Energy and Cities

Systemic approach to low carbon cities

PECC

Perth – April 2011

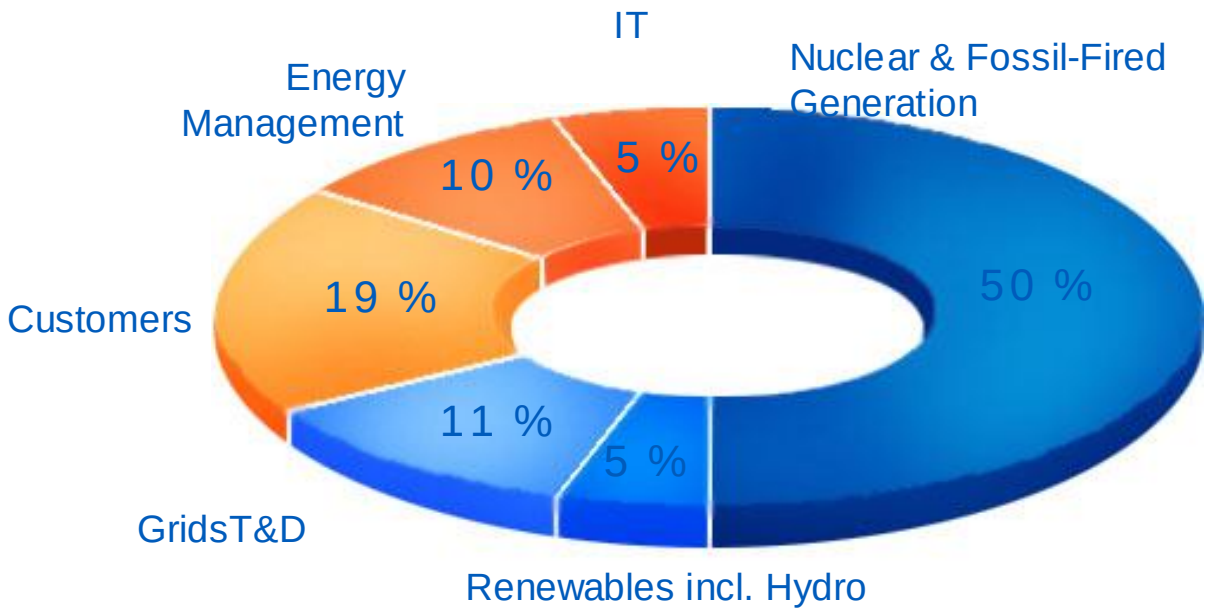
EDF

CHANGER L'ÉNERGIE ENSEMBLE

EDF Group

- Integrated energy company operating 130 GW with about 160,000 employees
- Consolidated sales: 65.2 billion Euros in 2010
- Acting in more than 20 countries with over 40 million customers (38 million in Europe)

R&D areas of activity



486 **M€ budget 2010**

R&D staff

+ 2 000 people including EIFER

Contents

- Energy and integrated approach for urban development
- Some developments by EDF R&D and EIFER
- Traditional actors and new comers
- Conclusion

Urbanisation is a challenge

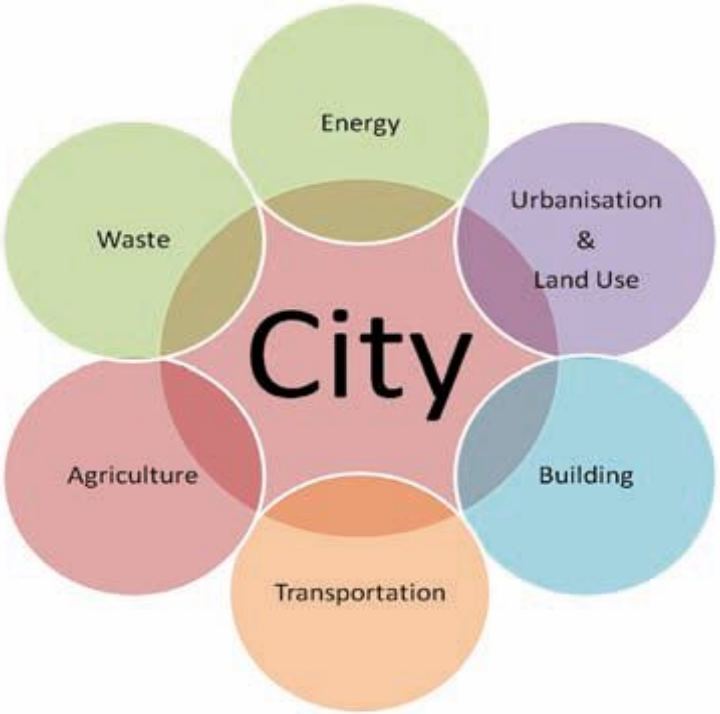
50% world population
lives in cities today

70% by 2050

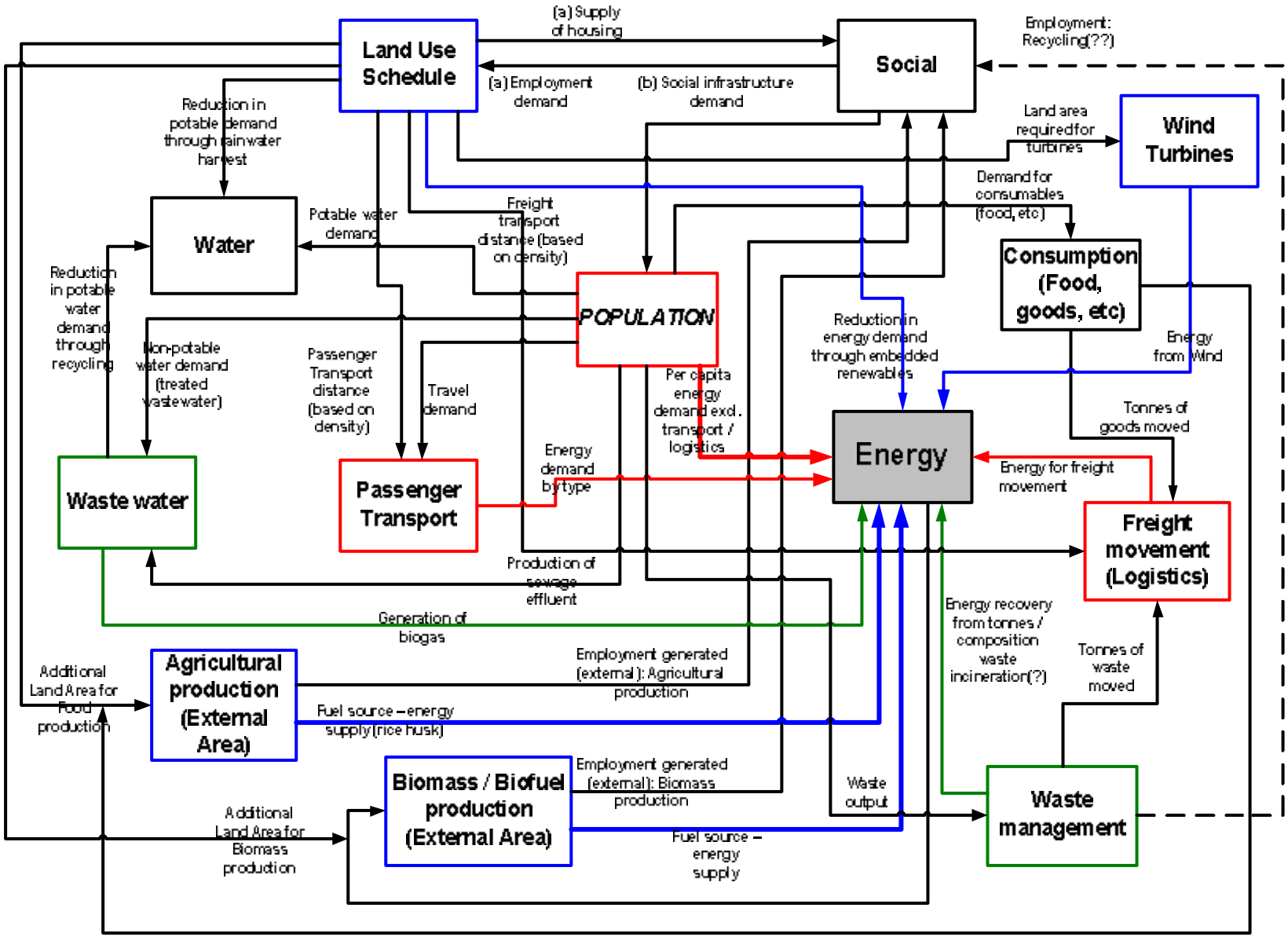
>40% of CO2 emiss°

6 Billions of citizens in 2050

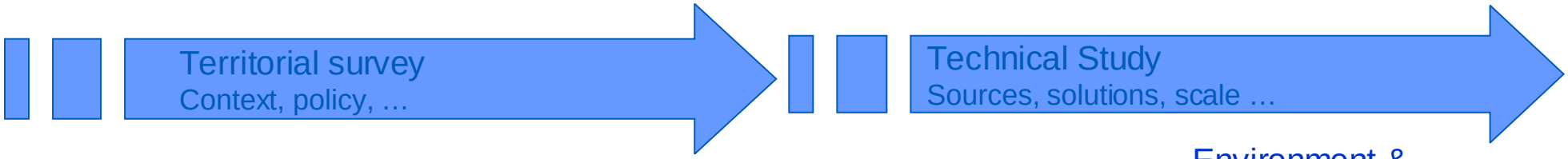
Cities are at stakes for low carbon policies



Energy in cities



Key factors and boundaries



Regulatory and Context aspect

Economic aspect

Social aspect

Environment & Health aspect

Strategic analysis
Strong points/weak points
Public policy
Guidelines
Opportunities
Strategic segmentation
…

Land and Real Estate analysis
Transactions market
Land holding
Costs
…

Human Factor Diagnosis
Mental map of territory
Standards of living
Needs
Acceptance of innovations
Risk perception
Ergonomics
…

Health diagnosis
Water
Air
…

Concerted Environment diagnosis
Transport
Biodiversity
Water
Waste
Energy
Noise
Accidental pollution

Regulatory analysis
SCOT
PLU
SDR
PADD
PRQA
Plan climat
PPRI
…

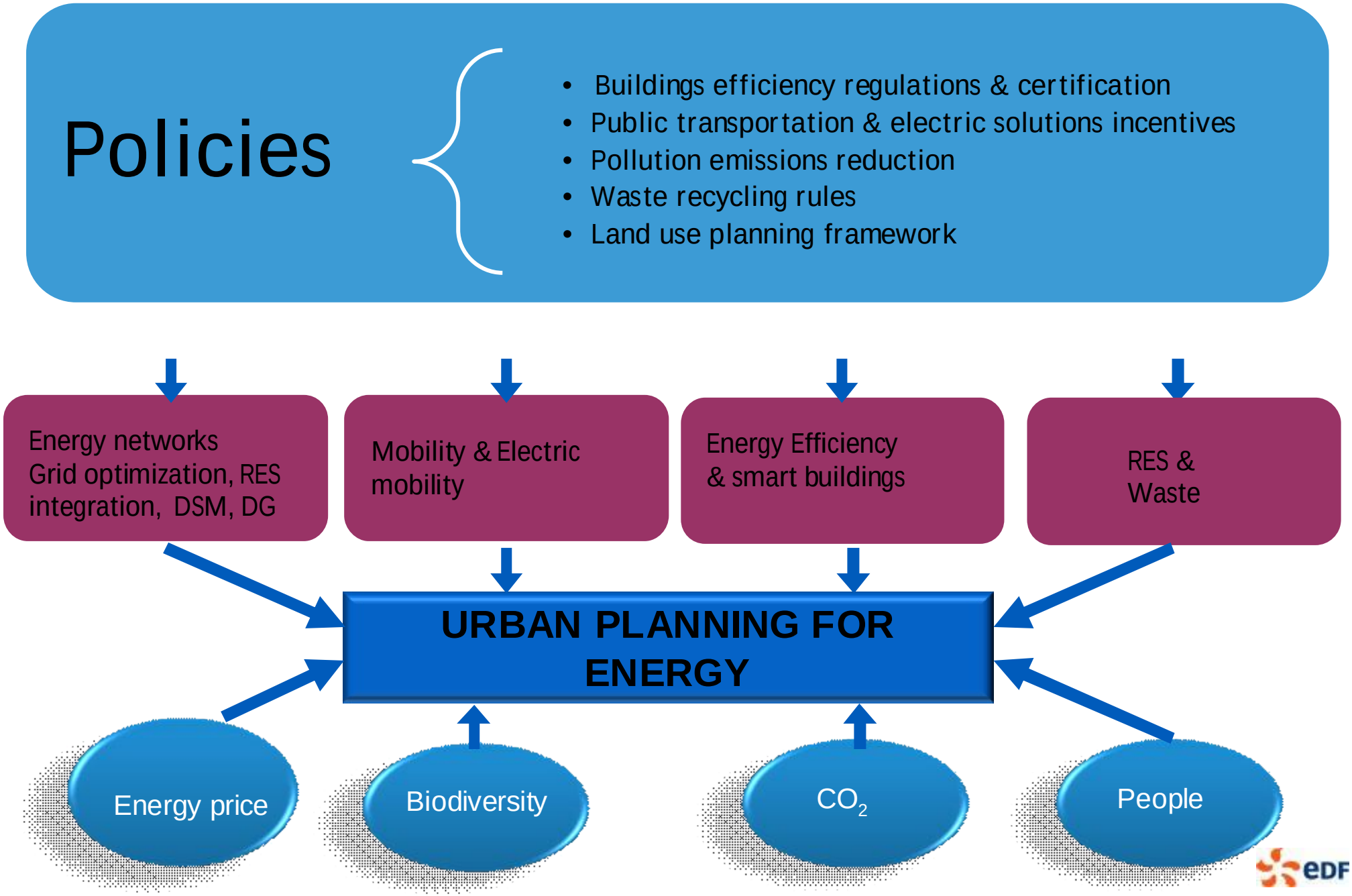
Financial analysis
Local taxation
Municipal resources
Subsidies, grants
…

Local economic analysis
Local HR
Available skills
Operational players
Company potential
…

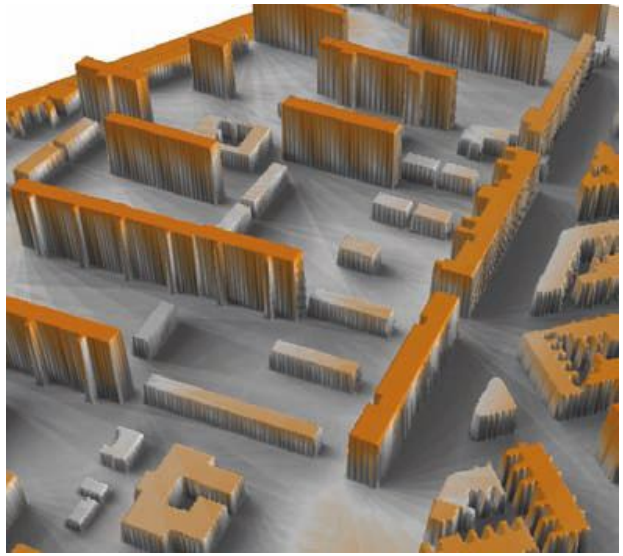
Quality og life diagnosis
Spaces
Comfort
Accessibility
Public services
…

Targets diagnosis
Total carbon emissions
Ecological footprint
Biodiversity
Eco-balance

An integrated approach



Some developments by EDF R&D and EIFER



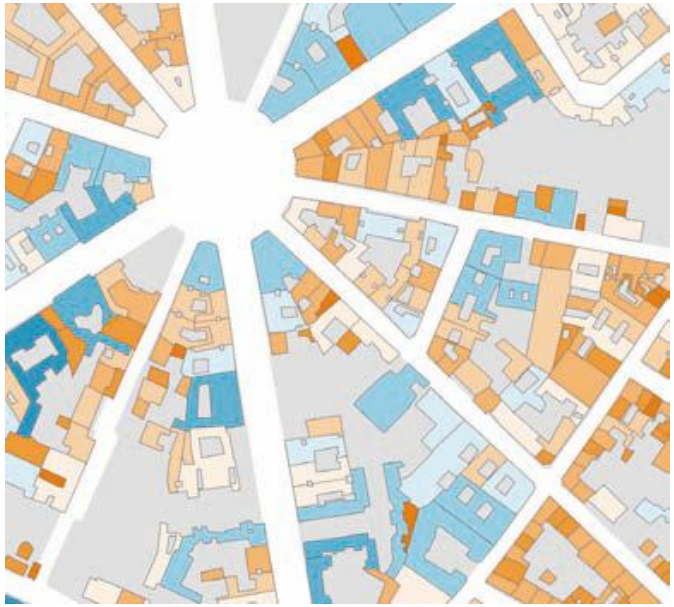
- Mega-cities sustainable development
- Heat-energy demand & city structures
- Urbanization processes related to energy demand
- Urbanization and energy demand management in territories

Megacity research project (Hyderabad-India)

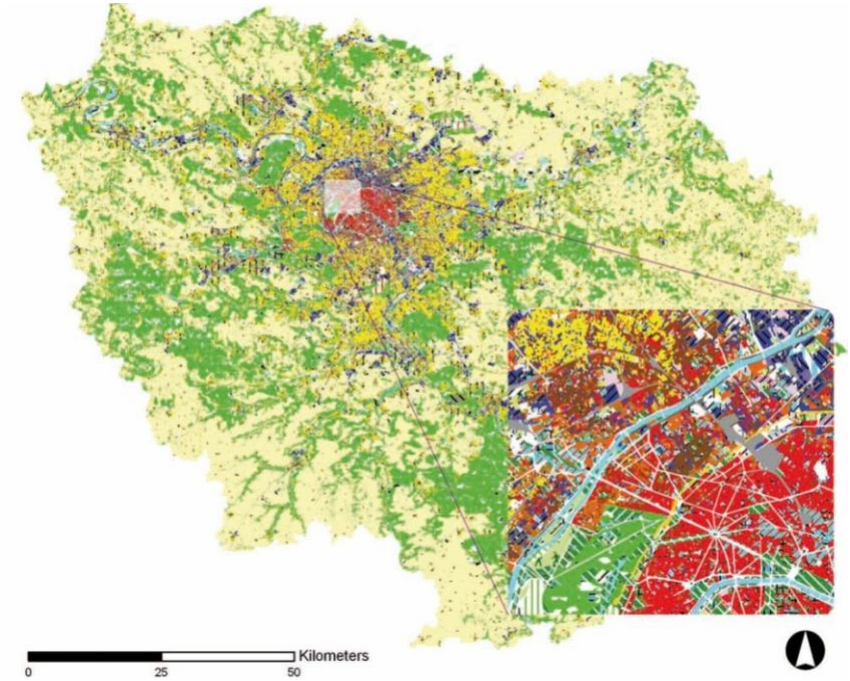
- Mega-cities of tomorrow
- Hyderabad's challenge
- Background conditions
- Integrative approach
- Approaching transformation processes
- Challenges to take up
- Focus on energy
- Further research approach

Urban morphology & heat energy demand (1/2)

- Buildings concentrate global energy demand
- Cities shaped by historical and current use
- Opportunities for improvement
- Scaling effects and neighborhoods

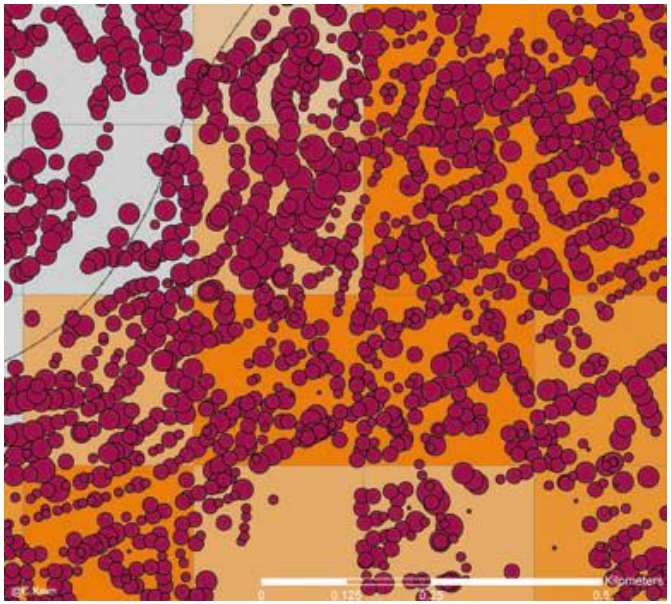


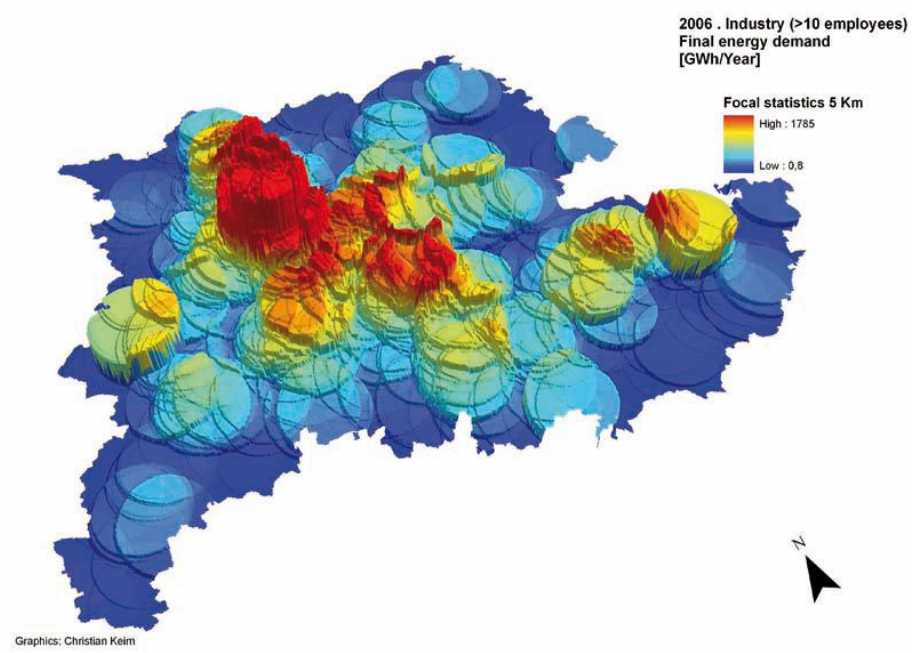
Urban morphology & heat energy demand (2/2)



- 25 buildings configurations in London, Paris, Berlin and Istanbul
- Shifting from the building to the neighborhood level
- Land-use management and infrastructural planning
- From urban morphologies to metropolitan area

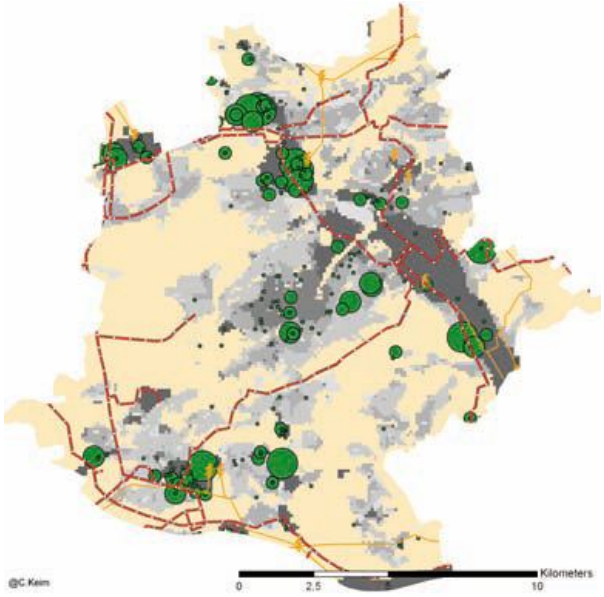
Urban dynamics and energy demand (1/2)

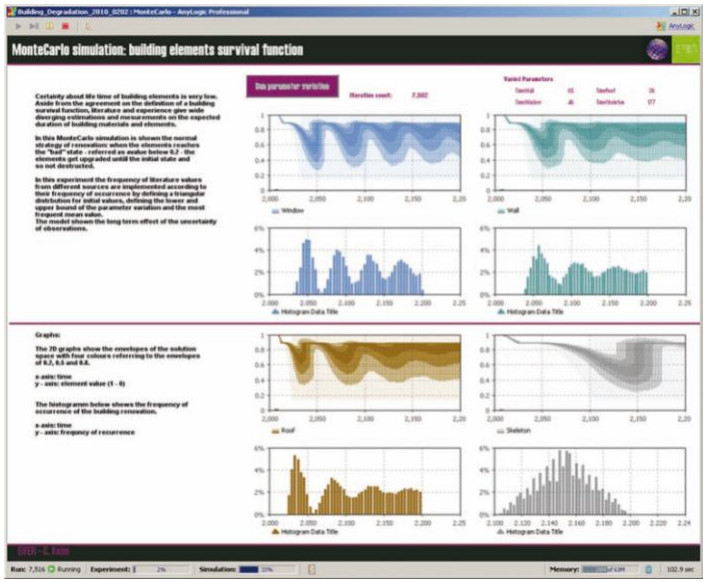




- Diversified trends among places
- Changes of urban use and related energy demand allocation
- Methodology combining numerical result with physical entities
- Representation of building stock, industry and tertiary sector
- Complex systems dynamics
- Land use growth model calibration

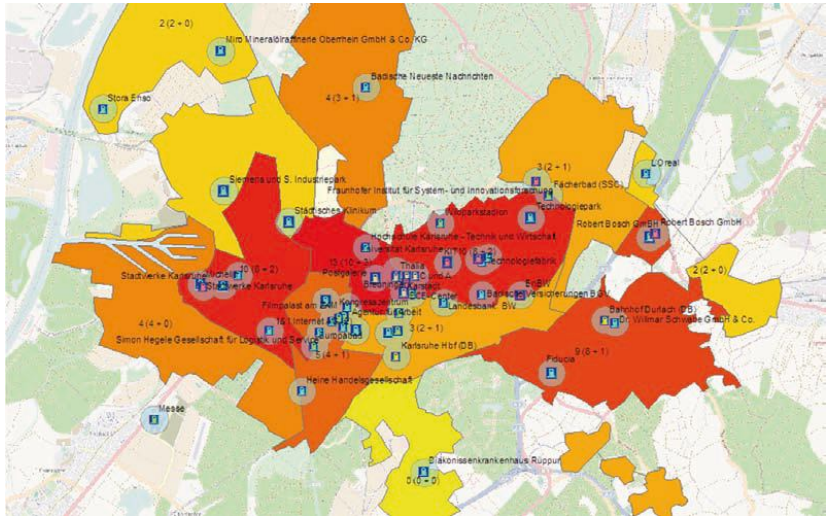
Urban dynamics and energy demand (2/2)





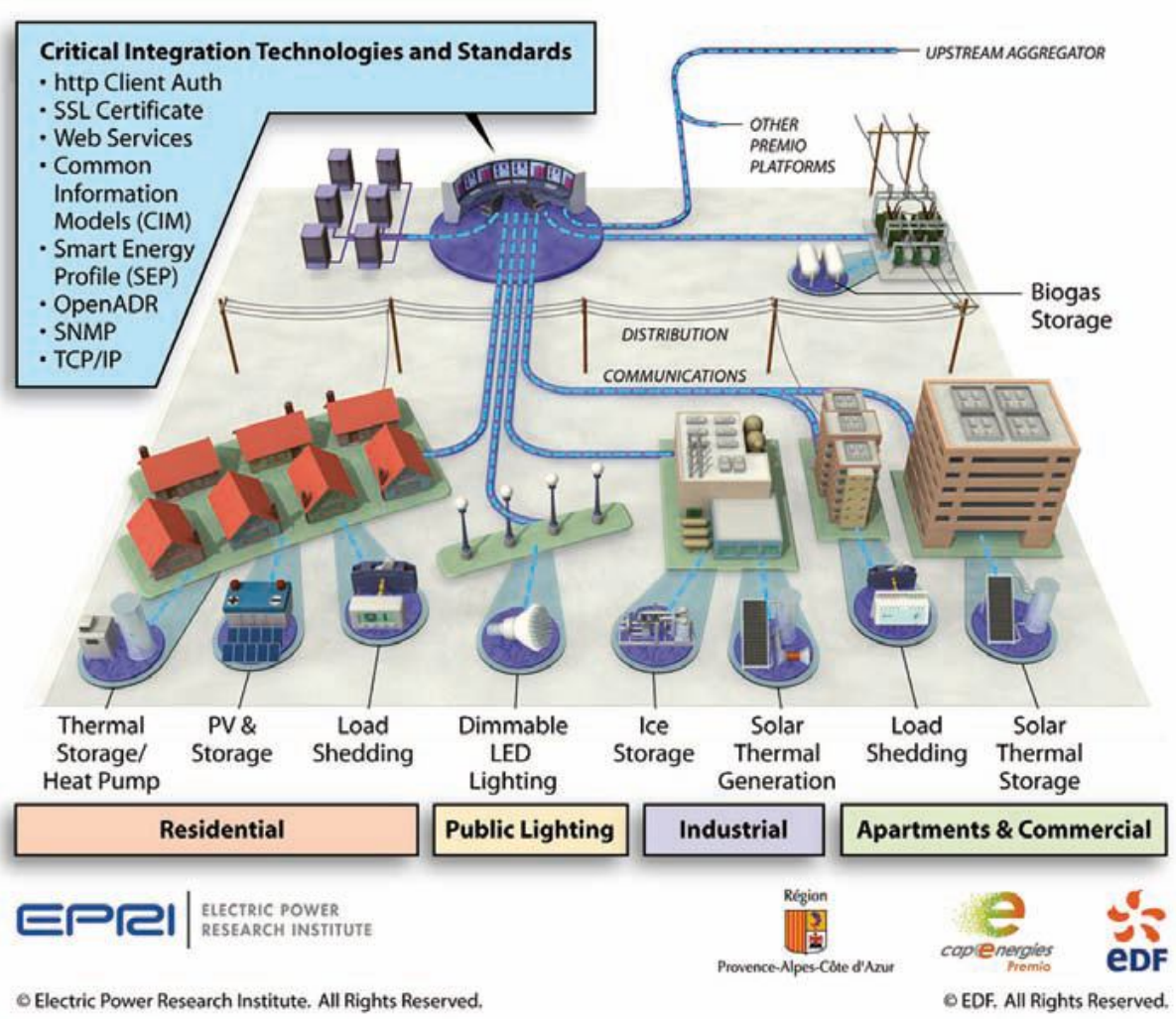
- **Building energy modeling and life cycle model**
- **Localization of congestion, parking availability, road pricing policies, public transport network and gaps, activity locations, population, etc.**
- **Comprehensive picture of energy demand side form quantitative and geopolitical point of view**
- **Holistic approach development to energy demand and spatial allocation**

E-mobility and infrastructure allocation



- **Localization of charging points**
- **Technologies of charge, pricing, energy storage, parking management, etc.**
- **City transport planning method integrating electric vehicles**
- **Macro-scale: activities, parking and modal split and Micro-scale: street level**
- **Model supporting strategic decisions for urban space and further analyses of urban mobility and energy demand**

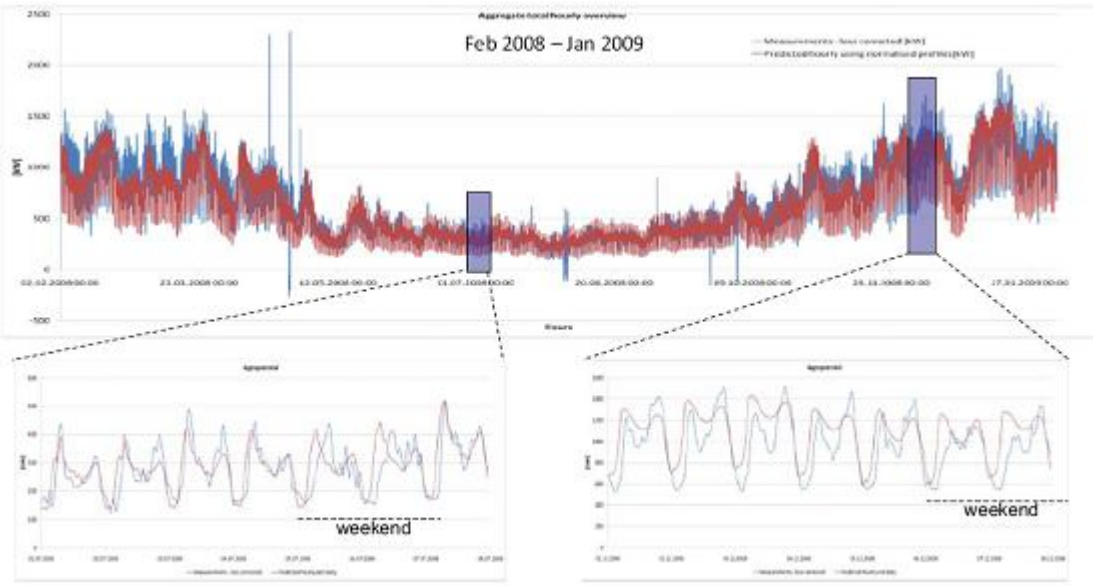
Demand side management in a territory: “Premio platform”

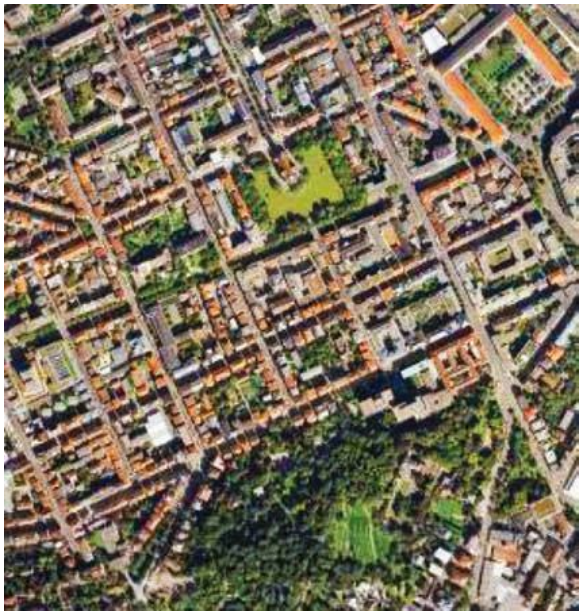


- **Power grid reliability**
- **Optimizing demand to reduce peak demand**
- **Distributed generation and renewable energies**
- **Promoting new energy culture and energy efficiency**
- **Demand-response and end-use flexibility**
- **Reducing GHG emissions**

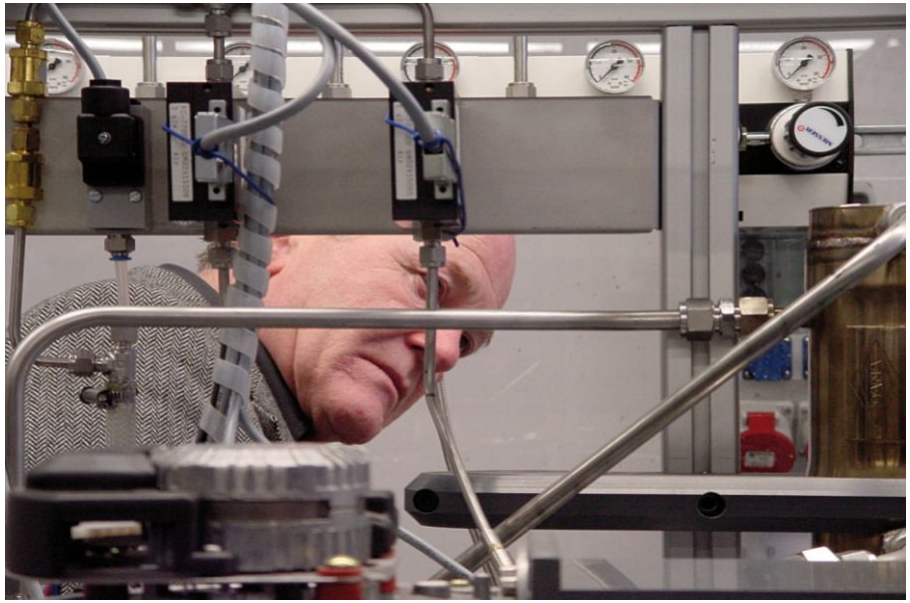
Sustainable cities: projects and uncertainties

- Reducing energy and water consumption and waste quantities
- Improve networks overall quality
- Favour renewable energies and energy demand management by end-user
- Better control development
- Different projects economics and uncertain economics viability





Sustainable cities: historical and new actors



- Role of the public sector
- Historical actors activities: energy, water, waste...
- Integrated approach blurring boundaries
- Current silos effect
- On-going changes
- Evolutions for current players
- New comers and competition

Regulatory activities: what's next?

- Regulatory activities and concessions vs. integrated development
- Strategic integration and infrastructures sharing
- Renewal of concessions
- Integrating urban development objectives
- Customers are expecting changes and improvements towards sustainable cities

Conclusion

- Evolutions towards more sustainable cities
- Multiple projects and research and development
- Systemic approach
- Economic uncertainties remain for historical actors and new comers
- Cities offer major opportunities for effective and imaginative responses to climate change