

# Achieving energy goals and climate in cities

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**Integrative, multidisciplinary, evidence based and participatory approach to implement ambitious energy and climate goals in cities**

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# Context

## Municipalities and cities moving towards net zero greenhouse gas emissions

Cities and municipalities seek to:

- improve energy efficiency
- reduce greenhouse gas emissions (to 0)
- mitigate local air pollution

Related **environmental and regulatory changes** have **increased the complexity** of challenges cities, energy utilities, and real estate owners are faced with.



# Questions and challenges

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## related to the transformation of the energy sector

Key questions :

1. **How to reach** can ambitious energy and climate related goals? And at which **costs and benefits**?
2. How to develop **urban energy and climate plans** while meeting urban development requirements?
3. How to balance building **energy-efficiency** with tapping **local energy potentials**?
4. To which **extent are electricity, gas, and thermal networks** needed and cost-effective to tap these potentials?

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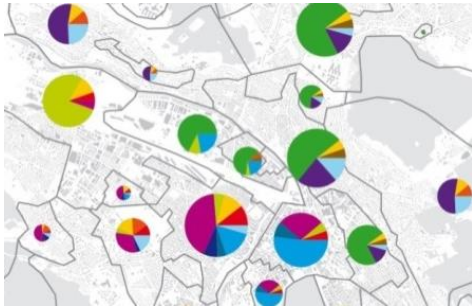
**Key barriers** against transforming the building and related energy sector in urban:

- Challenges are addressed individually and independently
- Used instruments lack an interdisciplinary approach
- Lack of coherence and transparency of data
- Lack of comprehensive approaches

# Specific challenges

## In the urban context

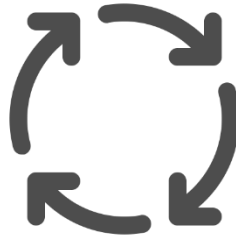
### Physical and technical



#### Structure building stock

#### Spatial structure of

- Demand
- RES Potentials
- Energy infrastructure
- Restrictions



### Political, economic, organisational & others



#### Framework conditions

#### Stakeholders

- Building owners and voters
- City administration with different “boxes”
- Asset holders, e.g. (energy) utilities
- Further stakeholders (e.g. investors)

=> Goal-oriented, strategic, forward-looking, systemic and integrative approach needed

# Approach

## Steps to meet challenges in regard to the transformation of municipalities

### 1. Create a common ground

Independent executive agent or moderator to:

- Engage with stakeholders
- Agree on
  - Goals
  - Procedures
  - Boundary conditions

### 2. Evaluate policy options

Adopt a scenario technique

- Coherent storylines
- Simulate
- Evaluate impact upon agreed indicators
- Iterate with Step 3

### 3. Evidence based decision making

Support process using tools, e.g.:

- Pre-studies
- Urban building energy model (sUBEM)
- Energy and Climate Concept

### 4. Take decisions based on findings

- Agree on goals and policy instruments
- Implement urban and energy planning
- Monitor

# 6 interactive tool- supported steps with stakeholder involvement

## 1. Analyze current situation:

Emission inventory, energy balance, stock inventory

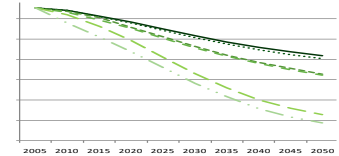
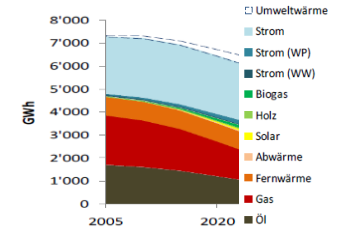
## 2. Goal setting and strategic approach; feasibility and impact of policy instruments

## 3. Systemic and integral assessment of demand, efficiency and renewable energy sources (and other indicators, e.g. economic, policy)

## 4. Decide strategic approach and instruments

## 5. Support implementation with data at high resolution for various use cases

## 6. Monitoring and adjust



# Evidence based decision making

## Steer decision making process

Process is supported using the spatial urban building energy model (sUBEM) or building stock model (BSM):

- Compare the effects of different interventions
- Assess the impacts of different scenarios
- Large-scale model
  - Creates a model of a neighbourhood or an entire city
  - Represent individual buildings
  - Spatially
  - Matches demand and spatial renewable potential
  - Physical, technical, energy, emissions
  - Techno-economic, decision making, policy instruments
  - Indicators: energy and power demand by type (individual, grid,), emissions, investment and life-cycle costs by actor

### Involve all stakeholders

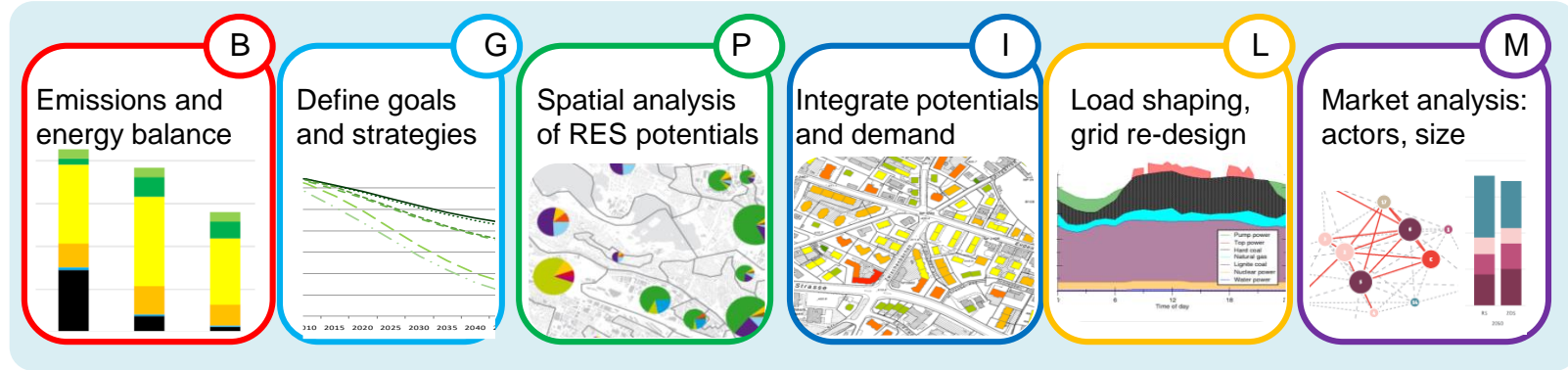
One model (tool) for several use cases of different actors:

- Urban planners
- Urban energy utilities (suppliers and producers)
- Grid and network operators
- Building portfolio owners
- Building code designers and implementers
- Tenants associations
- Energy and climate policy makers

As such, we enable engagement between the various decision-making levels and bodies of cities and municipalities.

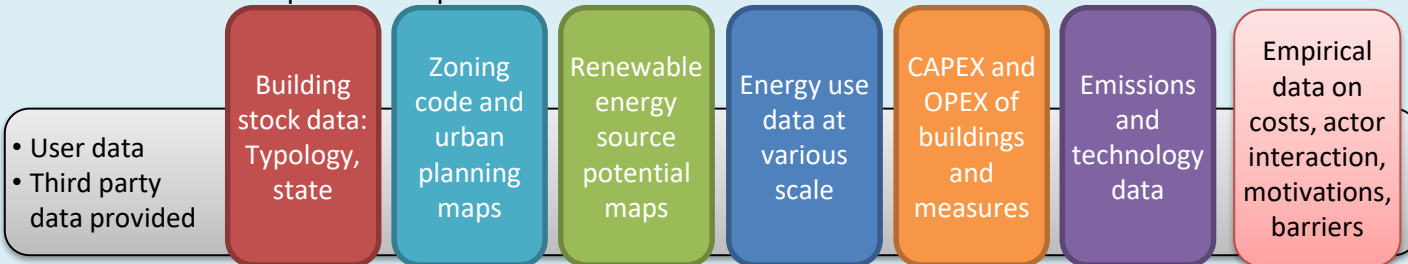


# One approach, many modules, various use cases



## Survey tools, calculation and data base engine

- Process, integrate, impute and synthesize data
- Simulate decision making, model energy and emissions, calculate scenarios
- Import and export interfaces

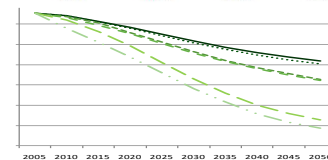
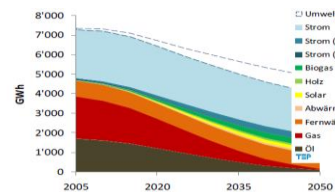


# Success stories

## Approach presented has been and is being implemented by the City of Zurich

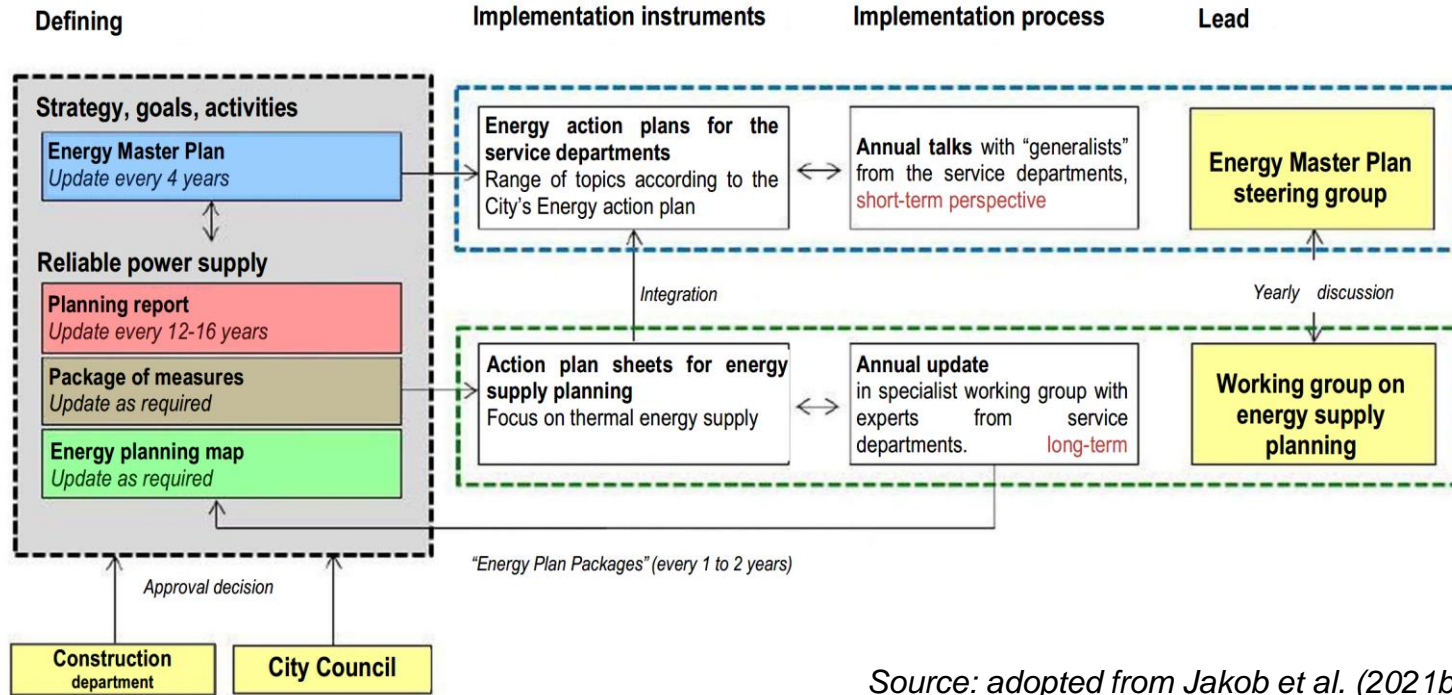
- Multi-phase approach  
(Pre-study, evaluation at strategic level, decisions, implementation)
- Allowed for stakeholder integration
- Enabled binding energy and climate strategy
- Backed-up by the population
- Instruments implemented (e.g. concessions)
- Planning and real world investments in local thermal (heating and cooling) networks and district heating grids of several hundred of millions approved

Other cities, Cantons, and private initiatives (e.g. WIS) follow similar approaches together with TEP Energy and others



# Implementation framework: example City of Zurich

## Process organization for municipal energy planning



Source: adopted from Jakob et al. (2021b)

## Further reading

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- Jakob et al. (2021a). Martin Jakob\*, Bruno Bébié, Robert Kunze, York Ostermeyer (2021): „Erfolgsfaktoren einer Smart Region (Best Practice) am Beispiel von Zürich“. In: Smart Region, pp 329-351.
- Jakob et al. (2021b). Translation in English of Jakob et al. (2021a): “Success factors for a comprehensive Energy and Climate strategy for of Zurich” Available from:  
\* [martin.jakob at tep-energy.ch](mailto:martin.jakob@tep-energy.ch)
- Various concepts used are described  
Claudio Nägeli's PhD, Chalmers University
- [www.tep-energy.ch](http://www.tep-energy.ch)

