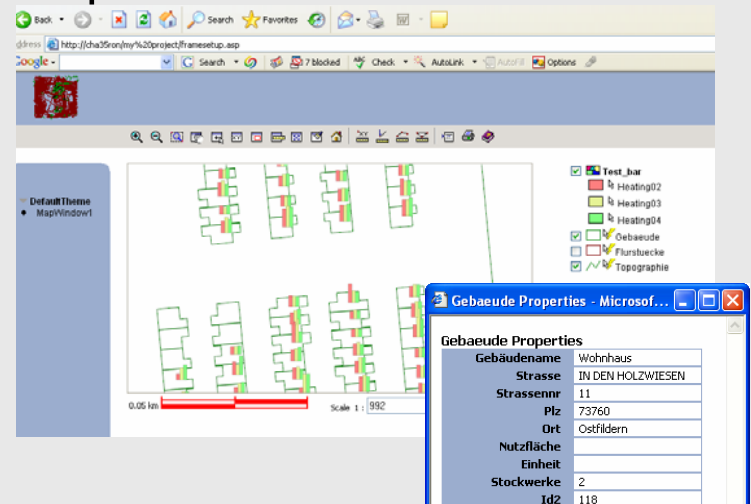
Overview

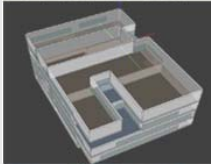


Detail

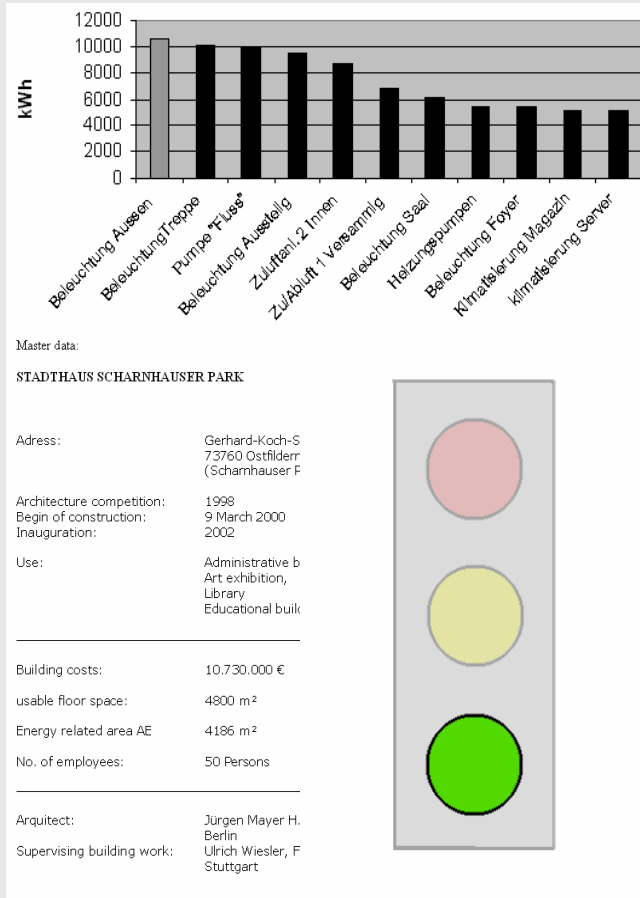


Map on the Web



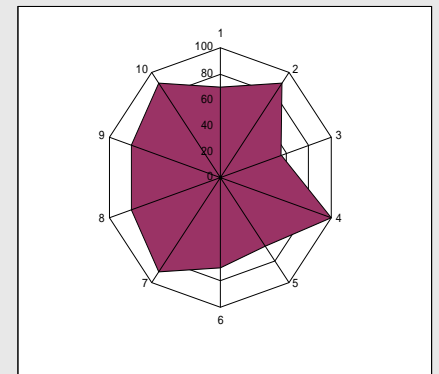
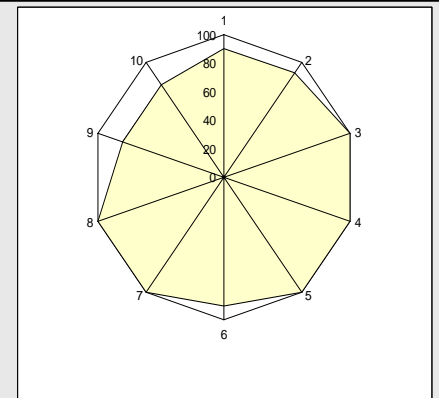


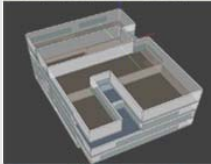
Example: Facility management; benchmarking, indicators



Comparing building types:

1. insulation
2. Building materials
3. Heating consumption
4. Primary energy cons.
5. CO₂-Emiss.
6. Domestic engineering
7. Location
8. Use
9. Cost efficiency etc.

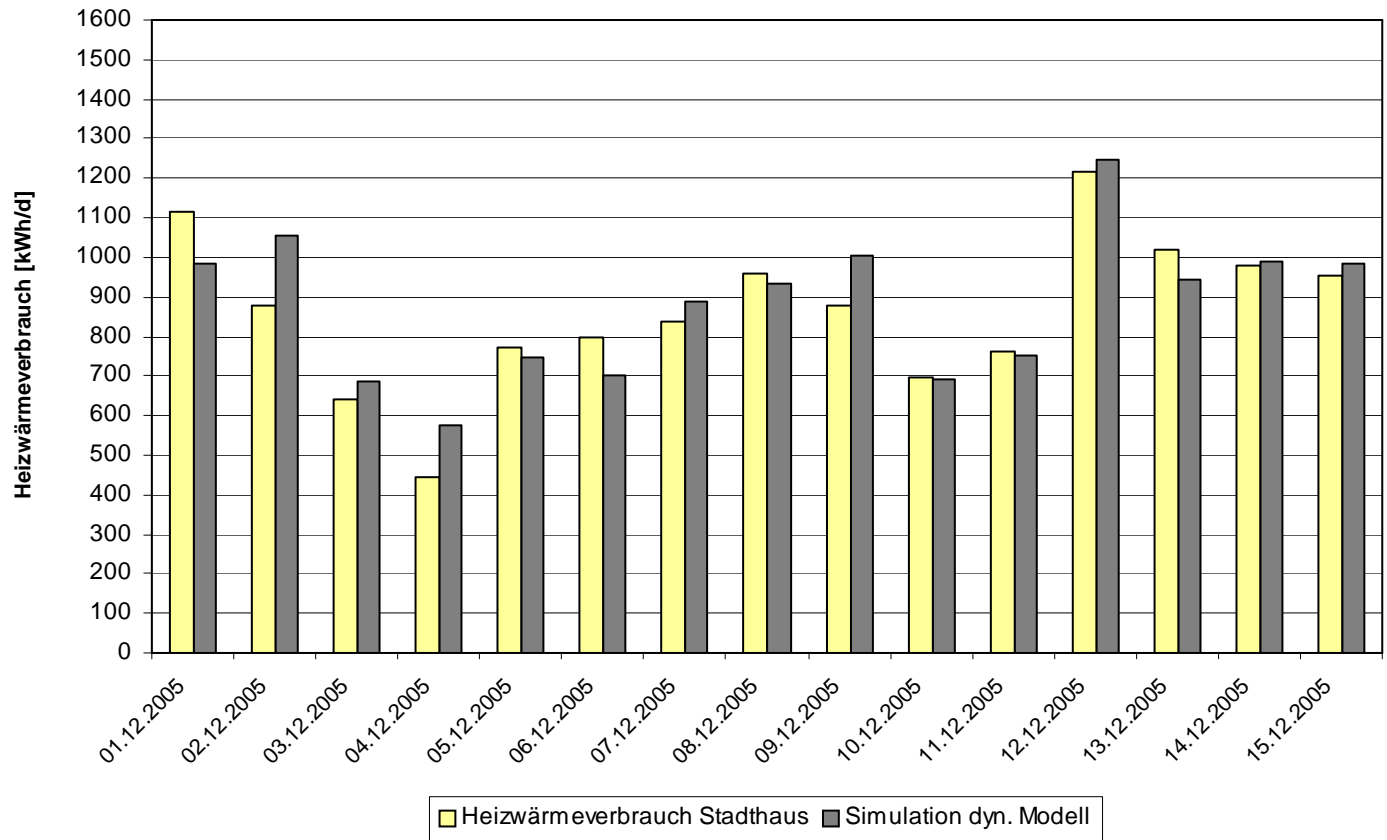


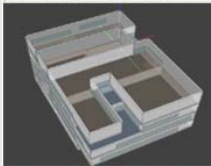


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How is performance evaluated? Simulation / consumption comparison on day-based-timescale Date: **December**





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Conclusion

- Common indicators for energy consumption are needed
- Exchange information about visualisation platforms
- Use online simulation as an advanced fault detection scheme
- Classify buildings in benchmarking systems