

Integrated spatial and energy planning

Energy efficiency and renewable energy in relation to spatial planning and urban development

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Topics

The theory ...

- Instruments of spatial planning in urban areas – at the overall level of urban form and at the local level – and their interrelation with energy issues.

The practice ...

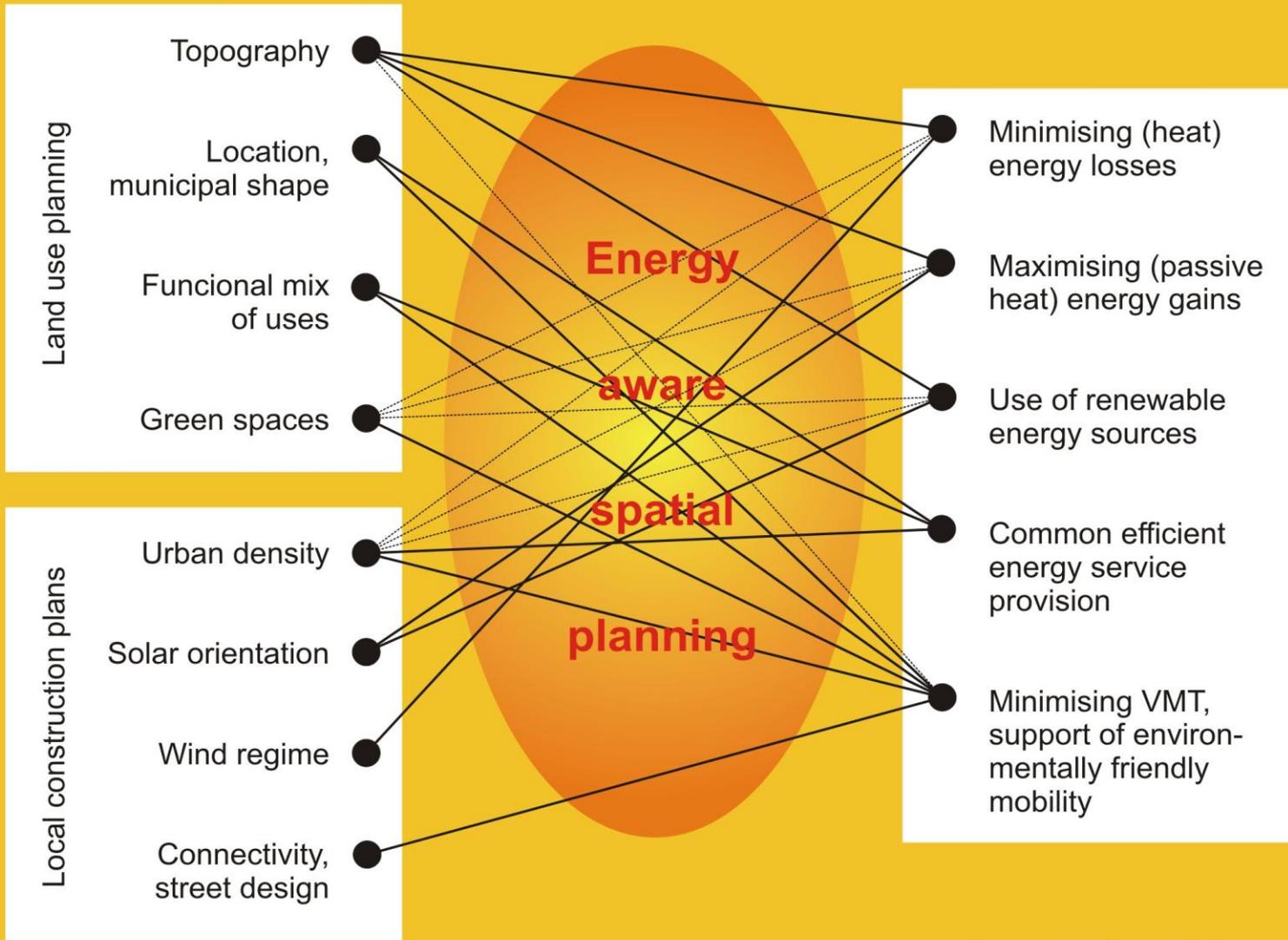
- Experiences from the implementation of integrated planning – actual processes in 6 European cities participating in the project TRANSFORM

Conclusions and outlook

Spatial planning



Energy issues



———— Important interrelation
..... Interrelation of relevance

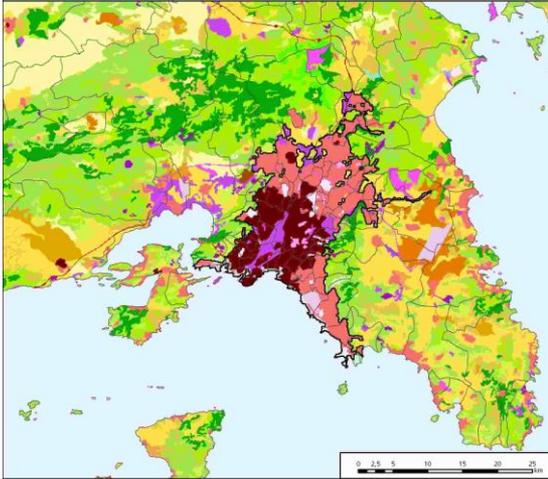
Energy relevance of land use planning in urban areas

Municipal land use plans define the location of different functions and thus the shape of the built up area as well as its functional mix.

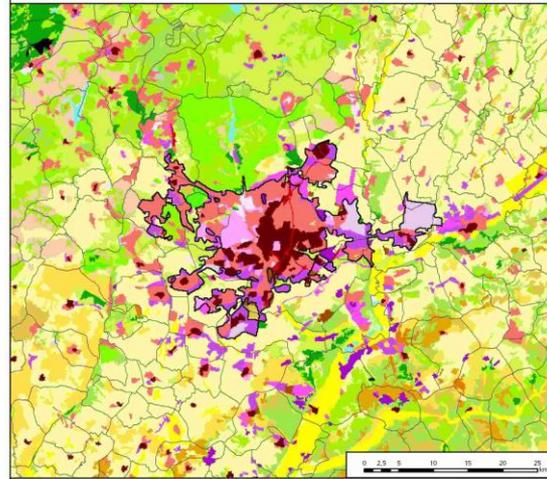
- The **overall urban form** (compact versus sprawled development)
 - is decisive for general mobility options especially referring to the financial feasibility of public transport
 - and the overall efficiency (and costs) of networks for energy/heat supply and other technical infrastructure
- **Land use mix** is describing the distribution of functions as e.g. housing, industry, services and green areas within an area
 - important for the integration of social/commercial services
 - may provide with options for e.g. use of waste heat
 - may influence the micro climate (heat island effects)

Metropolitan areas - Land consumption

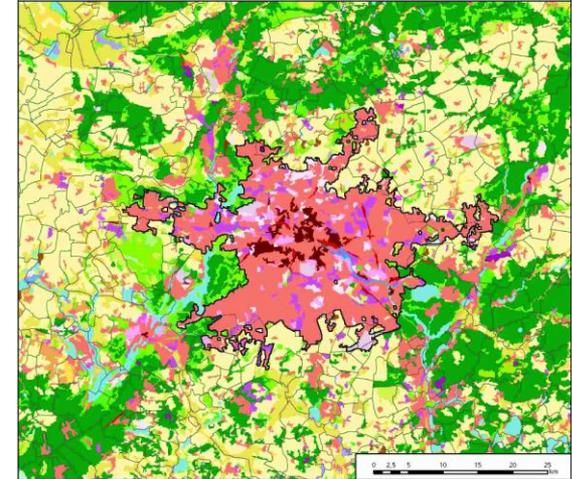
Αθήνα (Athens)
Urban Area Classification 2000



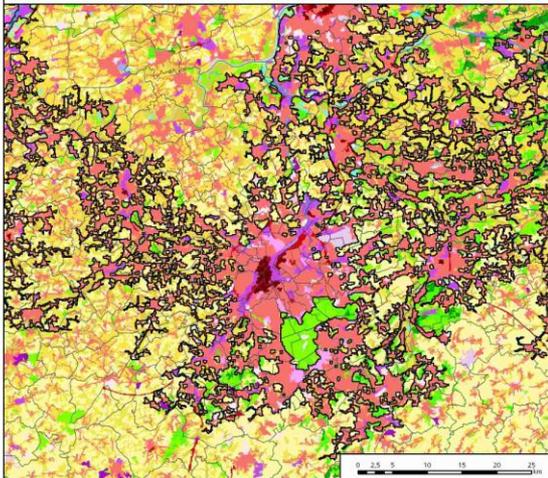
Madrid
Urban Area Classification 2000



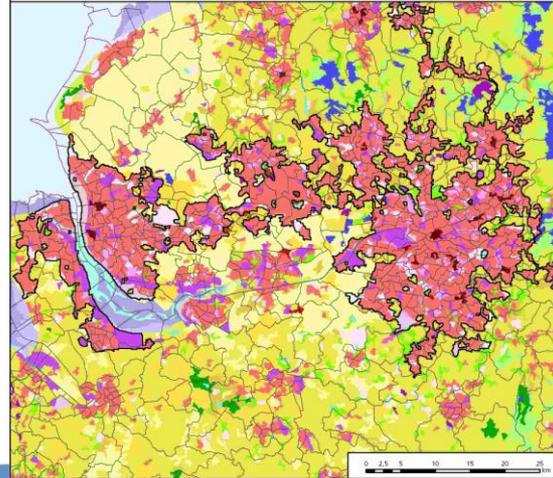
Berlin
Urban Area Classification 2000



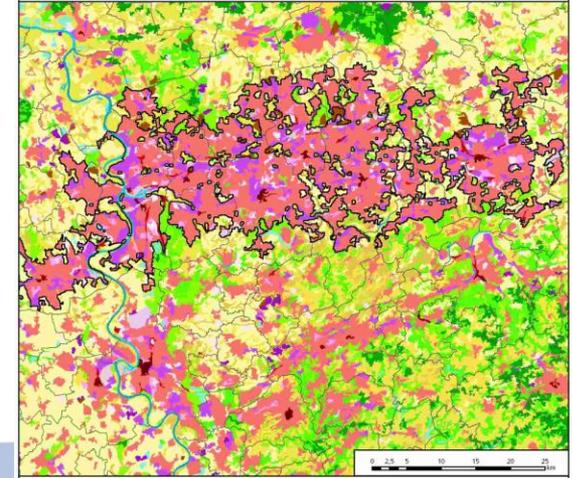
Brussel/Bruxelles
Urban Area Classification 2000



Wirral - Liverpool - Manchester
Urban Area Classification 2000



Ruhrgebiet
Urban Area Classification 2000



→ about 3.5 million inhabitants in the urban area

Local construction plans define density and design of urban quarters

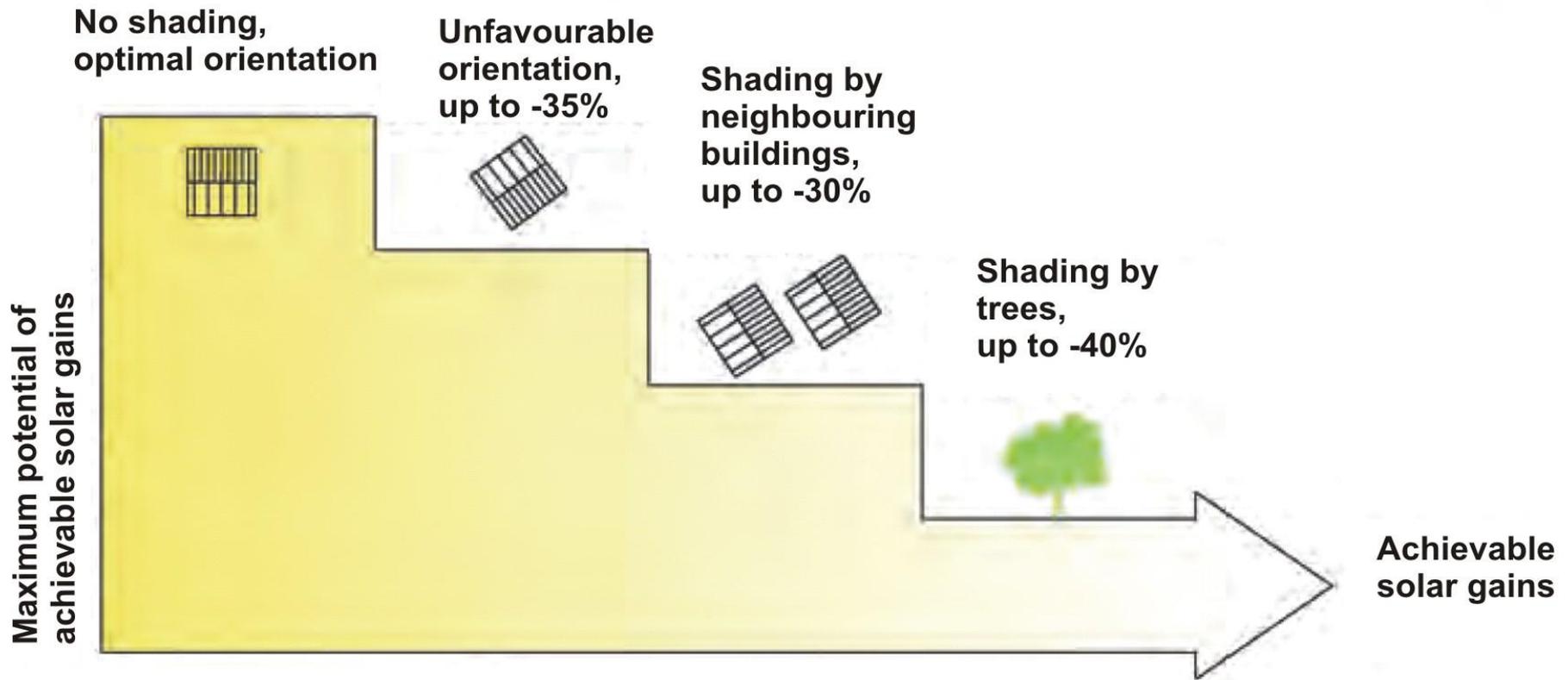
- Future **urban density** is influencing options for district heating/cooling networks and possible solar gains, mobility-options and the local micro-climate
- **Solar orientation of buildings** (by orientation of streets and plots) is important for passive and active use of solar energy
- **Connectivity of streets and pathways** is possibly avoiding detours and supporting short distances within the city

→ Planning at the local level ranges from the size of urban quarters to the building block (beyond the level of single buildings)

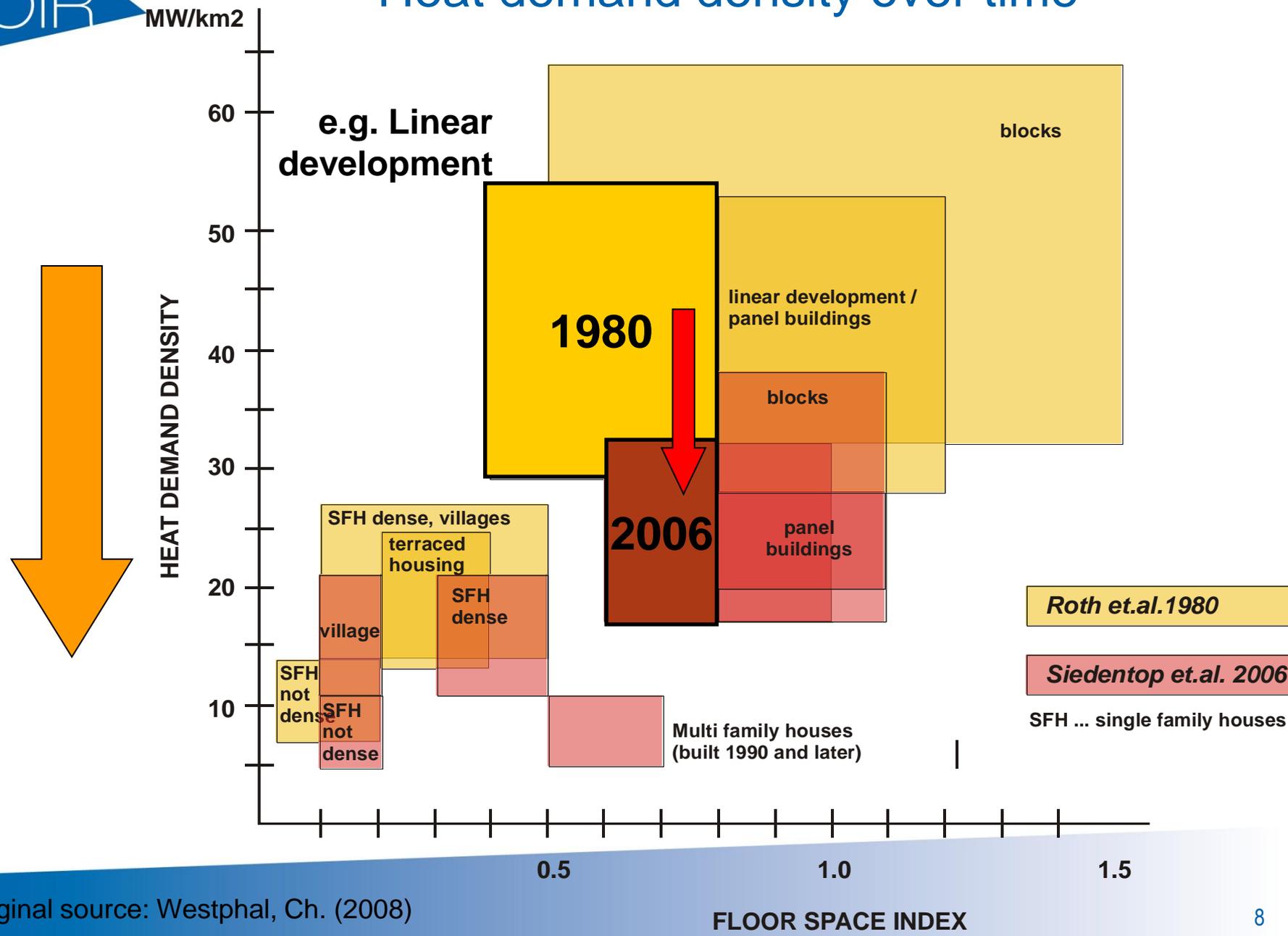
→ Decision taking takes place at a smaller scale and with a shorter perspective in terms of impact

→ Locational factors and counteracting effects have to be considered

Urban planning affecting achievable solar gains



Heat demand density over time



Original source: Westphal, Ch. (2008)

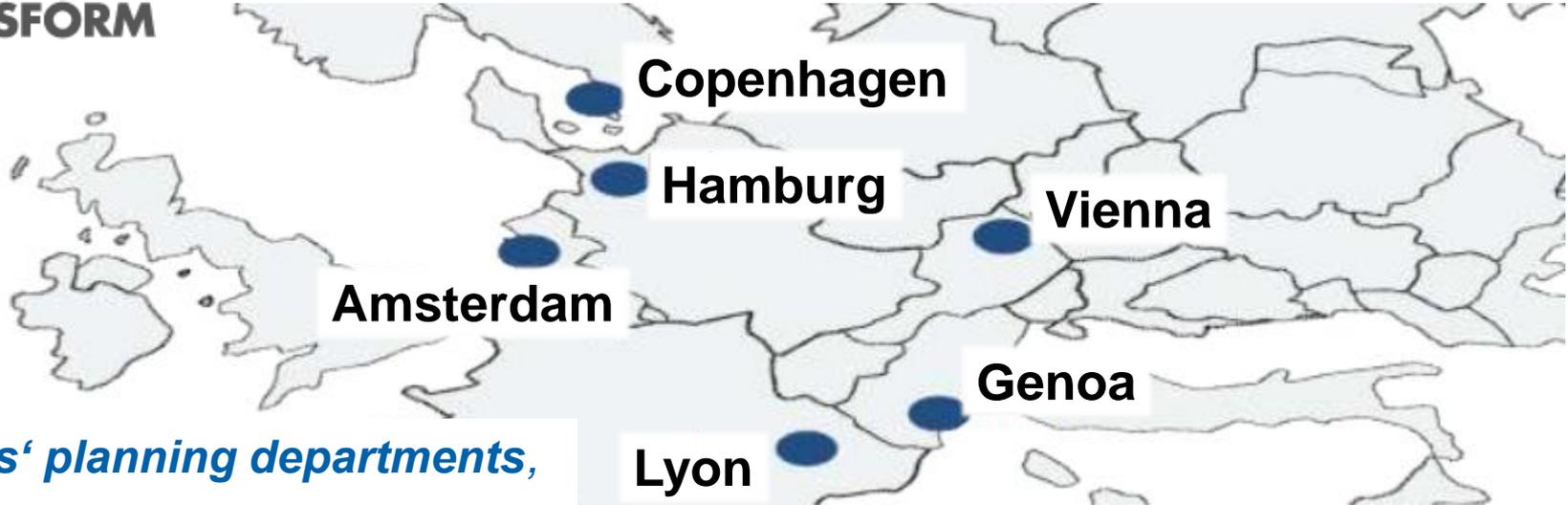
Summary on the interrelation between spatial and energy planning

- Planning refers to a long term to medium term perspective – but a quantitative relevance of impacts is achievable only on the long run
- No „one plan fits all“ solutions, detailed planning is necessary for every urban area / city / district / urban quarter / building block
- Counteracting effects have to be considered between different relevant aspects (e.g. limited solar gains in high density areas)
- Most relevant added values of integrated planning:
 - Higher energy efficiency and higher RES shares possible
 - Higher energy supply security and lower costs on the long run (for clients and the municipality)
 - Increased planning reliability also for energy supply companies



Experiences from implementation of integrated planning in different European cities

European research projekt TRANSFORM (FP7)



*Cities' planning departments,
together with:*

Energy companies

- ▼ DONG Energy
- ▼ ERDF
- ▼ ENEL
- ▼ ARE Liguria
- ▼ Hamburg Energie

Industrial partners

- ▼ ARUP
- ▼ HESPUL
- ▼ Accenture
- ▼ Siemens
- ▼ IBA Hamburg

Research partners

- ▼ AIT
- ▼ DTU
- ▼ ÖIR

The main objectives of the project TRANSFORM

- Definition of the state of the art of becoming a Smart Energy City
- Elaboration of a city wide Transformation Agenda for each of the TRANSFORM cities
- **Elaboration of detailed plan for “smart energy” implementation in a selected urban area in each of the TRANSFORM cities**
- Development of a quantitative decision support model
- Replication and dissemination of results

- **Amsterdam, Energiek Zuidoost**
Urban transformation of an **existing mixed-use area** according to 2020 targets, incl. Ajax stadium, offices, leisure, shopping, hospital, datacenters, energy plant
- **Copenhagen, Nordhavn**
Brownfield development port area with a vision for a CO2 neutral and green lab for new solutions providing room for 40,000 inhabitants and 40,000 jobs.
- **Genoa, Mela Verde**
Brownfield development port area together with mixed-use area with focus on a comprehensive CO2-reduction strategy
- **Hamburg, IBA Wilhelmsburg**
Transformation and **expansion of a mixed use area** with the objective 100% RES for electricity by 2025 and 100% RES for heating/cooling by 2050
- **Lyon, Part Dieu**
Urban **transformation of a 1960s business district** with floor space to be doubled by constant energy demand
- **Vienna, Urban Lakeside (aspern Seestadt)**

TRANSFORM partners – a closer look

- Energy aware planning approaches driven by spatial planners. They have the responsibility to develop the city in a sustainable, forward looking way considering EU 2020 (2030) energy targets.
- Urban planners are used to focus on local development areas and to plan urban design, transportation systems, mobility offers, etc. - in a medium to long term perspective
- Municipal energy planning departments and local / regional energy companies widely support the project as partners, but are not in charge of leading the discussion and collaboration process.
- But: Integrated spatial and energy planning for urban areas is still to be seen as a pilot action in most cities.

Challenges of planning the urban future – aspern Vienna's Urban Lakeside as an example

- A new, multifunctional urban district in the northwest of Vienna (240 ha area, 2.2 million m² gross floor space) with space for 20,000 residents and 20,000 workplaces.
- Mixed use for offices, production and service businesses, science, research and education, shops and entertainment, pubs and small business in the whole Urban Lakeside area.
- High quality of public transport (metro-line), car sharing, collective garages for cars, very good conditions for cycling and walking
- Attractive green and public spaces, high overall quality of living
- Planning and implementation based on a large number of technical and environmental studies

aspern Vienna's Urban Lakeside

... planning from the scratch

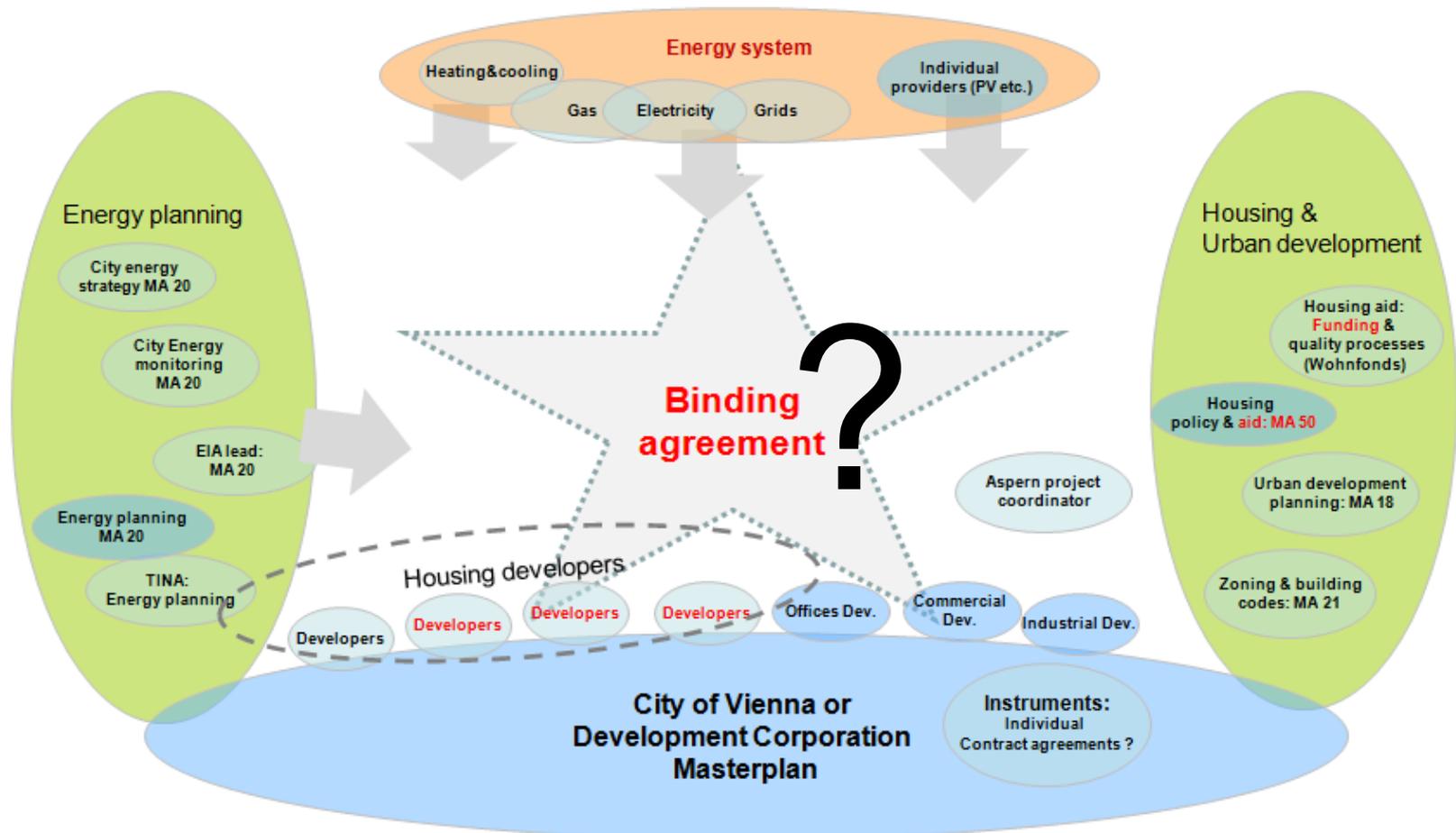


The future of aspern Vienna's Urban Lakeside



The challenge for integrated planning in Vienna

Area-focused integrated development approach, encompassing energy supply, (local) energy production and buildings



Major aim: Area-focused optimization

- New planning processes considering technical issues but also governance, legal and economic framework conditions.
- Integrated planning instead of subsequent planning phases - common objectives of (until now often) sectorally organized municipal departments, common timelines and a common language between spatial planners and energy planners.
- Cooperation of energy experts and planners with stakeholders at regional, municipal and local level is key for the implementation of energy efficient and carbon reduced technical solutions.
- Finally it needs enhancement of legal restrictions and political commitment even though decisions on long term plans in the actual situation of major changes in the energy sector are a specific challenge.

„Game changers“ – a summary on key questions from the experiences in the TRANSFORM cities

- Enhancement of co-ordination models and legal framework conditions for energy co-operations and the use of energy data
- Feasible business models for private investment, applicable under existing laws and rules and interesting for banks or other financial institutions and companies
- Legal (and technical) solutions for the implementation of district heating systems (with different specifications: recovered by renewables/waste heat, low/ultra-low temperature)
- Involvement of important stakeholders in order to come to an agreement for a holistic development and development of successful participatory models influencing end-user involvement and behaviour

- Spatial planning shapes future options of living and working in a city and may essentially support the implementation of innovative energy systems. It is not (only) driven by professional technical decisions, but influenced by target conflicts between different development aims of urban stakeholders and legal constraints to be considered.
- Energy issues (and energy experts) have to be included in an early phase of planning and balanced with other important objectives and concerns of urban development.
- This stepwise alignment of municipal decisions with energy efficient development options is necessary in order to achieve a perceptible contribution to the transformation of the built environment.
- The basis must be a sound knowledge on interdependencies between spatial structures and related energy issues as well as on legal, financial and governance framework conditions in place.

Thank you, for your attention!

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