



ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE



INNOVATIVE GOVERNANCE
OF LARGE URBAN SYSTEMS

A composite background image of two nighttime cityscapes. The top half shows a wide view of a city with a large body of water and many lit-up buildings. The bottom half is a closer, more detailed view of a dense urban area with numerous skyscrapers and lit windows.

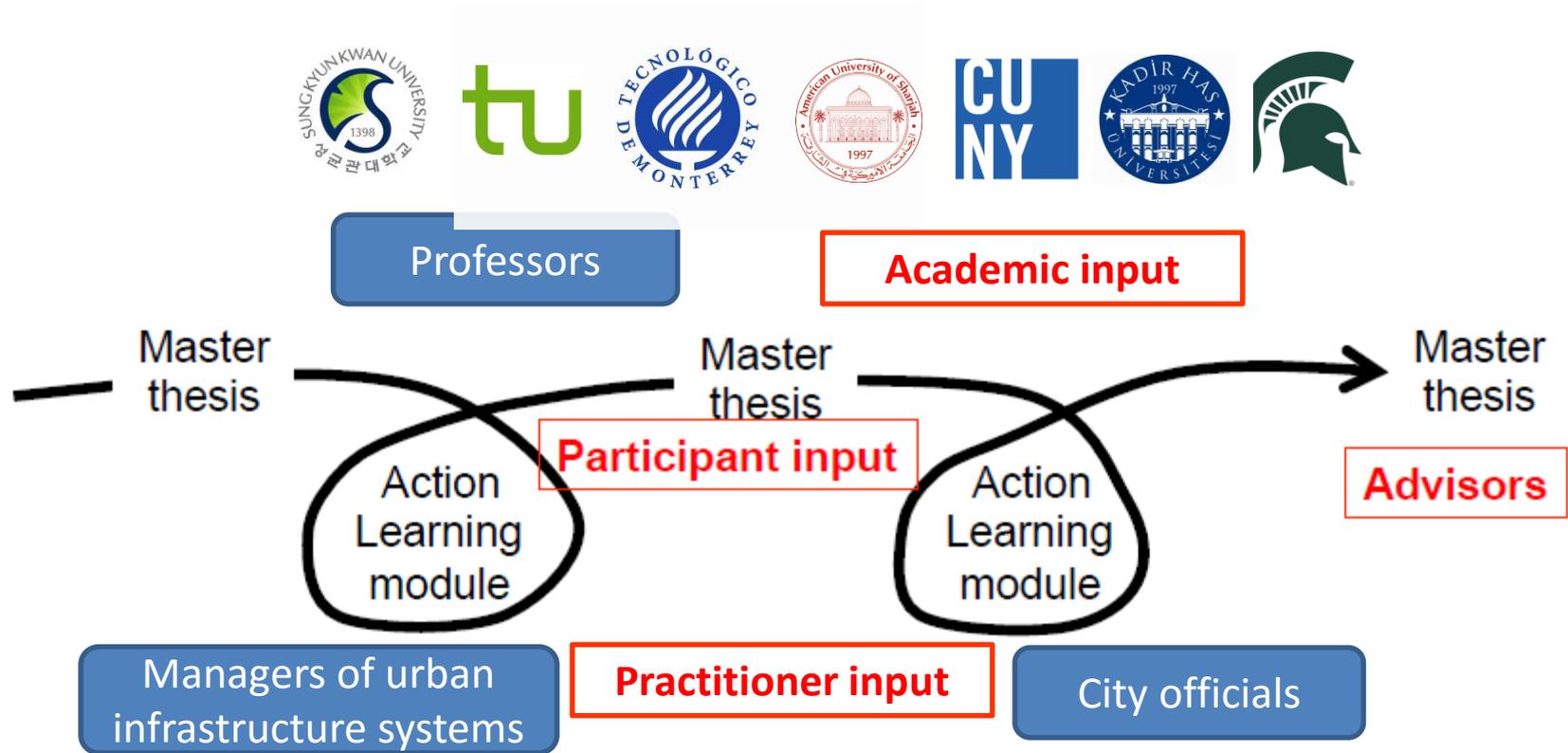
Smart Cities

Matthias Finger

Program

- Background: the IGLUS program
- Challenges for cities
- Development of the ICTs
- Conceptualization
- Smart cities
- What are cities doing?
- Analysis: what do all these projects have in common?

IGLUS - Innovative Governance of Large Urban Systems



The IGLUS Executive Master

Thanks to action-research, participants acquire unique skills, experiences and insights along their global learning journey in matters of governance and management of urban infrastructure systems.

Participants take 5 out of the 6 2-week training models, complete a preparatory MOOC and write a 60-page master thesis to obtain an Executive Master degree from EPFL

Preparatory MOOC (Massive Open Online Course)

Mexico City, Guadalajara
Nov. 2015

Dubai
Feb. 2016

Istanbul
April 2016

Seoul
June 2016

Detroit, New York
Sep. 2016

Dortmund, Barcelona
Nov. 2016

Master thesis

Challenges for cities

- The accelerating urbanization process
 - Over 50% of the world's population lives in cities
 - We expect an increase to 70% by 2050
 - The number of so-called mega-cities (more than 10 Mio. Inhabitants) will reach 30 by 2025
- This confronts cities with unprecedented challenges ...
 - To begin with when it comes to the provision of infrastructure services: energy, transport, communications, water and sewerage, waste management, housing, greens, but also education, health, security, etc..
 - The sustainability of all this (ecological, economic, social)
- The cities (the agglomerations, metropolitan areas) are increasingly left alone when facing these challenges:
 - They are becoming the relevant “problem-solving entities”
 - They are becoming themselves global economic, ecological and political actors

All this raises the question of the governance of these urban systems

In parallel: the development of the ICTs

- Ubiquitous computing:

- Sensors, RFIDs, Cameras, etc.
- Data are increasingly generated by the users / citizens themselves (e.g., smartphones)
- Autonomous Systems (e.g., driverless vehicles, drones, autonomous electricity systems)
- Pay-as-you-use (e.g., mobility pricing, congestion pricing)

→ **Generation of an unprecedented amount of data**

- **Exponential growth and spread of the ICTs:**

- computing power
- storage capacity
- transmission capacity
- price and accessibility

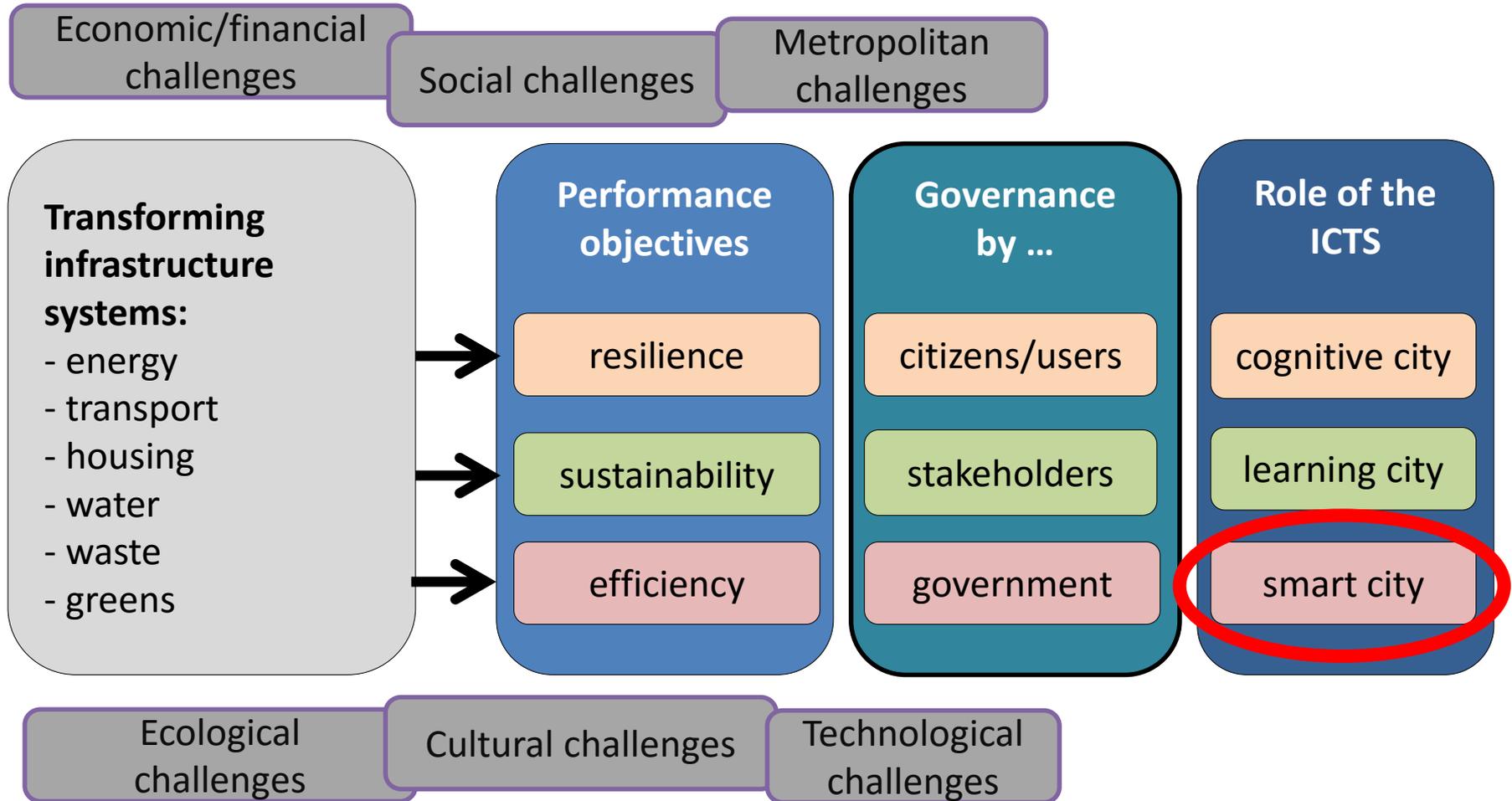
So far, the ICTs contribute mainly to:

- Efficiency gains
- More power for the user
- New business opportunities (models)

But: how can these ICTs also be used for the improved **governance of cities** (and agglomerations)?

Who should do what in order to make this possible?

IGLUS conceptualization



Smart city: definition

- The first definition of smart cities is proposed by the US Department of Energy (DoE), Office of Scientific and Technical Information in a paper written in 2000 by Richard E. Hall and entitled “The vision of a smart city”
- *“A city that monitors and integrates conditions of all of its critical infrastructures including roads, bridges, tunnels, rails, subways, airports, sea-ports, communications, water, power, even major buildings, can better optimize its resources, plan its preventive maintenance activities, and monitor security aspects, while maximizing services to its citizens” (p.2)*
- *“In the long term, systems and structures will monitor their own conditions and carry out self-repair, as needed”.*

“Smart city” according to Schneider Electric

Smart energy:

- Smart grid
- Microgrid
- District heating/cooling mgmt.
- Gas distribution mgmt.

Smart mobility:

- Electric vehicle charging services
- Traffic mgmt.
- Tolling management
- Airport solutions

Smart water:

- Plant network energy mgmt.
- Water distribution operation and loss mgmt.
- Storm water mgmt. and urban flooding
- Irrigation mgmt.

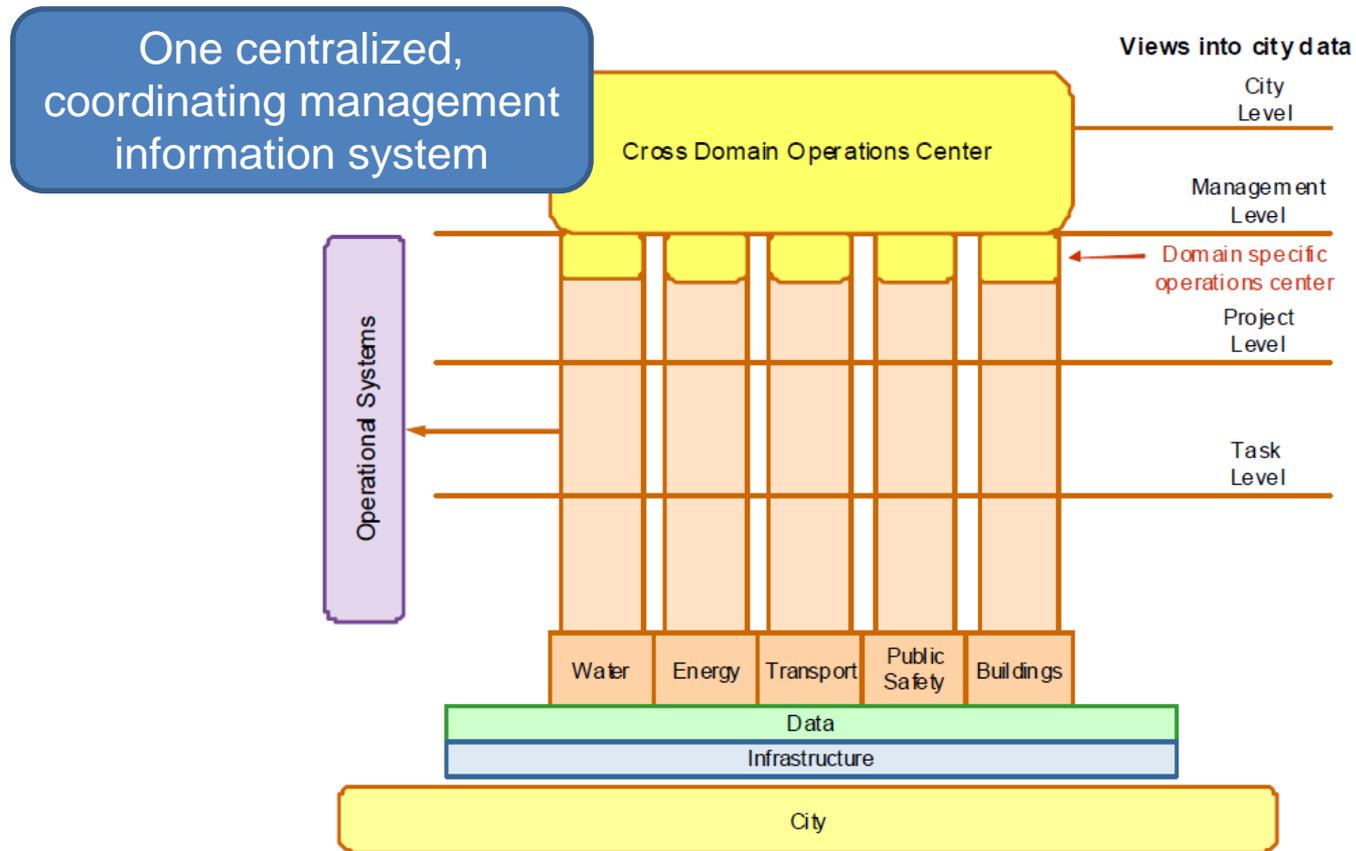
Smart buildings:

- Multiple disparate buildings mgmt.
- High performance buildings
- Flexible buildings
- Efficient homes

Smart city: definition II

- While the DoE definition considers building the system from independent (more precisely: interdependent) subsystems, IBM is mainly interested in managing the existing systems through a sophisticated management information system
- IBM defines a smart(er) city as “*one that makes optimal use of all the interconnected information available today, so as to better understand and control its operations and optimize the use of limited resources*” (IBM Redbook, page 2)

“Smart city” according to IBM



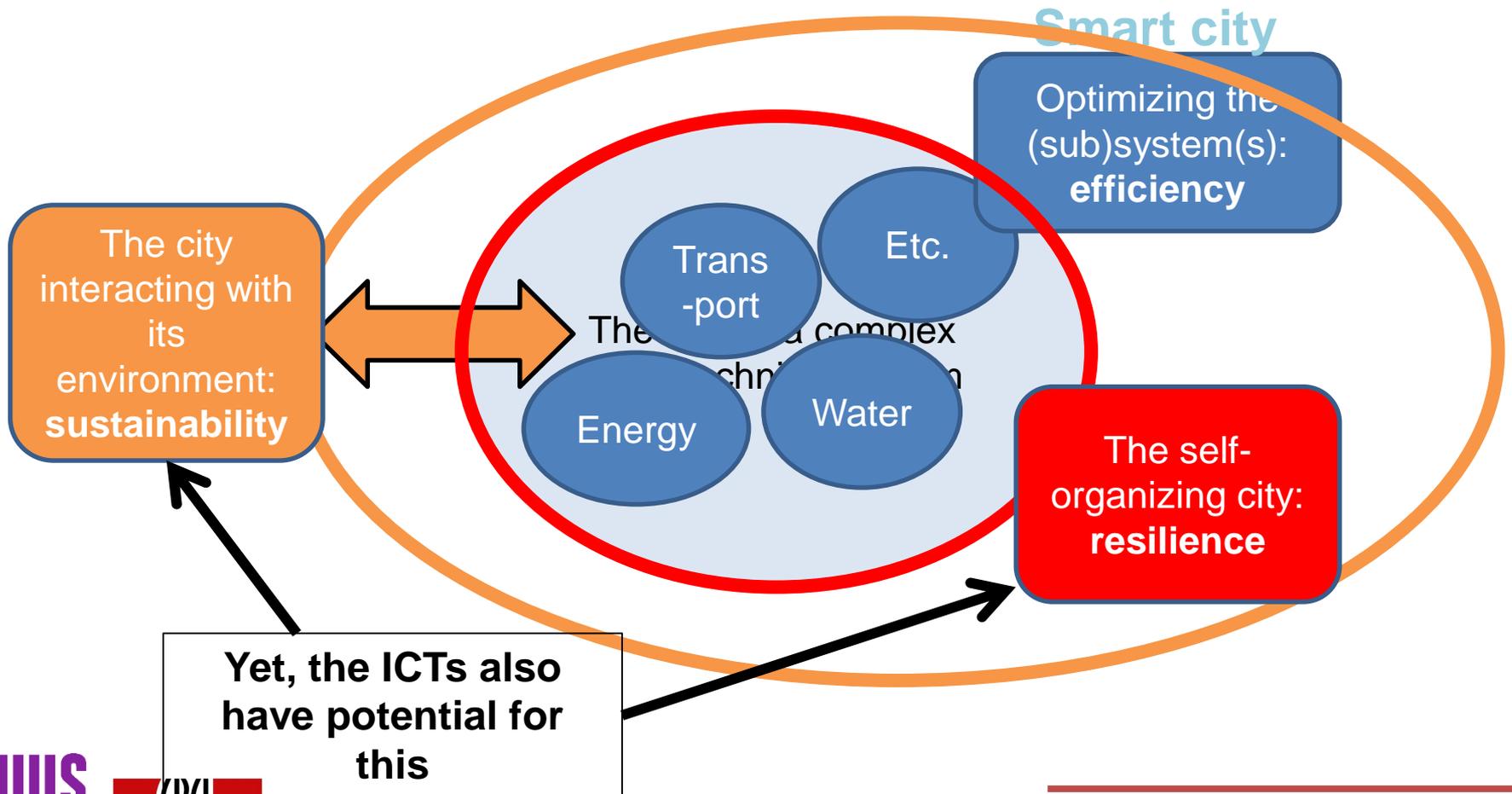
Source: IBM Redbook - a foundation for understanding IBM smarter cities (2011), p.8

“Smart city” according to Seoul

- Phase 1: Individual service level: *“Use of ICT to improve individual city operations”* (e.g. using ICT to improve the ticketing transactions in the subway system)
- Phase 2: Vertical service level: *“Integrating related processes and services within major sectors of a city”* (e.g. integrated public transport information systems to provide an efficient inter-modal public transport experience in the city)
- Phase 3: Horizontal service level: *“No distinction between different service areas with all parts seamlessly integrated within an efficient smart city ecosystem”* (e.g. integrated public transport, road infrastructure and telecommunication information systems to provide mobility in the city)

Source: ITU (2013). Smart cities – Seoul: a case study, p.3

IGLUS conceptualization II



What are the cities doing?

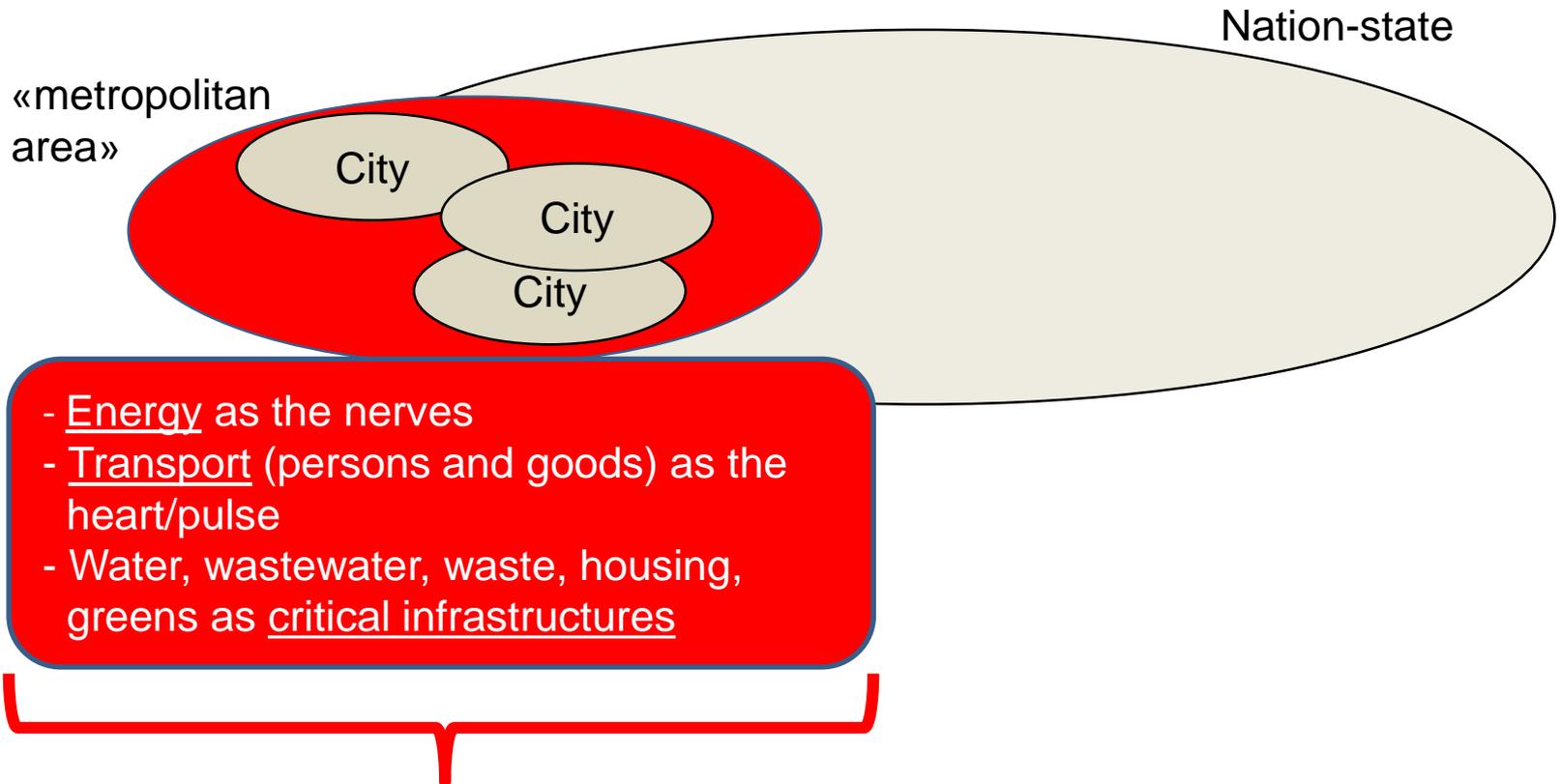
- City logistics
- Mobility as a service
- Waste-to-Energy
- Urban metabolism
- Urban rehabilitation

What do all these projects have in common?

PPP

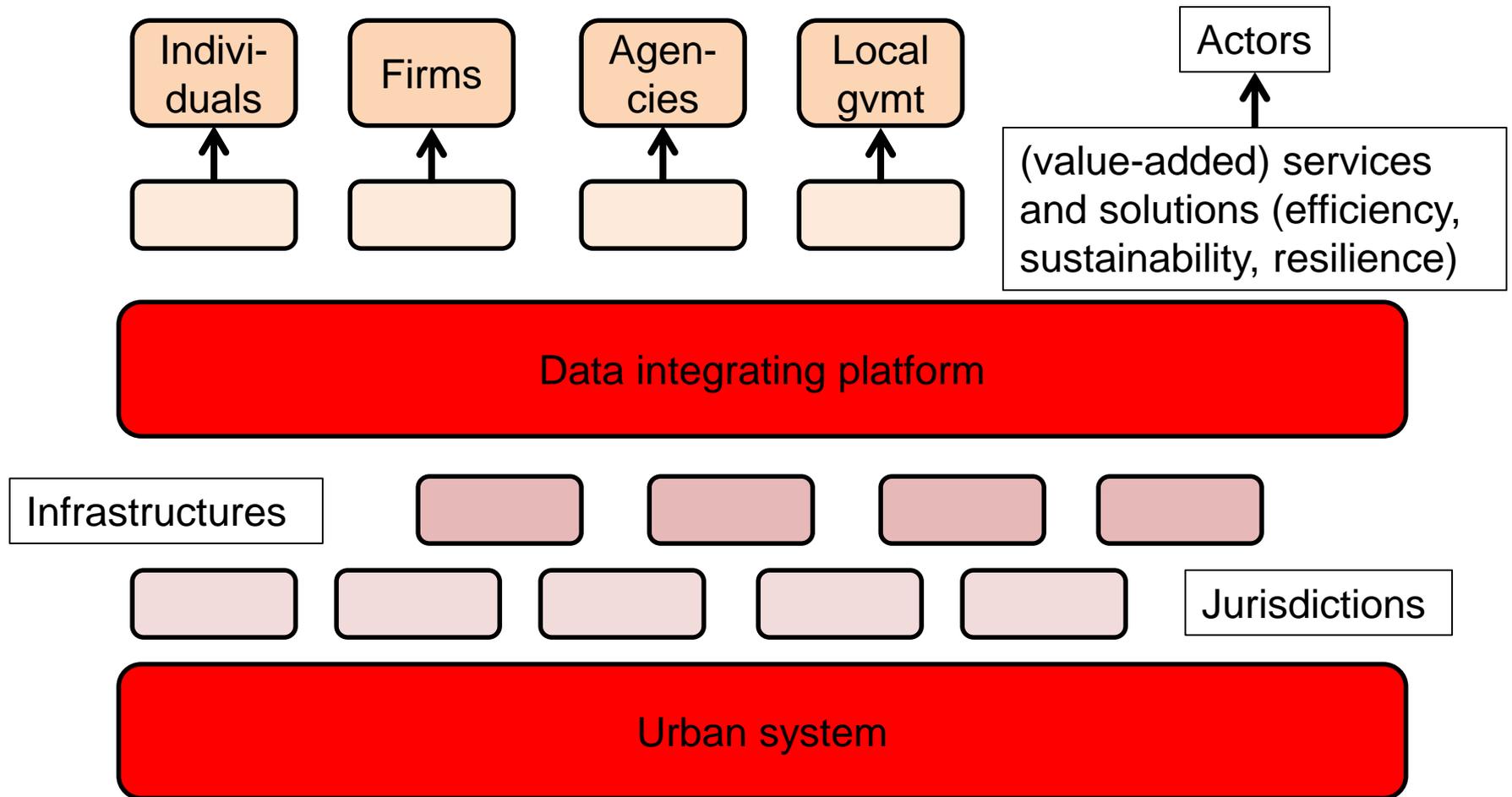
- A joint / collaborative process involving many stakeholders
- Often driven by a SOE (broader than a purely financial mission)
- Involving a University partner: (action-)research process, innovation process, experimentation
- Some sort of data integrating platform

Additional challenge: metropolitanization



ICTs (platform) as the cross/organizational coordination (efficiency and interaction)

The vision of a “smart” city



Conditions for “smart city” success

