

»Morgenstadt: City Insights«

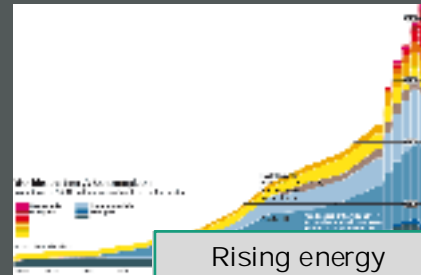
Hans Erhorn



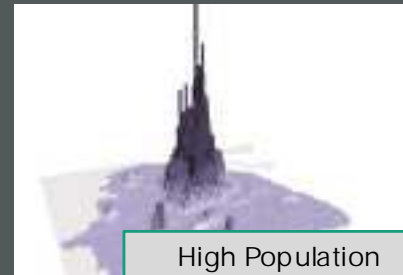
Cities: **Today's** problem, **tomorrow's** solution

Global challenges for cities

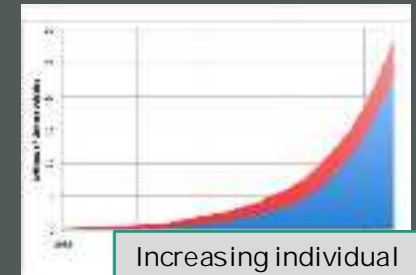
- Industrial patterns of consumption and production lead to big challenges for our cities
- Cities are increasingly developing a demand for sustainable solutions.
- The solutions of tomorrow will have to be fundamentally different from those of today.



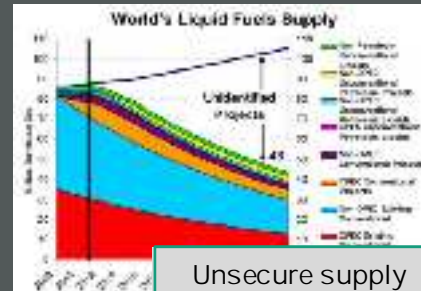
Rising energy demand



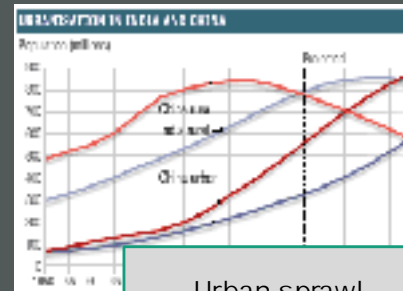
High Population density



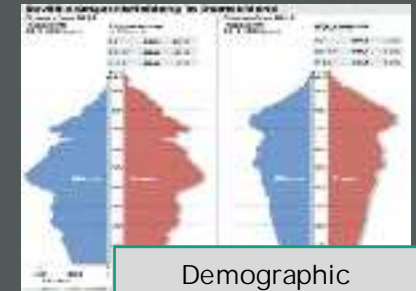
Increasing individual mobility



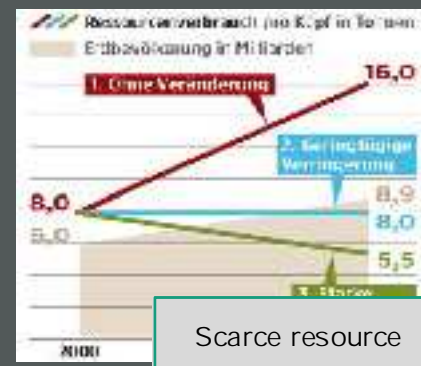
Unsecure supply w. fossil fuels



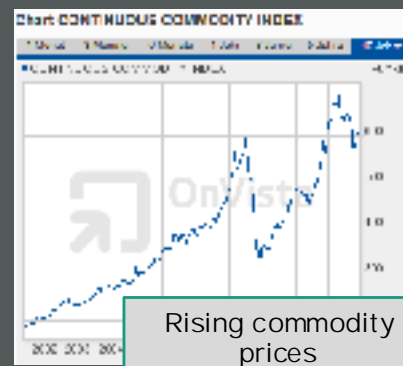
Urban sprawl



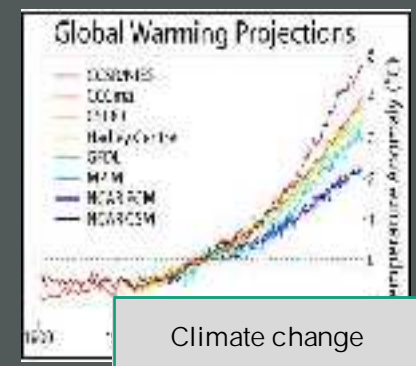
Demographic change



Scarce resource



Rising commodity prices



Climate change

Quellen: UN Populations Division, SPIEGEL, BBC, IPCC, NY Stock Exchange, Die Welt, Business Insider

What is happening in the cities at current...

Megatrend: sustainable transformation of technical systems...

3 great transformations of technical systems are currently impacting upon our cities:

Technological change in multiple sectors



Decentralized Energy Systems



Urban production & logistic systems



Ubiquitous communication



Electric Mobility, Shared mobility



Individual plus-energy houses...

Increasing rate of change

Synchronization of Innovation-cycles:



Buildings



Infrastructure



Vehicles



ICT & Data

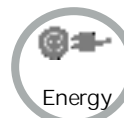


Mergence of separated sectors

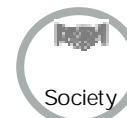
Divergent Technology-management



Security



Energy



Society



Mobility



Governance



Buildings

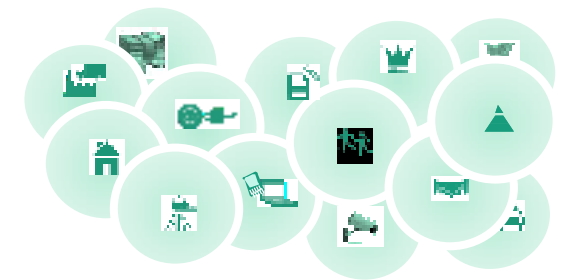


Logistik



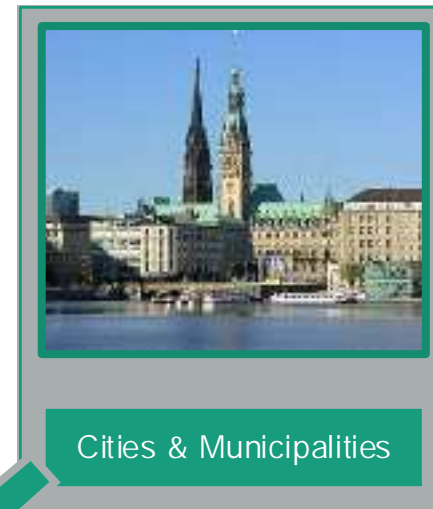
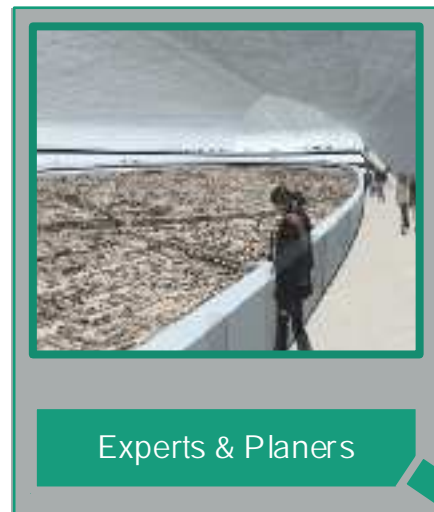
ICT

Convergent Technology-management



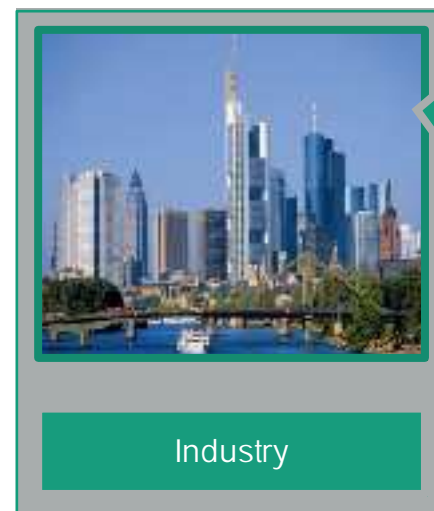
The missing link: Interconnection of relevant actors

- Have expert knowledge about urban subsystems
- Don't produce, can't enact



- Have systemic knowledge about cities
- Don't develop products and solutions

- Enabler of cities by producing sustainable products and solutions
- Need future markets



- Represent interests of civil society and 'city dwellers'
- Facilitate political dialogue



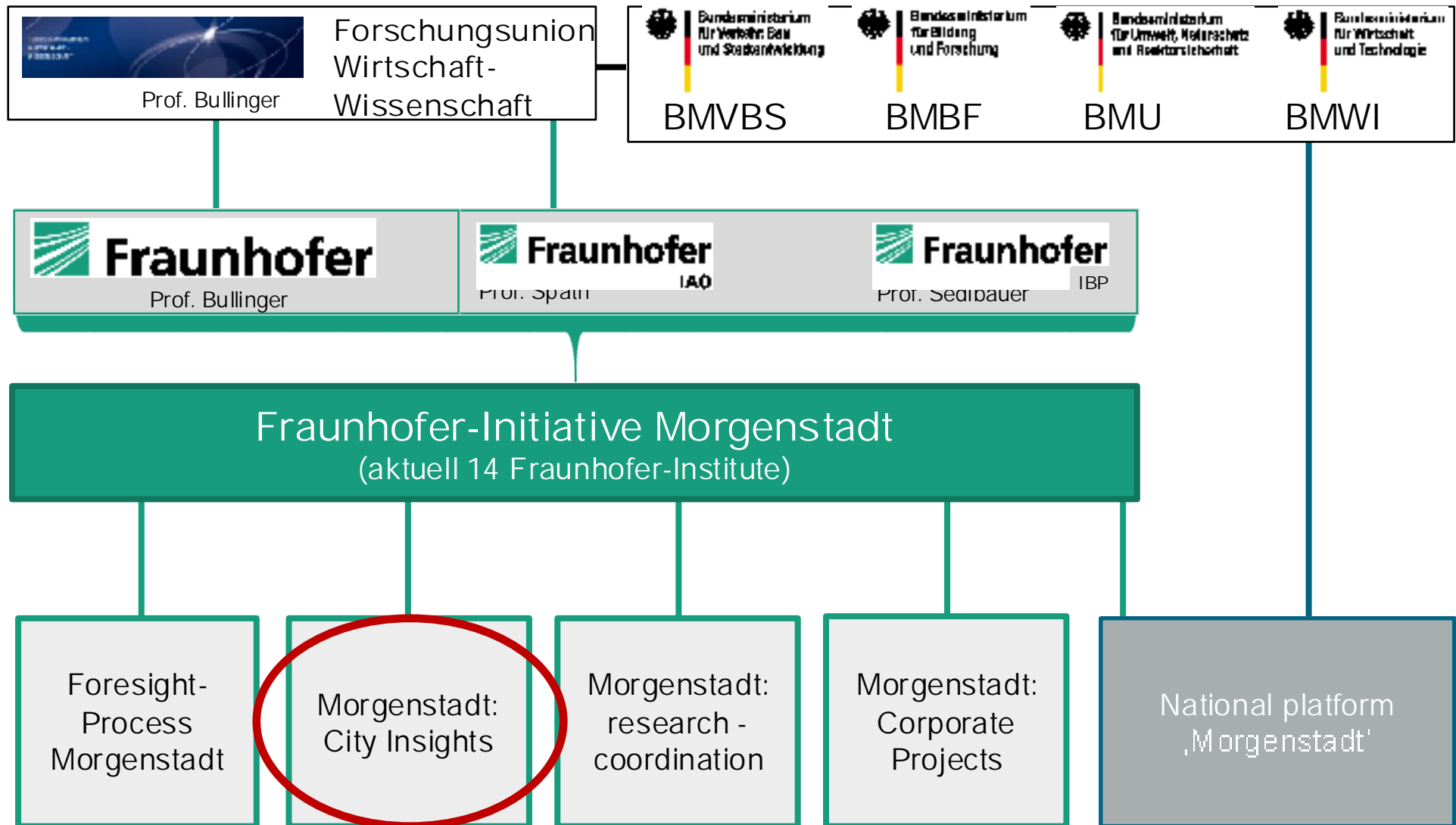
Aims of the network

Content objectives of the research project

- Develop a global status quo on best practices for sustainable urban transitions.
- Develop a reference frame for shaping future city projects.
- Connect urban technology systems, business cases and governance systems in an interdisciplinary research approach.
- Develop ideas and concepts for future sustainable solutions on city level.



Fraunhofer-Initiative Morgenstadt: Overview



National systems research Morgenstadt (Science, Industry, Cities, Politics)

Aims of the network

Community objectives of the research project

- Networking between companies, cities, and international partners.
- Development of joint city projects.
- Turntable of innovation.
- Exchange with national and international experts.
- New impulses and possibilities of presentation through Project meetings and workshops



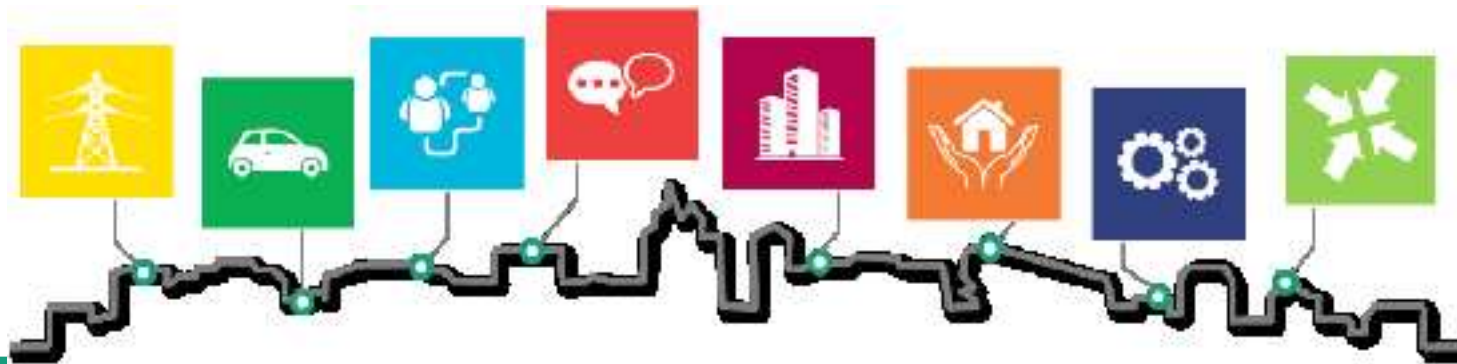
Joint research project – systemic approach

- In depth analysis of six inspiring global cities.
- On-site research by interdisciplinary teams of Fraunhofer Experts



- Analysis of the interfaces between technology systems, socio-economic factors and governance systems

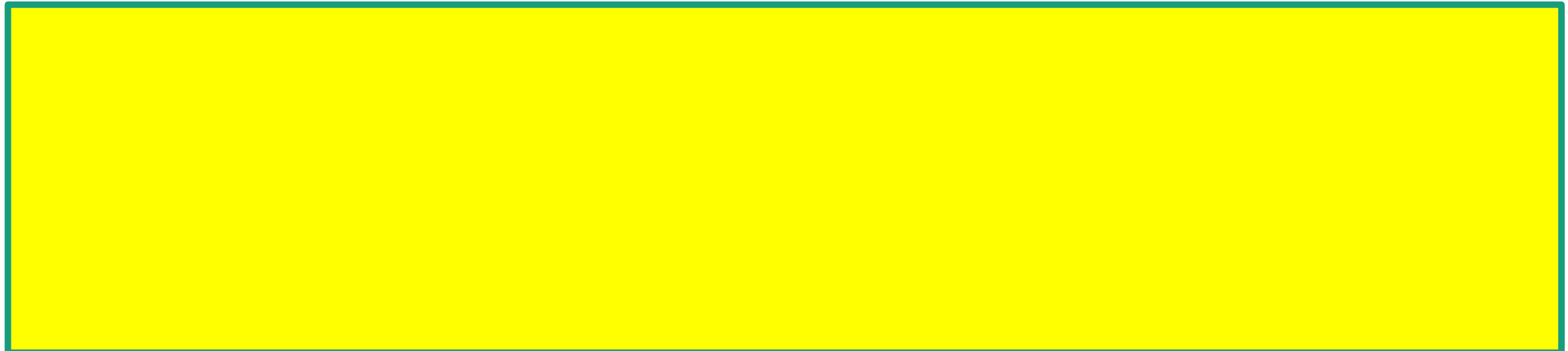
Energy • Mobility • ICT • Governance • Buildings • Security • Resources



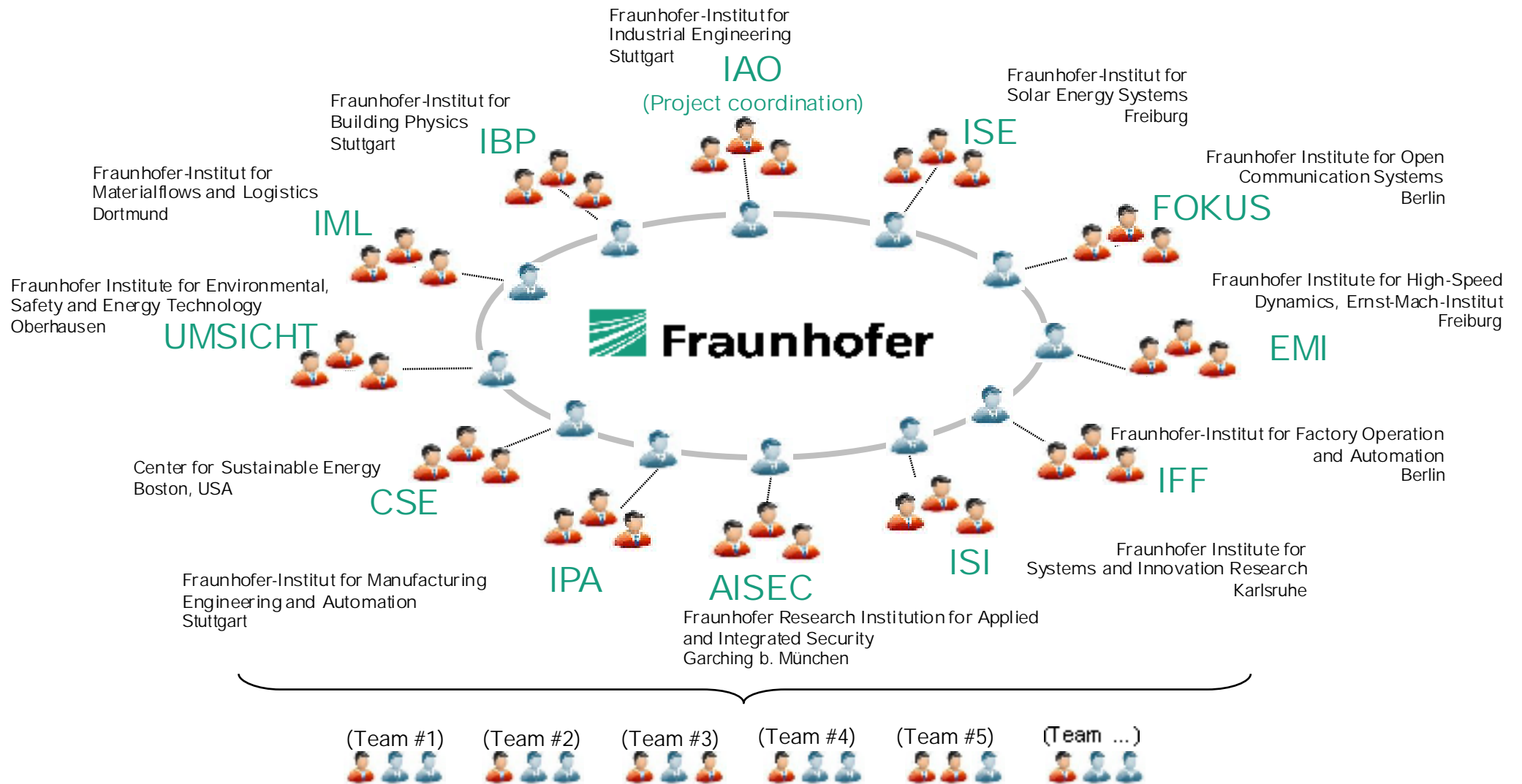
Example questions for research – Energy & Buildings

- *Which energy services are provided in „Morgenstadt“ and how can this help improve overall sustainability?*
- *To what extent is energy a common pool resource in future cities?*
- *Cities are „concentrated productivity“. The system boundaries defined for urban accounting and the evaluation of material-, energy- and money-flows are crucial for an assessment of urban sustainability. How do cities differ in valuation and measurement of their system boundaries and urban material-, energy- and money-flows?*
- *How can you double or triple the rate of energy-oriented modernization of buildings per year (3-5% / year)?*
- *Innovative business models play a great role in future cities. Which new services are expected here from an infrastructure provider?*
- *How can lifecycle-cost-analysis become standard for new urban projects?*

Partners in the network



Research in interdisciplinary teams



Voices of Morgenstadt



„We joined the project in order to enhance our understanding of sustainability and to gain insights into the energy provision of the future...“

Stefanie Hellbach, EnBW

„An interdisciplinary view on the city of tomorrow provides us with conclusions for our own actions...“

Dietmar Brandt, Volkswagen



„We want to improve our understanding of the cities and the relevant stakeholders and decision makers in a city as customers. Validate cities as a large system and want to identify opportunities for “system-solutions“

Dr. Armin Pfoh, TÜV SÜD

„The city of Norderstedt expects concrete progress and gaining suitable support for the implementation of new measures on its way to a sustainable development...“

Herbert Brüning, Norderstedt



Buildings

Copenhagen



- ❖ Green Solar Cities, Valby District
 - Large scale solar application on public and private buildings (4 MWp PV)
 - EU funded Concerto project
 - New buildings and housing renovation projects with improved energy efficiency
 - Why: project is based on solar and single building approaches; common way of reducing the energy demand of the building sector in CPH is to increase the renewable energy rate in the district heating network



Buildings

Copenhagen



❖ Royal Danish Playhouse

- Low energy building
- Climate belt: energy storage system using thermo-active slabs at facade areas
- Seawater cooling and optimised heat pump
- Natural ventilation in the foyers and offices, demand controlled ventilation in auditorium, night cooling
- Environmental friendly (green) concerte
- EU FP6 project Eco-Culture
- Why: seawater cooling + ventilation approach in such a landmark cultural building. Approaches can (and are) transferred to other buildings with similar use



Buildings

Copenhagen



- ❖ Think Tank Renovation and Think Tank 2025
 - Initiative of Realdania (organisation that manages a fund)
 - Members include the Danish building industry, the crafts council, the architect association, the engineer association, ministry for town, property agencies, research organisations
 - Seven topics have been defined that shall accelerate the renovation process in Denmark
 - Think Tank 2025: focus on general reduction of energy use in Denmark until the year 2025 (just started)
 - Why: The involvement of the various stakeholder makes this initiative interesting



Buildings

Copenhagen



- ❖ Major Development Areas Örestad and Nordhavn
 - New urban areas in the center of Copenhagen: housing + offices and other service buildings
 - Joint with metro developments
 - Örestad: big building blocks with large (green) spaces between
 - Residents like to live there, but negative opinions exist:
 - **The development is not considering the „human size“**
 - The spaces are following the main wind direction
> problems with draught
 - Nordhavn: (earlier industrial harbour area) takes Örestad experiences into account:
 - Smaller, more dense mix-used buildings , small inner courtyards
 - Why: Copenhagen is one of the few EU major cities that still grow. Urban planning approaches and financing approach.



Buildings

Berlin



❖ Berlin Adlershof

- HighTech – LowEx
- Large project area (420 ha): residential and office buildings.
- Aim: reduction of 30 % primary energy until 2020 (530 GWh/a)
- Energy efficient buildings, use of waste heat, **„open“ district heating, intelligent grid, integration of renewable energy**
- Demonstration project within BMWi EnEff:Stadt research initiative
- Why: Large scale energy efficiency development, attempt to attract educational and scientific organisations + movie industry



Buildings

Berlin



❖ Berlin Märkisches Viertel

- Large renovation of residential blocks: 13.000 residential units
- Renovation with inhabited dwellings
- Aim: KfW100, partly KfW70
- District heating system changed to biomass combined heat and power
- Investments: GESOBAU, European Fond for Regional Development, City, State
- Why: Initiative by municipal housing association (GESOBAU), large energy reduction and social improvement

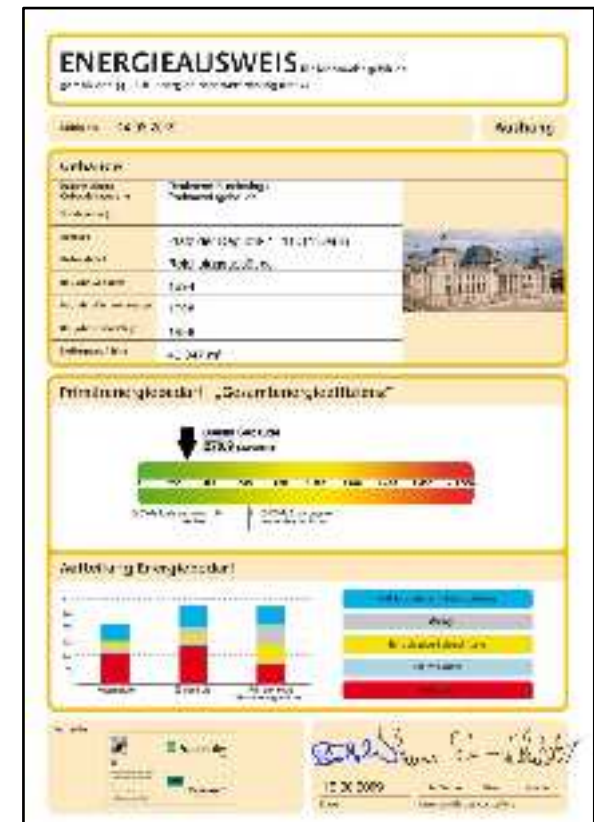


Buildings

Berlin



- ❖ Governmental Buildings in Berlin
 - High energy efficiency: example renovation of Reichstag
 - Public buildings as leading examples (as requested by the EPBD recast)
 - Energy commissioner responsible for the energy efficiency, controlling all energy consumptions
 - Guidelines for new and renovation of governmental buildings to become energy efficient, also life-cycle guidelines
 - Annual energy report
 - Commitment: all new government buildings shall be nearly zero-energy buildings already by 2012
 - Why: European-wide leading approaches for public buildings to be exemplary for other buildings





Berlin

- City development based on practical realisations on city quarter level.
- Coordinated and short retrofit processes increase the acceptance of the building users.
- New utilisation concepts for unused buildings and properties.
- City as living lab for new technologies and approaches.

Copenhagen

- Cutting edge technologies applied in lighthouse projects.
- Livability in urban planning by focusing on architectural quality of buildings and public spaces.
- Public buildings as shining examples for increased energy efficiency.

*“We can't solve problems by
using the same kind of thinking
we used when we created them.”*

Albert Einstein

The research platforms



Research Initiative EnEff:Stadt (Energy Efficient City) of the German Ministry of Economy and Technology (BMWi)

- Pilot projects on community level
- New technologies
- Planning instruments
- International collaboration
- Accompanying research team: cross analysis, assessment of project proposals, advice, guidelines, District Energy Concept Adviser



IEA ECBCS Annex 51: Energy Efficient Communities - Case Studies and Strategic Guidance for Urban Decision Makers

- International case studies on community and city level
- Guidebook to successful urban planning
- District Energy Concept Adviser

The District Energy Concept Adviser

INTERNATIONAL ENERGY AGENCY
Energy Conservation in Buildings & Community Systems Programme



IEA ECBCS Annex 51: Energy Efficient Communities

Case Studies and Strategic Guidance for Urban Decision Makers



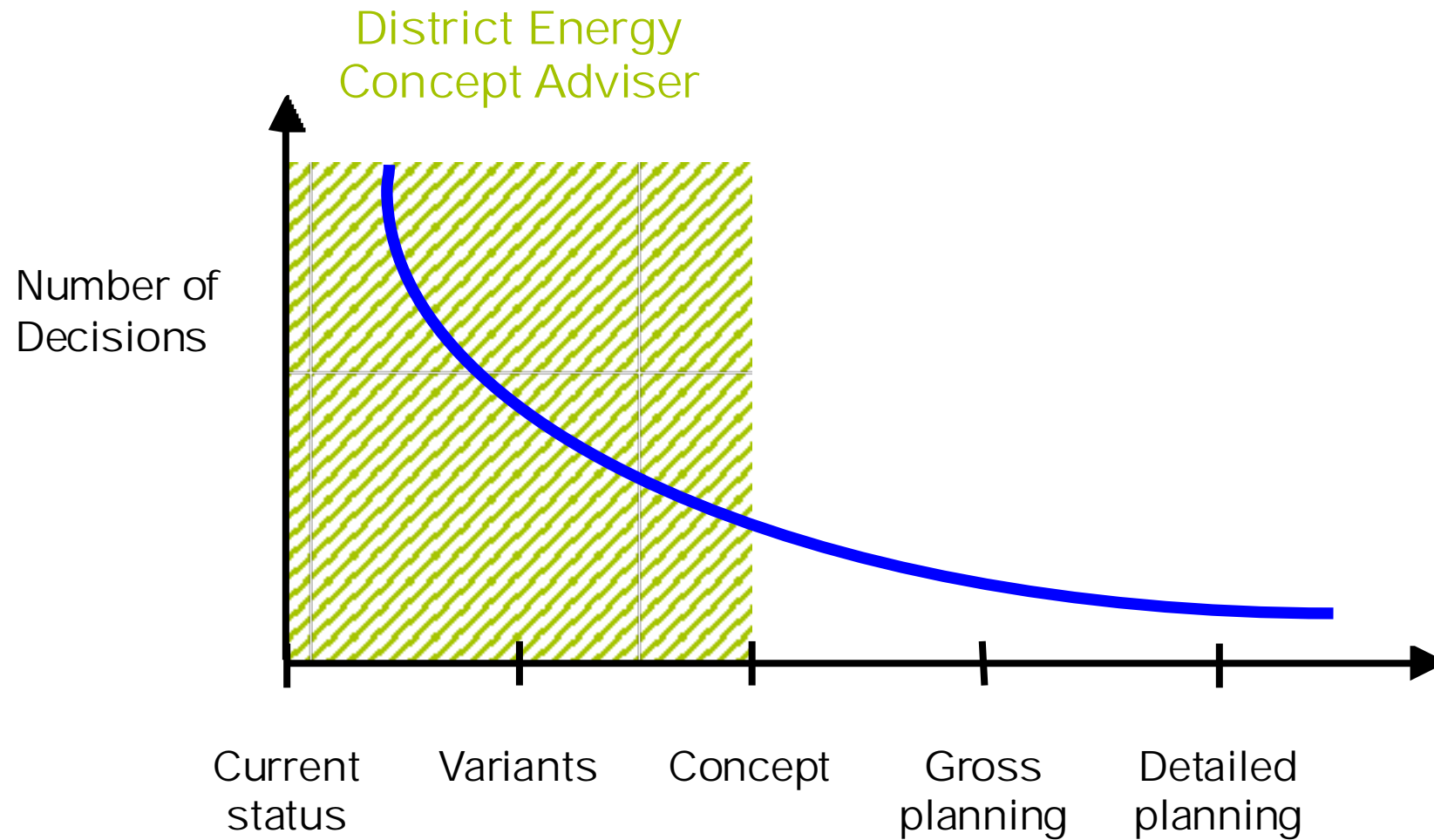
District Energy Concept Adviser

Click on a flag to start the tool



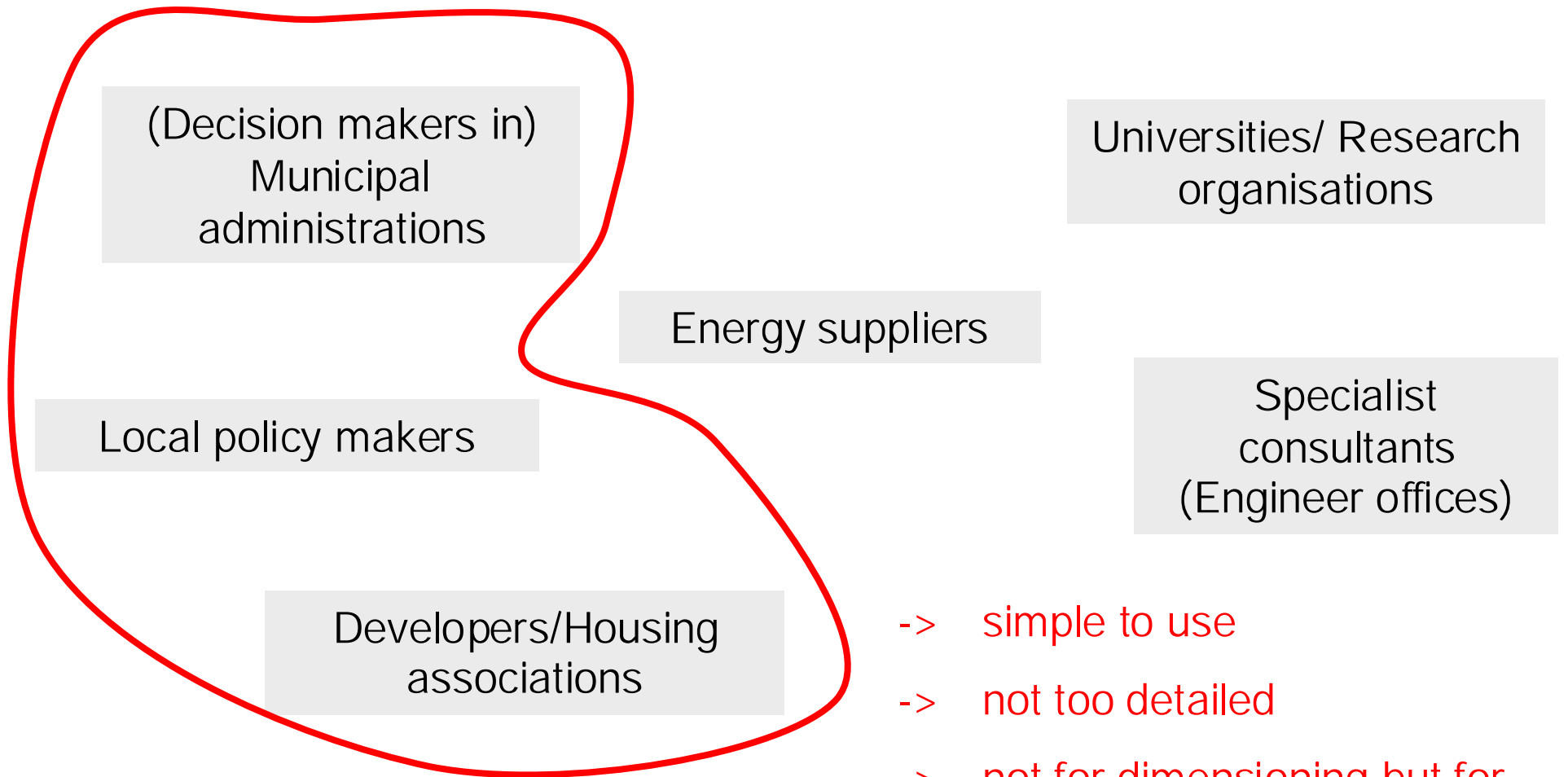
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Aim



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Target Groups



- > simple to use
- > not too detailed
- > not for dimensioning but for assessing the energy potential

Included Instruments

The screenshot shows the website interface for IEA ECBCS Annex 51. At the top, it features the logos for the International Energy Agency (IEA) and Fraunhofer IBP. The main heading is "IEA ECBCS Annex 51: Energy Efficient Communities", with a subtitle "Case Studies and strategic guidance for urban decision makers". Below this, there are two yellow circles highlighting interactive elements: "Choose a national data set:" and "Choose a tool section:". The "Choose a national data set:" section displays a row of national flags including Denmark, Canada, Denmark, Finland, France, Germany, Japan, Hungary, Sweden, Switzerland, and the USA. The "Choose a tool section:" section lists several tool options, each with a description and a corresponding button:

Tool Description	Tool Name
Compare the energy consumption of your district with national averages.	Performance rating
Learn from 19 realised energy efficient districts from both existing/retrofitted and new built districts.	Case studies of energy efficient districts
Which energy efficient strategies and technologies are applicable?	Energy efficient strategies and technologies
Assess different energy concepts (demand and supply) for districts. Calculation of delivered energy, primary energy and CO2 emissions.	Energy assessment of districts
Download of reports from Annex 51 and national programmes and projects.	Basics
Contact the participating organisations of Annex 51	Contact

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INTERNATIONAL ENERGY AGENCY
Energy Conservation in Buildings & Community Systems Programme

**IEA ECBCS Annex 51:
Energy Efficient Communities**
Case Studies and strategic guidance
for urban decision makers

Fraunhofer
IBP

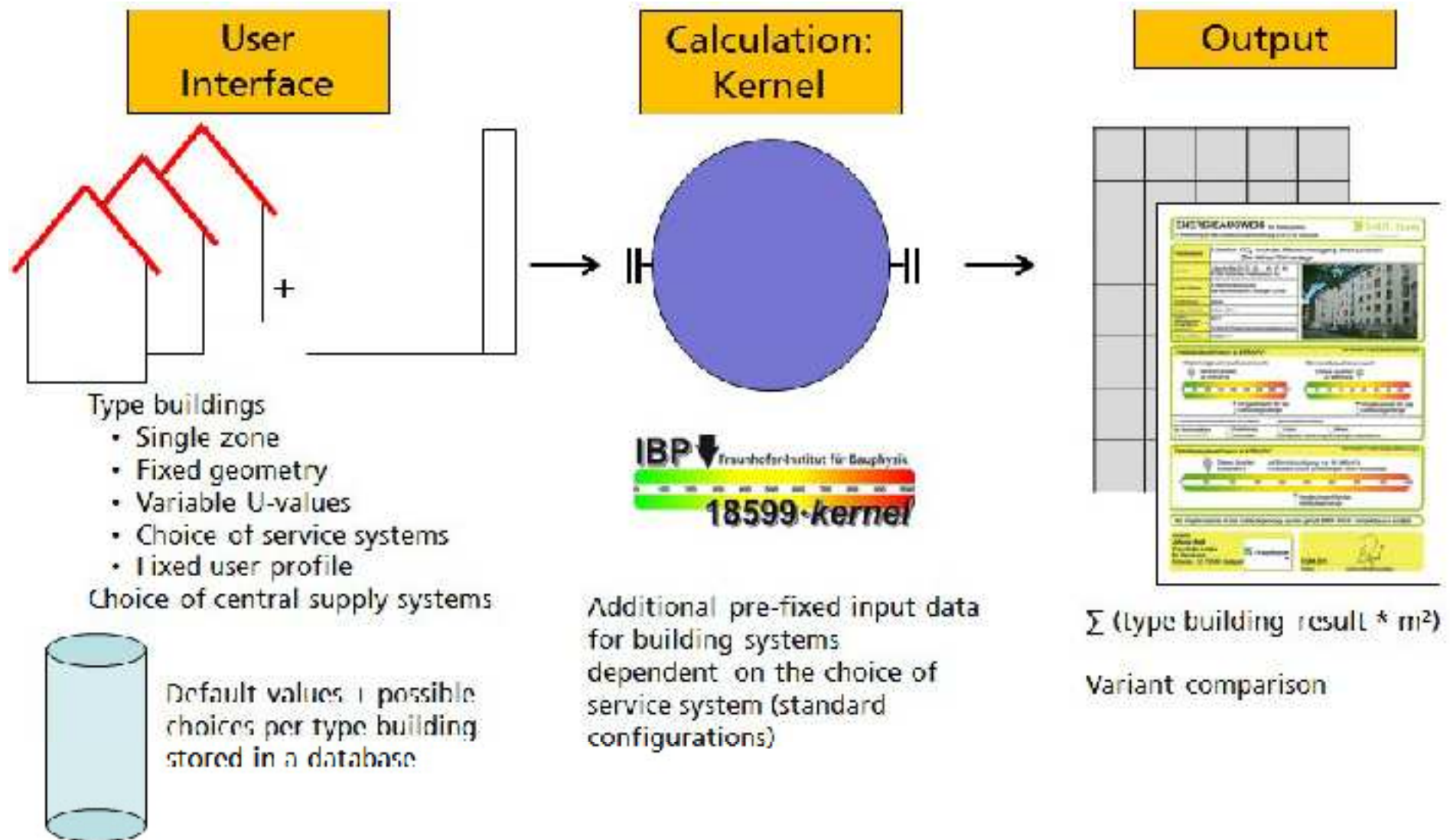
Choose a national data set:

Choose a tool section:

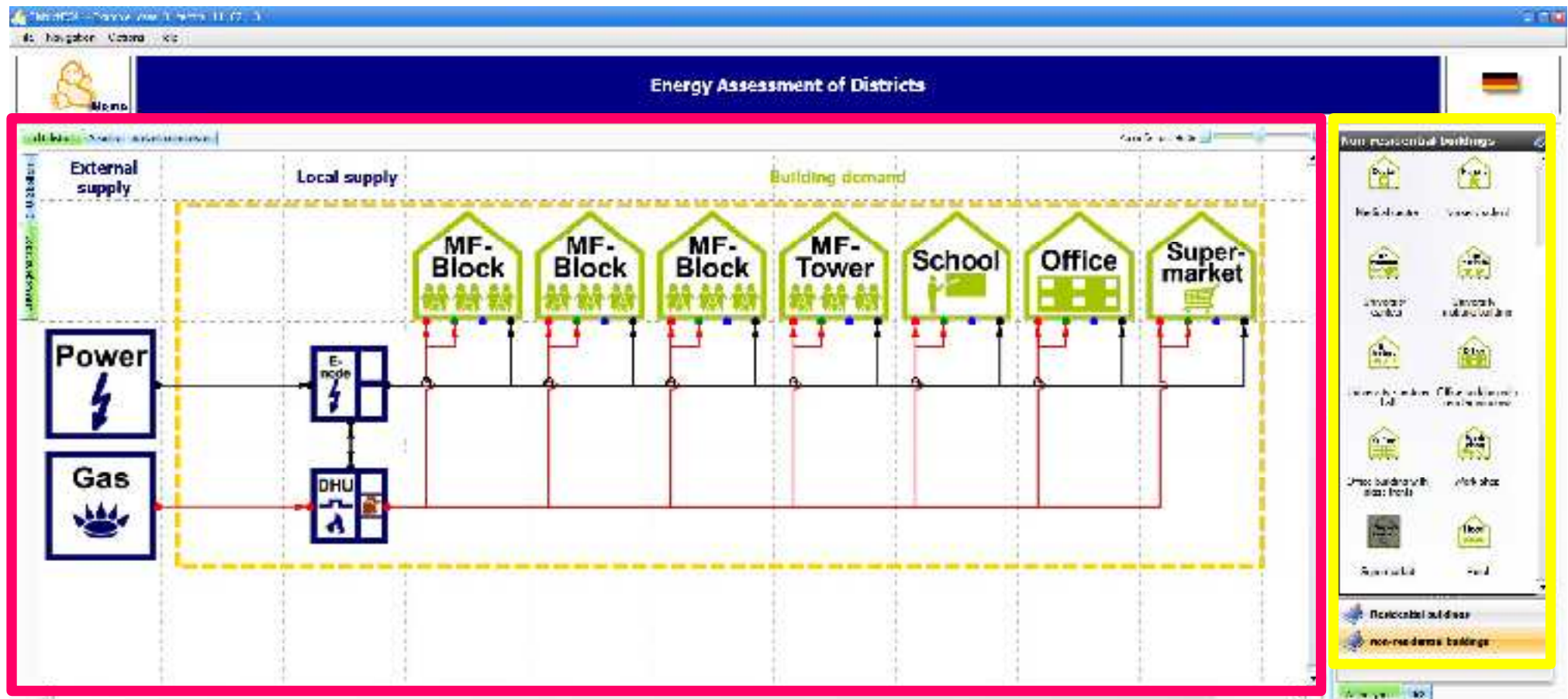
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Energy assessment of districts



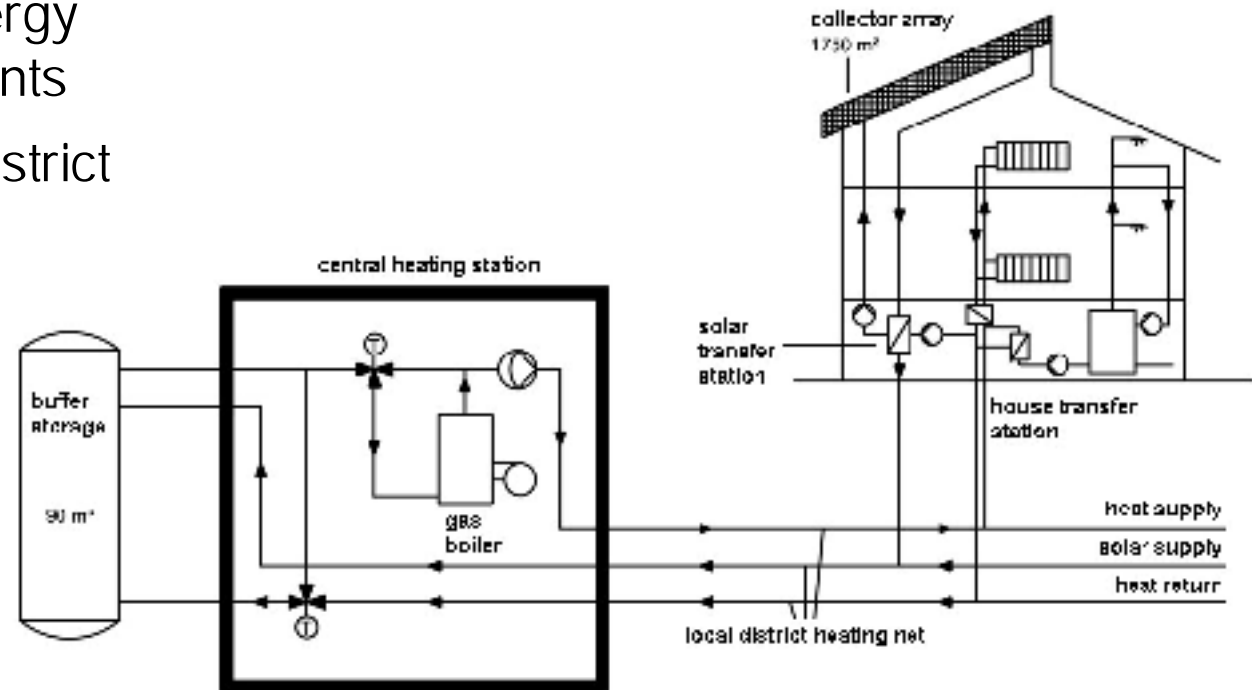
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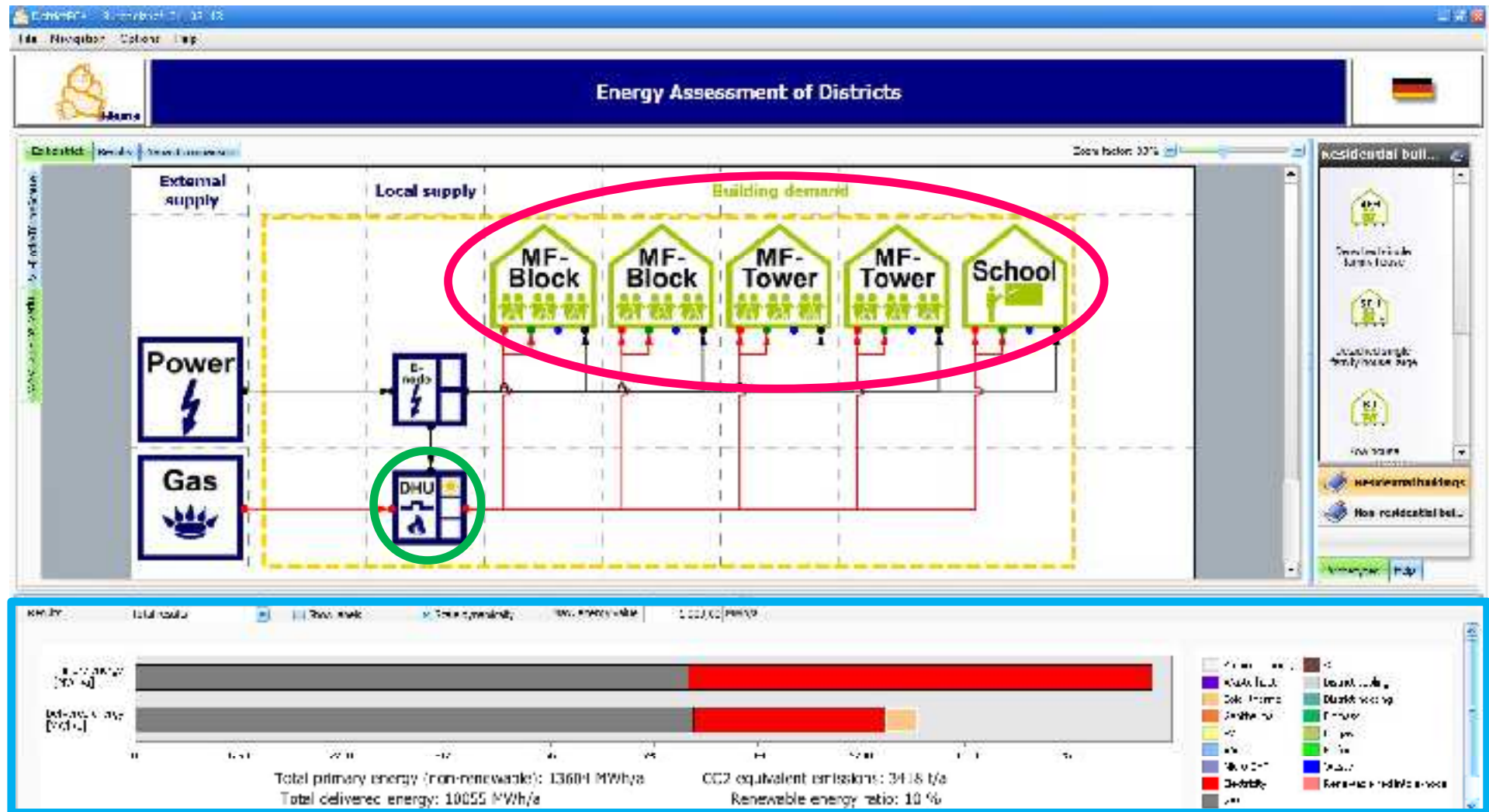
Example of an assessment with the District ECA: Stuttgart-Burgholzhof

- City quarter built in 1998-2000
- 31 multi-family houses
- 1 school building
- Building envelope quality 30 % better than national energy performance requirements
- Solar supported local district heating net, gas boiler as main generator
- Consumption data from 2002



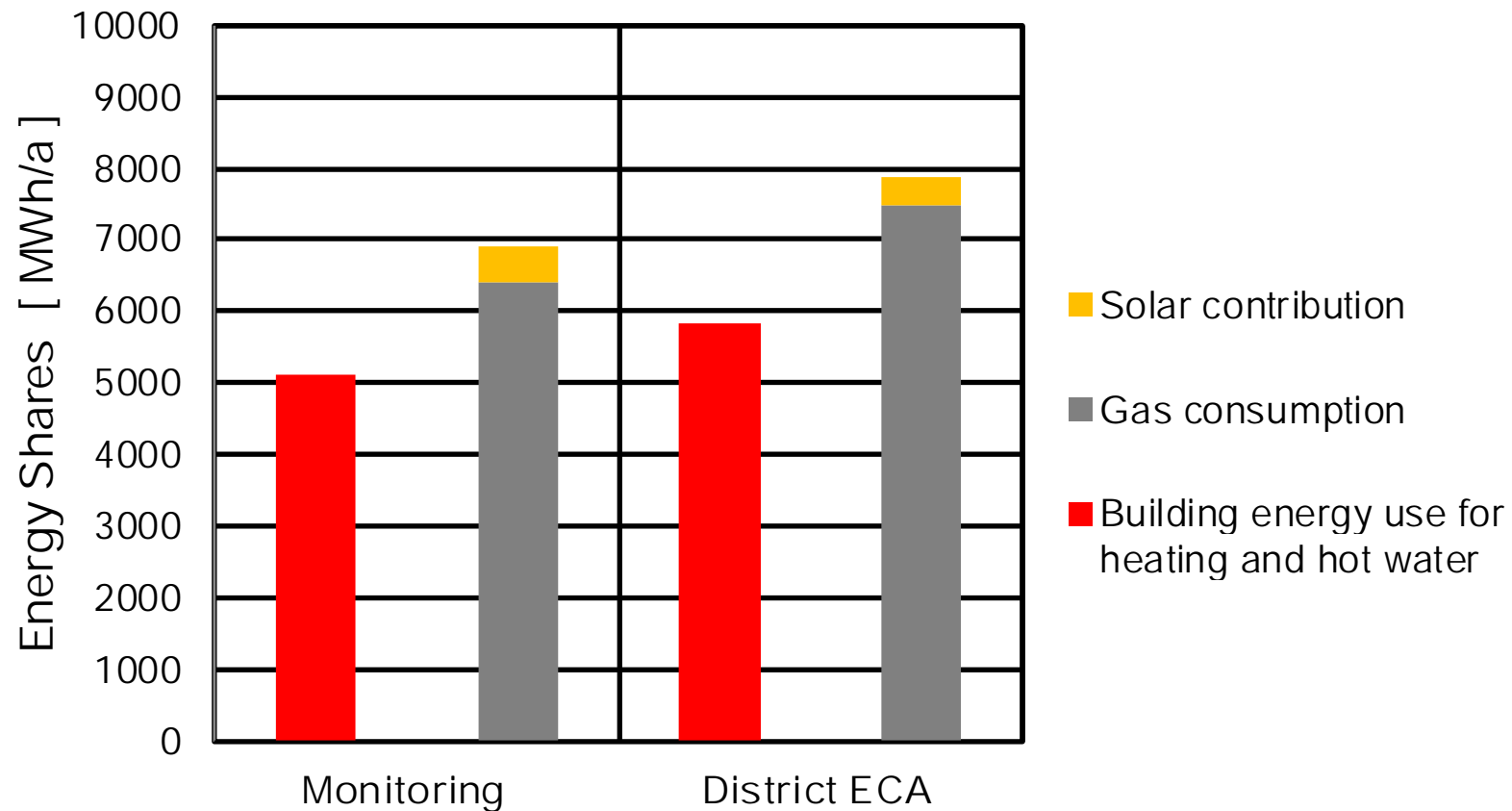
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Example of an assessment with the District ECA: Stuttgart-Burgholzhof



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Example of an assessment with the District ECA: Stuttgart-Burgholzhof



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How to get the District Energy Concept Adviser

International version



German version



Download for free at:

www.annex51.org

www.eneff-stadt.info

Since May 2013