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*Le Smart Cities e le sinergie del  
consorzio EERA*

Mauro Annunziato

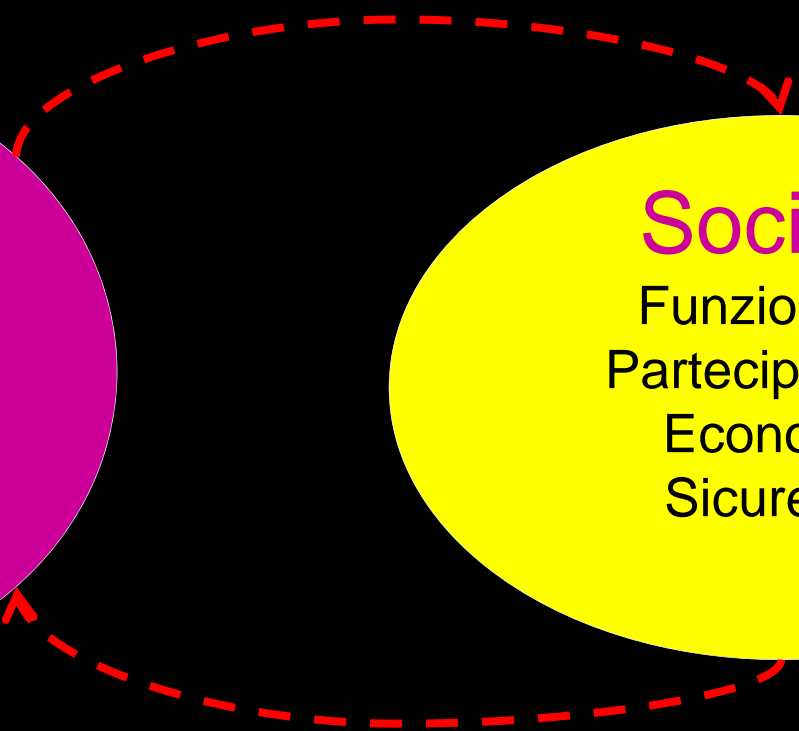
UTTEI - Coordinatore Smart Cities ed Ecoindustria



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## *Contenuti*

- Smart City
- EERA – Smart City
- Programma Smart City ENEA



*Hybrid city*

*Smart participation*

*Social cohesion*

*Human oriented technology*

*Digital PA*

*Digital divide*

*Web 2.0*

*Green economy*

# Smart City : sostenibilità a 360°

## SMART ECONOMY

*Development of innovative spirit  
Ability to transform  
Eco-industry  
ICT-infrastructures  
Alternative economy*

Smart Economy

## SMART MOBILITY

*Local accessibility & Info-mobility  
Zero-carbon vehicles – city car  
Green biking  
Mobility on-demand  
Sustainable and safe public transport systems  
Urban sensor network*

Smart Mobility

## SMART ENVIRONMENT

*Smart urban landscape  
Attractiveness of natural conditions  
Pollution  
Environmental protection  
Green area*

Smart Environment

Smart integration

Smart Participation

## SMART PARTECIPATION

*Development of the cultural identity  
Social interaction & communication  
Access to the Cultural facilities  
Touristic attractiveness  
Individual/Social Creativity  
Inclusion and ethnic plurality  
Cosmopolitanism / Open-mindedness  
Participation in public life & decision-making*

Smart Energy

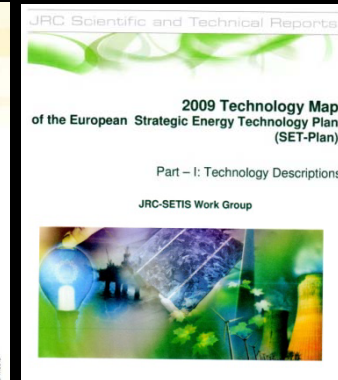
## SMART ENERGY

*Green energy  
Energy efficiency  
Diffused energy and self-production  
Ecobuildings and power parks  
Sustainable resource management  
Efficient public lighting*

Smart Living

## SMART LIVING

*Health conditions  
Individual safety  
Housing quality  
Education facilities*



# SMARTcities







## Recenti Eventi Significativi

Febbraio 2009 - American Recovery and Reinvestment Act  
-> Notevole spazio alla tematica "Smart City" (3.4 Billion \$)

Ottobre 2009 - EU SET PLAN (10-12 B€)  
-> EUROPEAN INITIATIVE ON SMART CITIES  
-> EERA – GDL smart city

Piano d'Azione EU -> Smart City: una delle 7 principali misure per 2 Ml nuovi posti in EU

# Smart City: alcune esperienze nel mondo

						
<b>Iniziato</b>	<ul style="list-style-type: none"> <li>• 2009</li> </ul>	<ul style="list-style-type: none"> <li>• 2009</li> </ul>	<ul style="list-style-type: none"> <li>• 2008</li> </ul>	<ul style="list-style-type: none"> <li>• 2007</li> </ul>	<ul style="list-style-type: none"> <li>• 2008</li> </ul>	<ul style="list-style-type: none"> <li>• 2008</li> </ul>
<b>Stato</b>	<ul style="list-style-type: none"> <li>• Progetti pilota in corso</li> </ul>	<ul style="list-style-type: none"> <li>• Progetti pilota in corso</li> </ul>	<ul style="list-style-type: none"> <li>• SG Pilota in corso</li> </ul>	<ul style="list-style-type: none"> <li>• Piano pluriennale di sviluppo</li> </ul>	<ul style="list-style-type: none"> <li>• Piano pluriennale di sviluppo</li> </ul>	<ul style="list-style-type: none"> <li>• Progetti pilota in corso</li> </ul>
<b>Obiettivi</b>	<ul style="list-style-type: none"> <li>• Riduzione CO2 40% entro 2025 vs. 1990</li> </ul>	<ul style="list-style-type: none"> <li>• Riduzione CO2 migliaia di tonnellate anno</li> </ul>	<ul style="list-style-type: none"> <li>• Full Smart Grid (DG, sensori e controlli, display energia, sottostazioni smart)</li> </ul>	<ul style="list-style-type: none"> <li>• Collocare la Comunità di Madrid come punto di riferimento nel percorso di sviluppo sostenibile</li> </ul>	<ul style="list-style-type: none"> <li>• Ridurre la carbon Footprint a Londra attraverso efficientamento edifici</li> </ul>	<ul style="list-style-type: none"> <li>• Carbon Free</li> <li>• Zero spreco</li> <li>• UAE leadership nelle tecnologie innovative</li> <li>• Diversificazione del settore economico</li> </ul>
<b>Abitanti</b>	<ul style="list-style-type: none"> <li>• 735.000</li> </ul>	<ul style="list-style-type: none"> <li>• 500.000</li> </ul>	<ul style="list-style-type: none"> <li>• 95.000</li> </ul>	<ul style="list-style-type: none"> <li>• 3.100.000</li> </ul>	<ul style="list-style-type: none"> <li>• 7.500.000</li> </ul>	<ul style="list-style-type: none"> <li>• 50.000</li> </ul>
<b>Attori principali</b>	<ul style="list-style-type: none"> <li>• Liander (DSO Ele &amp; Gas)</li> <li>• AIM (Amsterdam Innovation Motor) – Comune di Amsterdam)</li> </ul>	<ul style="list-style-type: none"> <li>• Enel/Endesa</li> <li>• Altre 11 imprese</li> </ul>	<ul style="list-style-type: none"> <li>• Xcel Energy (DSO Ele &amp; Gas)</li> <li>• City of Boulder (US Colorado)</li> </ul>	<ul style="list-style-type: none"> <li>• Governo Regionale di Madrid</li> </ul>	<ul style="list-style-type: none"> <li>• LDA (London Development Agency)</li> </ul>	<ul style="list-style-type: none"> <li>• Mubadala Development Company (Abu Dhabi)</li> </ul>
<b>Altre informazioni</b>	<ul style="list-style-type: none"> <li>• Investimenti programmati 1,1 mld€ (DSO, Comune, privati); 2010/2020</li> </ul>	<ul style="list-style-type: none"> <li>• Focus su RES, Smart meters, trasporto elettrico</li> </ul>	<ul style="list-style-type: none"> <li>• Investimento programmato mil\$ (Privati)</li> </ul>	<ul style="list-style-type: none"> <li>• Focus sulla gestione rifiuti e qualità dell'aria</li> </ul>	<ul style="list-style-type: none"> <li>• Programma di Efficienza Energetica degli Edifici (BEEP)</li> </ul>	<ul style="list-style-type: none"> <li>• Scopo: edifici, generazione elettrica, rifiuti, trasporto</li> </ul>

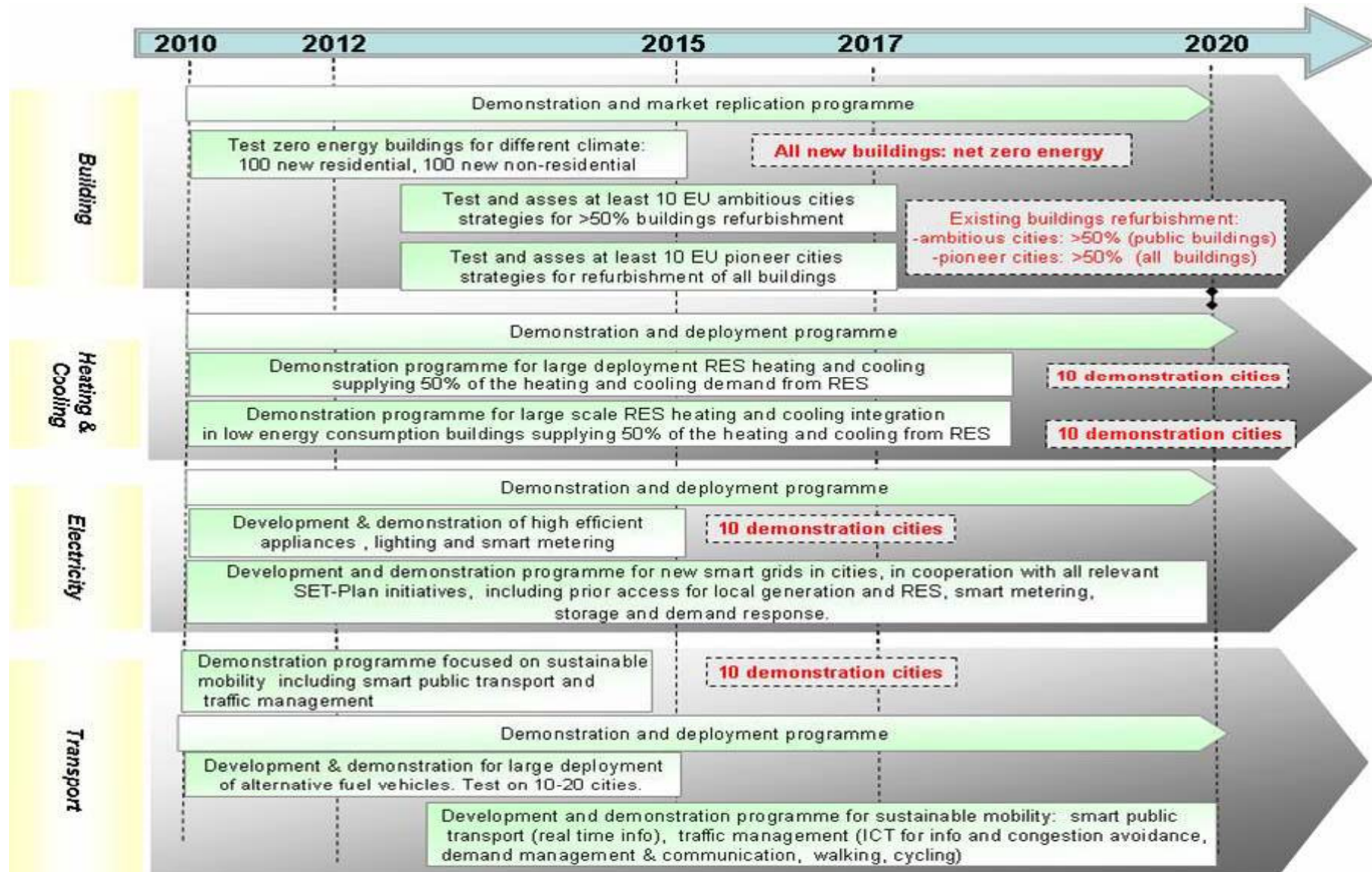
## Le *European Industrial Initiatives* (EII) del SET plan

Budget stimato (UE + Paesi Membri + Industria)  
per il periodo 2010-2020

<b>EII end Joint Undertakings</b>	<b>Budget totale pubblico&amp;privato [mld Euro]</b>
Solar (fotovoltaico+termico)	16
Wind	6
Grid	2
CCS	11-16
Bioenergy	9
Sustainable Nuclear (fission)	5-10
Smart Cities	10-12
Hydrogen and Fuel Cells	5-6
Fusion for Energy	10-11 (?)
<b>Totale</b>	<b>74-88</b>



# EU Smart City Initiative





# EERA Smart City

- 27 paesi europei – delegati di team nazionali

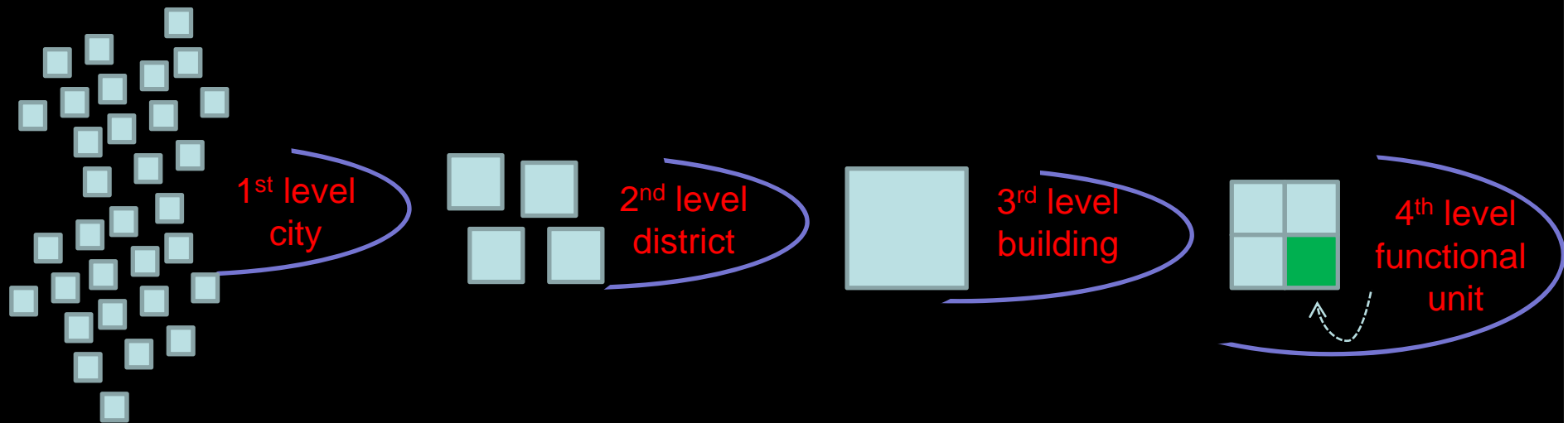
## Obiettivi immediati

- Definizione delle articolazioni principali della ricerca
- Mappatura delle attività di ricerca e sviluppo in Europa sulla smart city

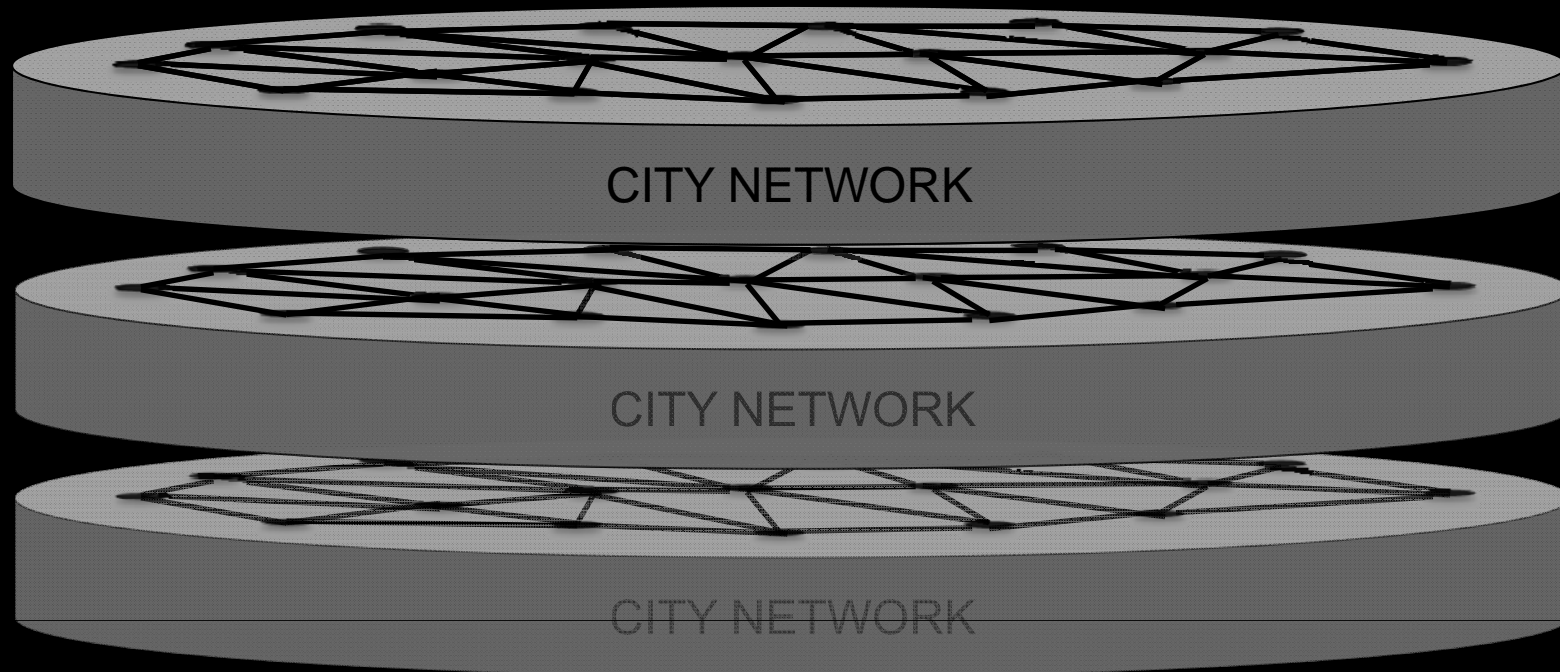
## Obiettivo strategico

- Preparare un joint Program su Smart City entro fine 2011

# SPATIAL VS RELATIONAL: THE SPATIAL APPROACH



# SPATIAL VS RELATIONAL: THE RELATIONAL APPROACH

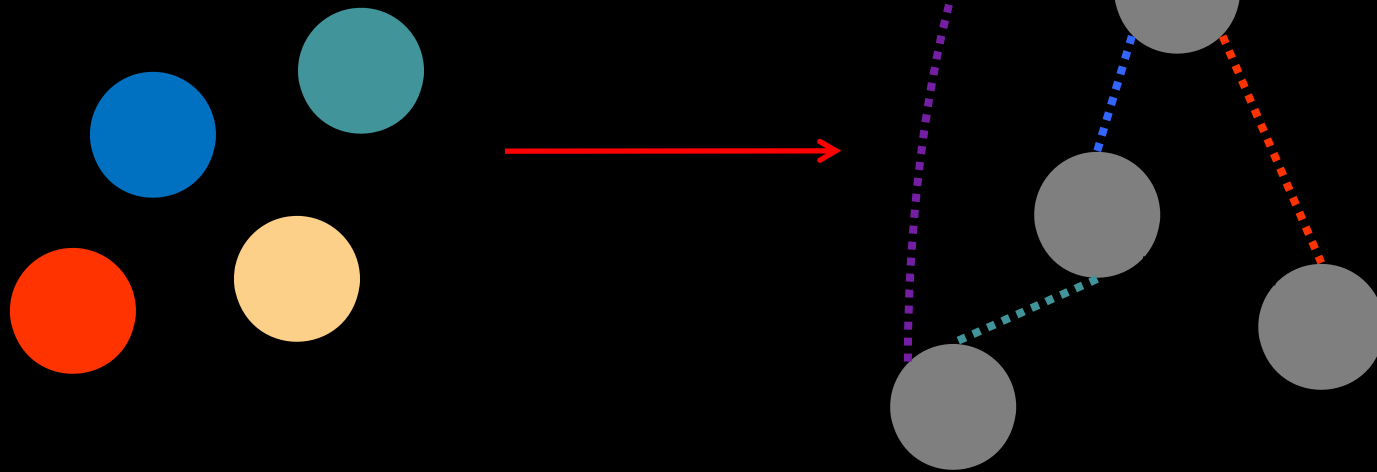


**THE CITY AS A CLUSTER OF INTERCONNECTED NETWORKS**

# SPATIAL VS RELATIONAL: THE RELATIONAL APPROACH



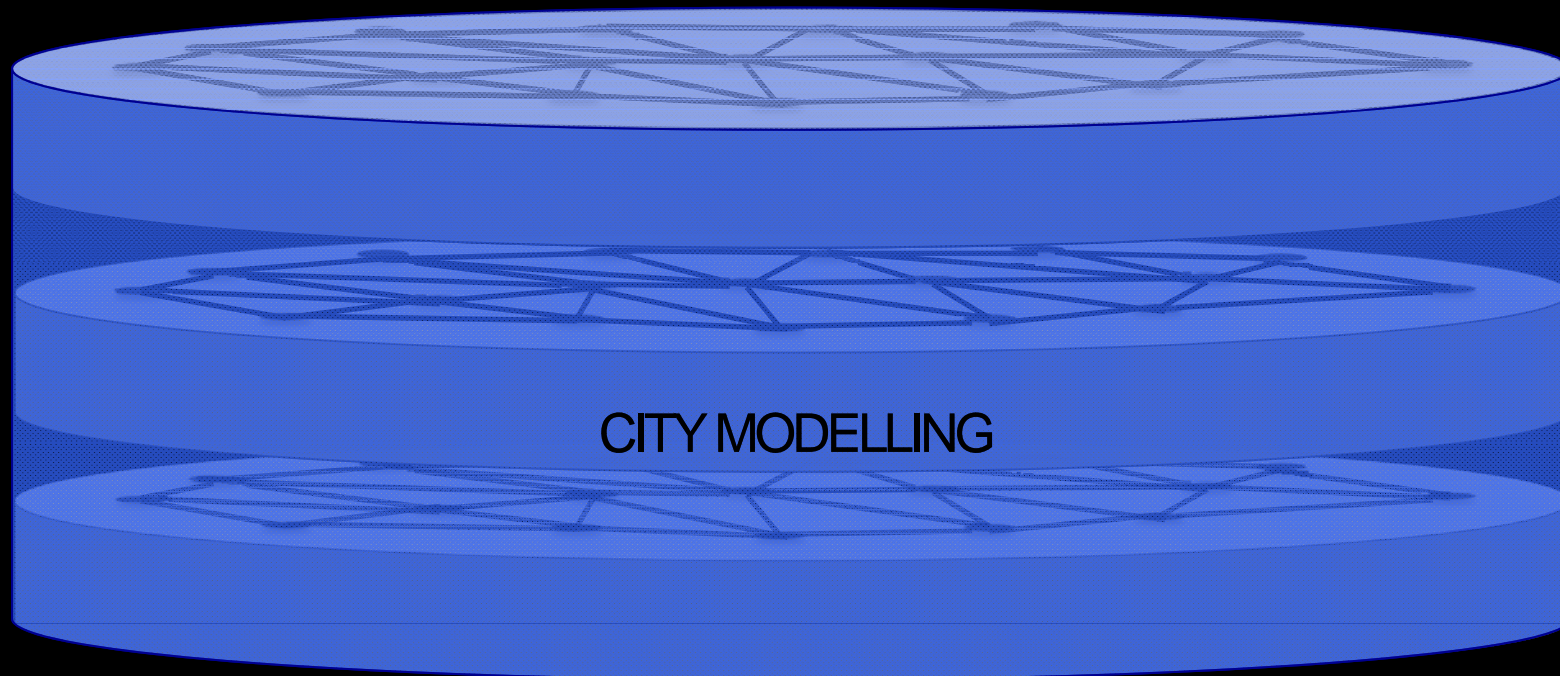
FRANCISCO VARELA  
the autopoietic organization



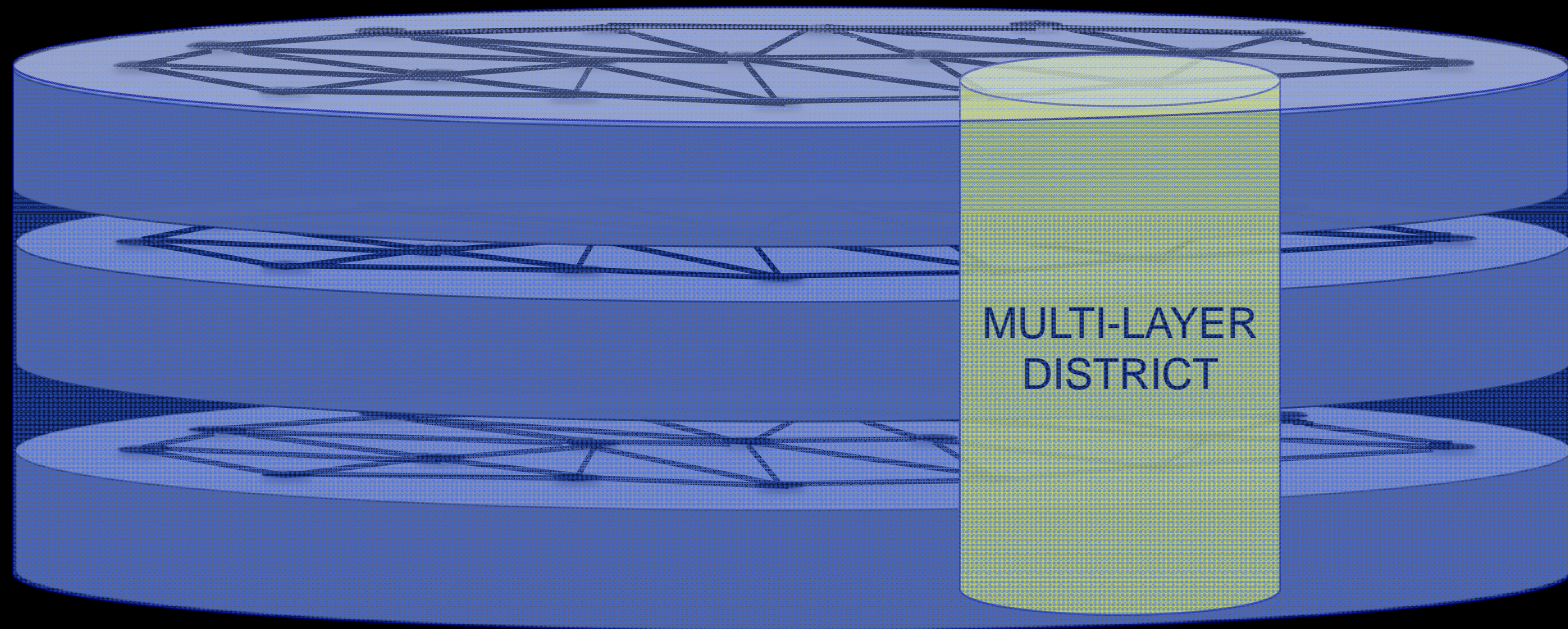
...from description of components...

...to description of relations...

1<sup>ST</sup> LEVEL: SMART CITY  
CITY INT/EXT INTERACTIONS  
GLOBAL VIEW

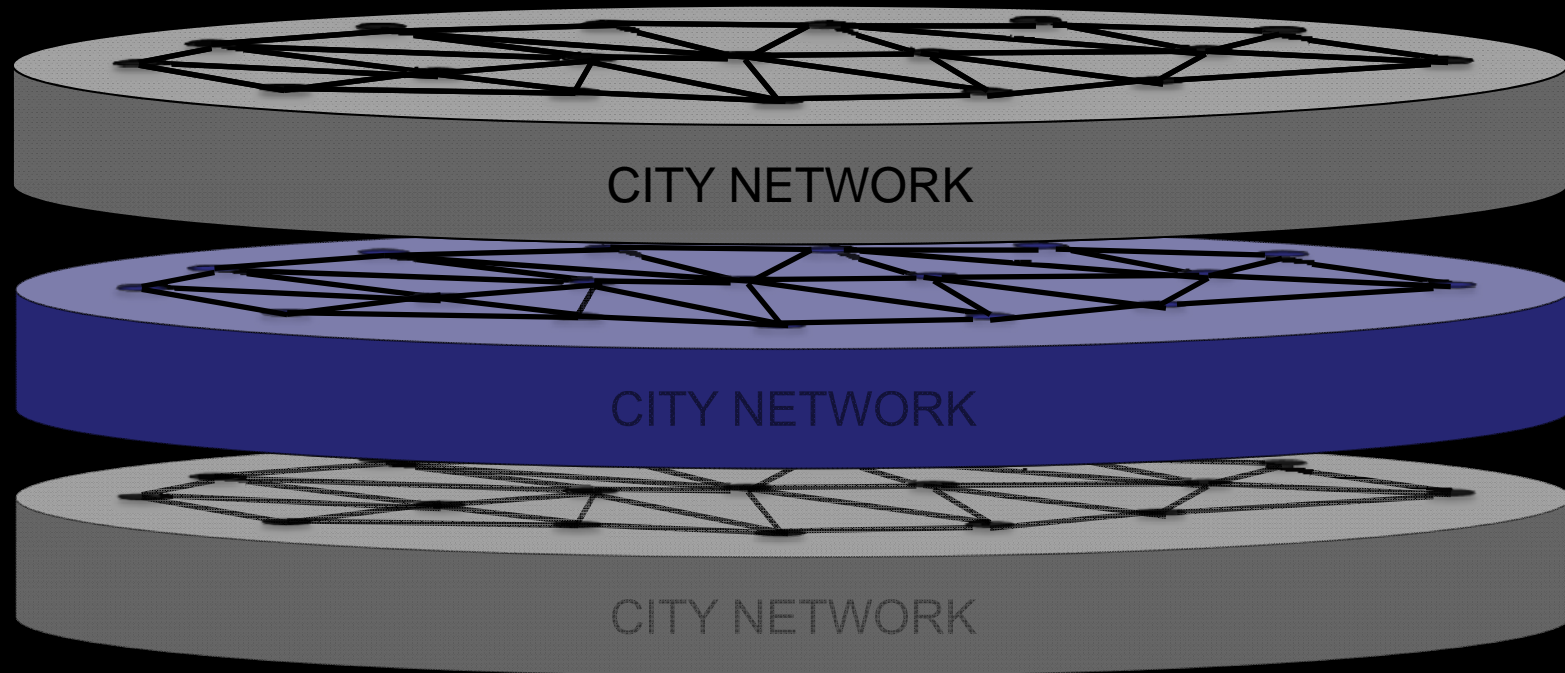


2<sup>ND</sup> LEVEL: SMART DISTRICT  
MULTI-LAYER DISTRICT INT/EXT INTERACTIONS  
VERTICAL SPOT



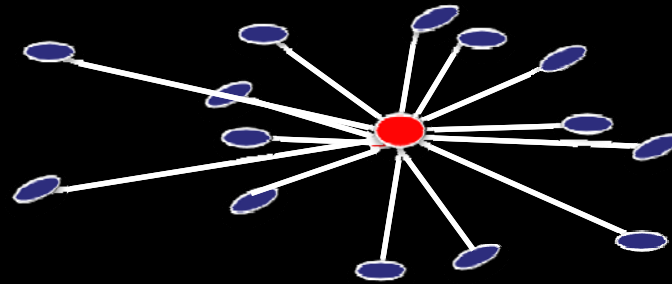


3<sup>RD</sup> LEVEL: URBAN NETWORK  
NETWORK LAYER INT/EXT INTERACTIONS  
HORIZONTAL LAYER





4<sup>TH</sup> LEVEL: SMART USER  
USER/BUILDING TO CITY/GRID INTERACTIONS  
NODE

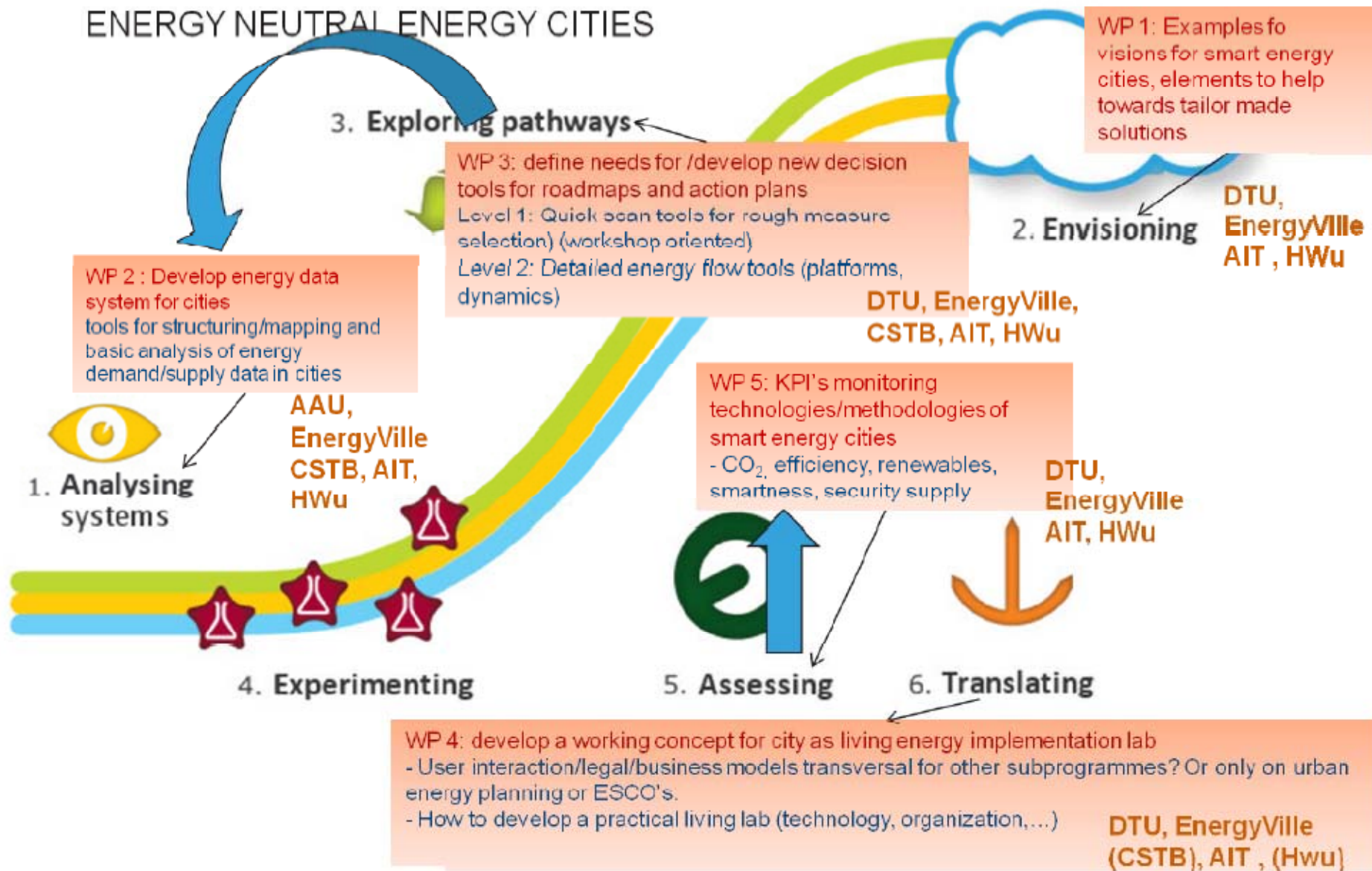


# EERA Smart City Sub-Programs

- ENERGY IN CITIES (Responsible AIT, Deputy VITO)
- URBAN ENERGY NETWORKS (Responsible ENEA, Deputy VITO)
- INTERACTIVE BUILDINGS (Responsible LNEG, Deputy AEE INTEC)
- URBAN CITY RELATED SUPPLY TECHNOLOGIES (Responsible TNO, Deputy: Tbd)

# Sub Programme “Energy in Cities”

SUPPORT THE TRANSITION PROCESS TOWARDS SMART ENERGY NEUTRAL ENERGY CITIES



## Sub Program Interactive Buildings



## **Sub-Programme Urban city related supply technologies**

### ***Ambition:***

Transition to sustainable energy neutral districts and cities in 2050.  
Creation of reliable, safe, sustainable energy supply.

### **RES, research topics defined**

- How to bring renewable energy sources into the city?
- How to connect it to the infrastructure
- How to integrate it within the city and buildings

Solar

Biomass

Geothermal

waste heat

Wind

Mixed

...



# Smart City

## URBAN ENERGY NETWORKS

Mauro Annunziato  
**ENEA - Italy**

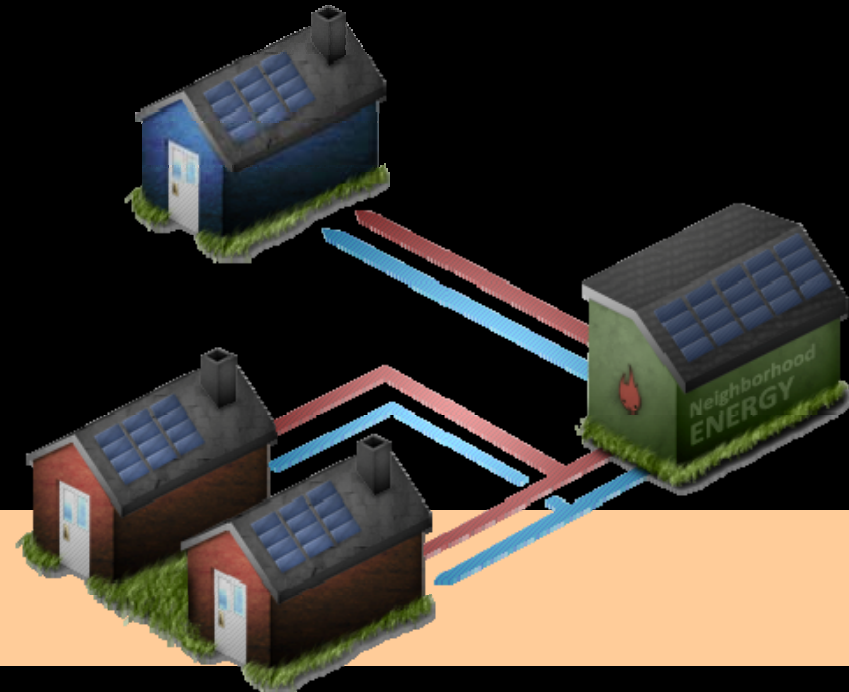
[www.eera-set.eu](http://www.eera-set.eu)

# WP 1. Smart Energy Districts

## 1.1 Inter-building interactions

1.2 District heating and cooling management

1.3 District integration between energy production and energy consumption



Inter-building thermal and electrical energy balancy.  
Street scale energy network.  
Inter-building/street operation management.

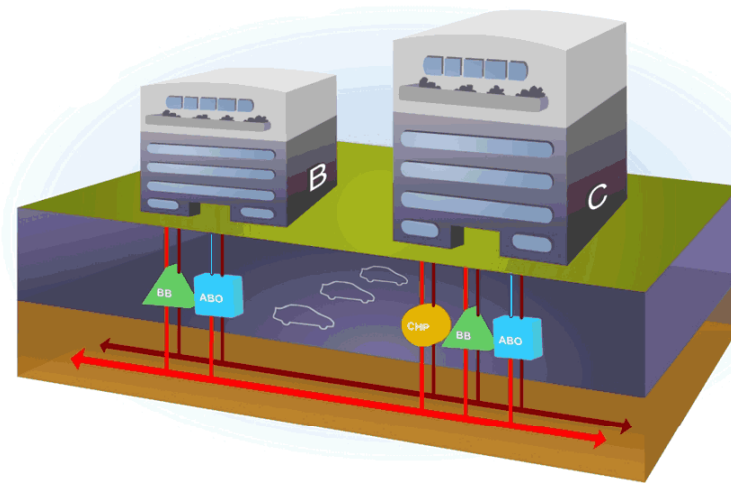


# WP 1. Smart Energy Districts

1.1 Intra-building interactions

**1.2 District heating and cooling management**

1.3 District integration between energy production and energy consumption



District operation and management.

Inter-district thermal interaction management.

# WP 1. Smart Energy Districts

1.1 Intra-building interactions

1.2 District heating and cooling

**1.3 District integration of energy production and consumption**

Multi-energy source intelligence (heat, cooling, electricity opt. balance).

Demand side management for local optimization.

Management of faults, emergency, black out, self-healing procedures.

Integration of medium DER, small DER.

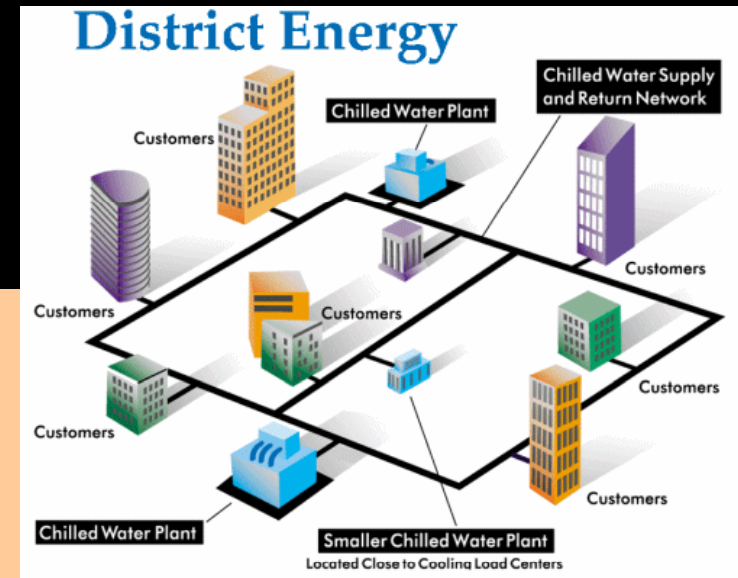
Electrochemical storage.

Energy consumption minimization of intra-district networks.

Prediction of the district energy production/consumption.

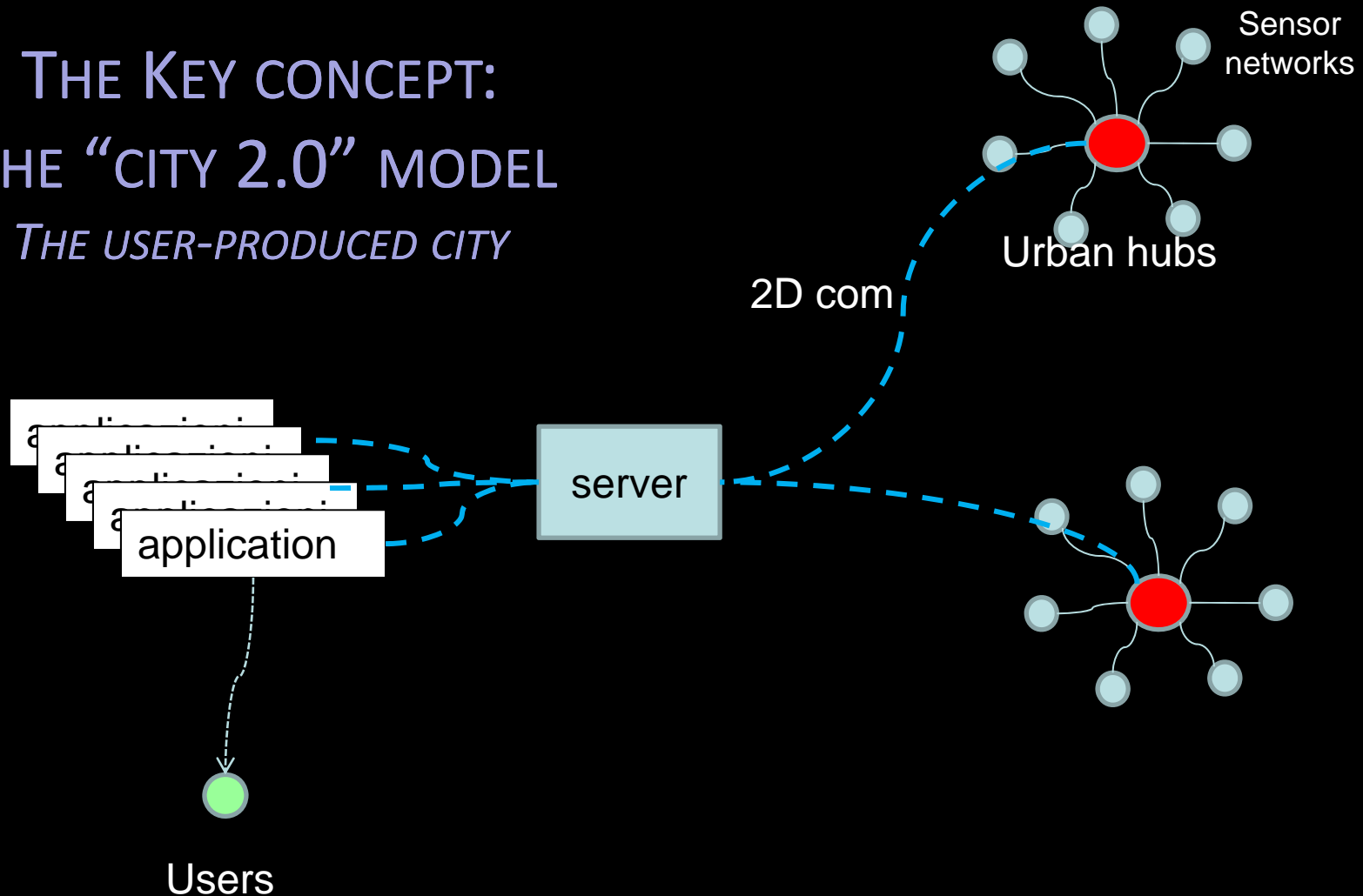
Dealing with the electrical grids (Com solutions, network automation, storage off RES peak generation).

Interaction with Smart Grid JP Initiative.



# WP 2. Urban space network integration

THE KEY CONCEPT:  
THE "CITY 2.0" MODEL  
*THE USER-PRODUCED CITY*

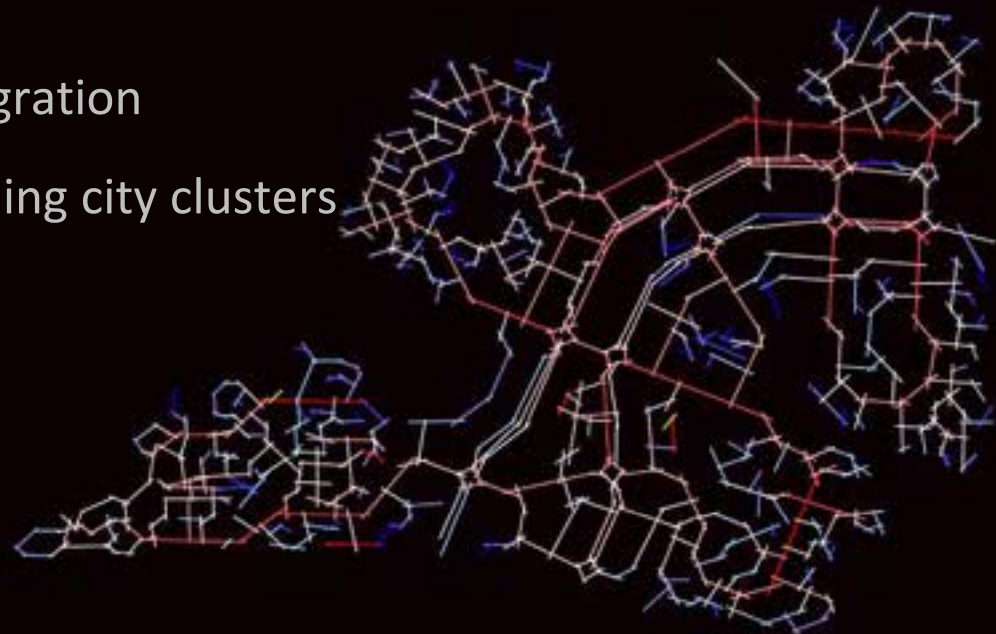


# WP 2. Urban space network integration

## 2.1 Urban scale network integration

## 2.2 Energy-mobility network integration

## 2.3 Remote management of building city clusters



Urban sensor networks, data-energy transmission network, urban data management, environment intelligence.

ICT architectures for smart streets, smart node, smart ring, smart subnet.

Integration of smart services in energy networks: public lighting, traffic/safety monitoring, info-mobility, buildings monitoring, environmental control, waste, water.

Multifunctional platform for network integration (multi-layer info sharing, harmonisation of data acquisition and collection, performance integrated indicators)

Evolution of Medium Voltage distribution networks for smart City services (bidir. com, smart interface MV & LV,).

Critical urban network interconnections, effects on network safety/operation, cyber security.

# WP 2. Urban space network integration

2.1 Urban scale network integration

**2.2 Energy-mobility network integration**

2.3 Remote management of building city clusters



Interaction between mobility and urban energy/ict structure (integrated traffic monitoring, info-mobility, smart public transportation).

E-mobility (system architectures, recharging infrastructure, business models).

# WP 2. Urban space network integration

2.1 Urban scale network integration

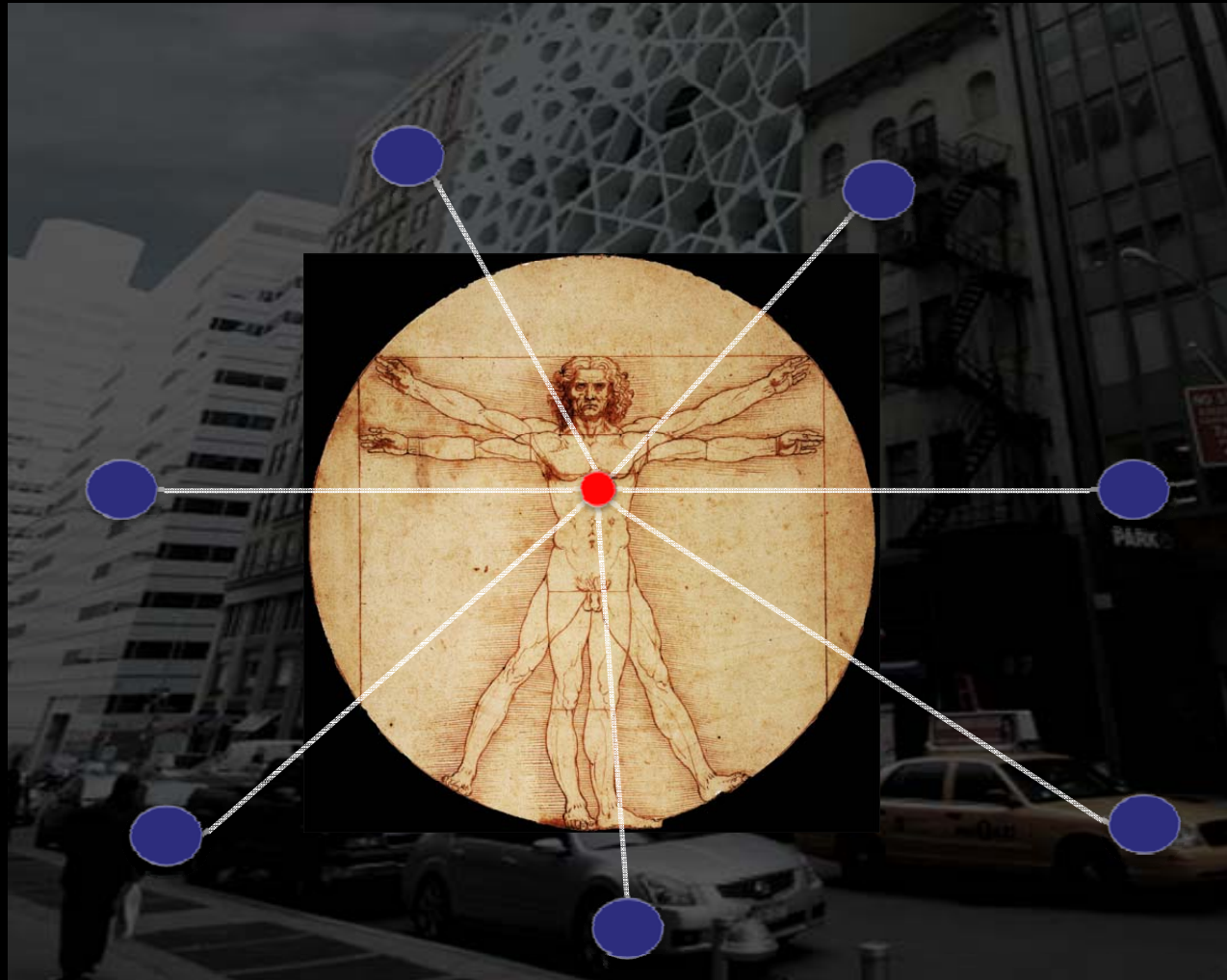
2.2 Energy-mobility network integration

**2.3 Remote management of building city clusters**



Real time network monitoring.  
Predictive modelling and diagnostics.  
Network remote control.  
Cyber security.

## WP 3. Human factors: the citizen-city interaction



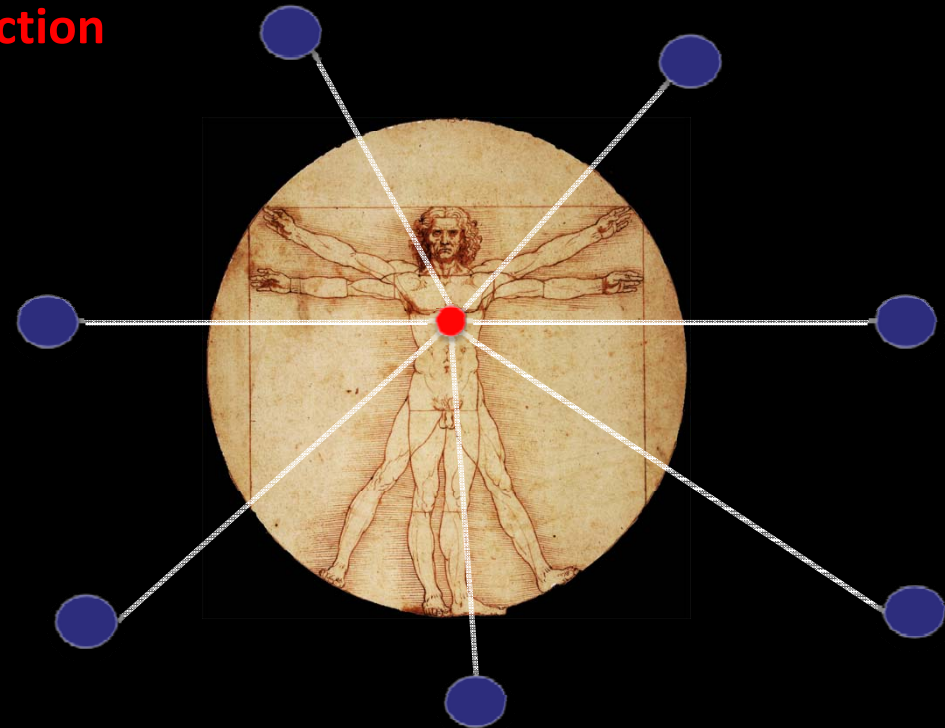
KEY CONCEPT: THE HUMAN ORIENTED TECHNOLOGY



# WP 3. Human factors: the citizen-city interaction

## 3.1 Citizen-urban networks interaction

## 3.2 End user-Grid Interface



Interaction between Citizen and city networks in public space.  
People driven urban network management.  
People interaction for rising consciousness about city sustainable environment.  
People acceptance and participation.

# WP 3. Human factors: the citizen-city interaction

## 3.1 Citizen-urban networks interaction

## 3.2 End user-Grid Interface



Advanced smart metering and smart agents/devices.

End user-grid interaction for appliance control.

People-grid information dialogue, rising customer consumption awareness (e.g. by customer display)

Best practice for end user dialog.

Management of the user behaviour data for user energy management conscious orientation.

Interaction with Smart Grid JP Initiative.

# IL PROGRAMMA “SMART CITY” DELL’ENEA

RICERCA DI SISTEMA – SMART TOWN:

SVILUPPO DELLA MODELLISTICA SMART STREET

CITY 2.0: SVILUPPO TECNOLOGIA, DIMOSTRATIVO SU

SCALA URBANA, SPERIMENTAZIONE SMART TOWN

## Ricerca di Sistema Elettrico

Progetto: Tecnologie “smart” per l’integrazione della illuminazione pubblica con altre reti di servizi energetici e loro ottimizzazione

Durata: annuale (novembre 2011)

Budget: 1 ML Euro (600 KEuro Università)

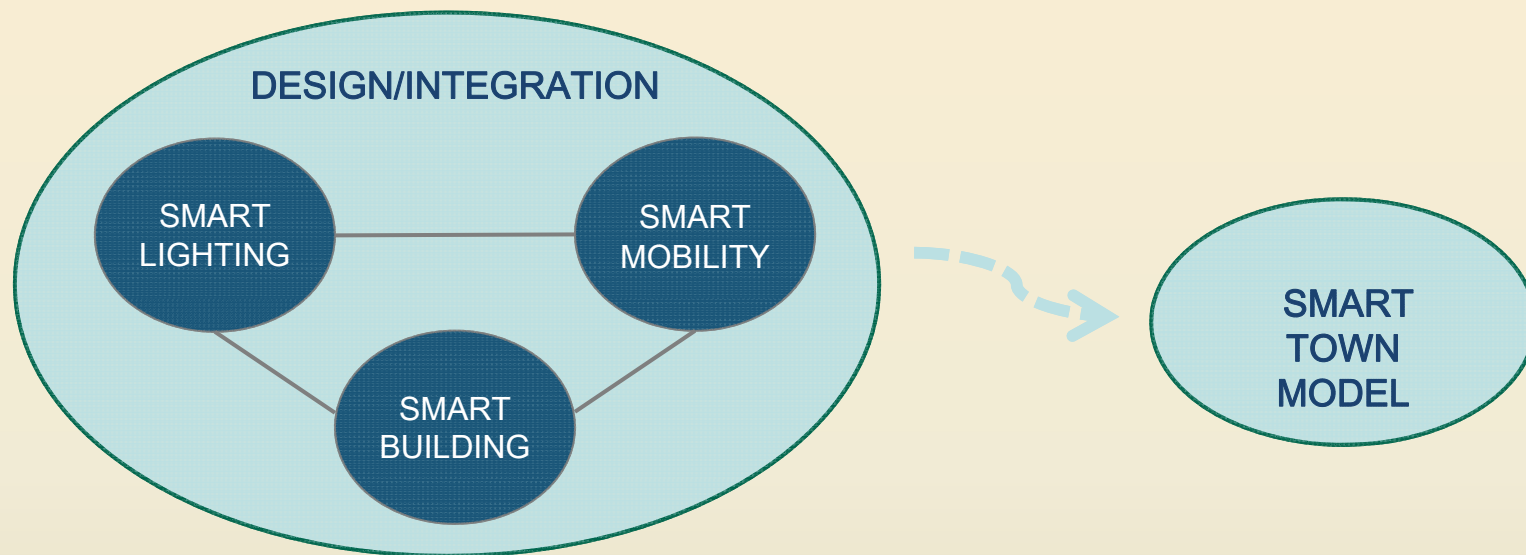
Finanziamento: MSE – AEEG

Partners: 6 univ. italiane di eccellenza su SC

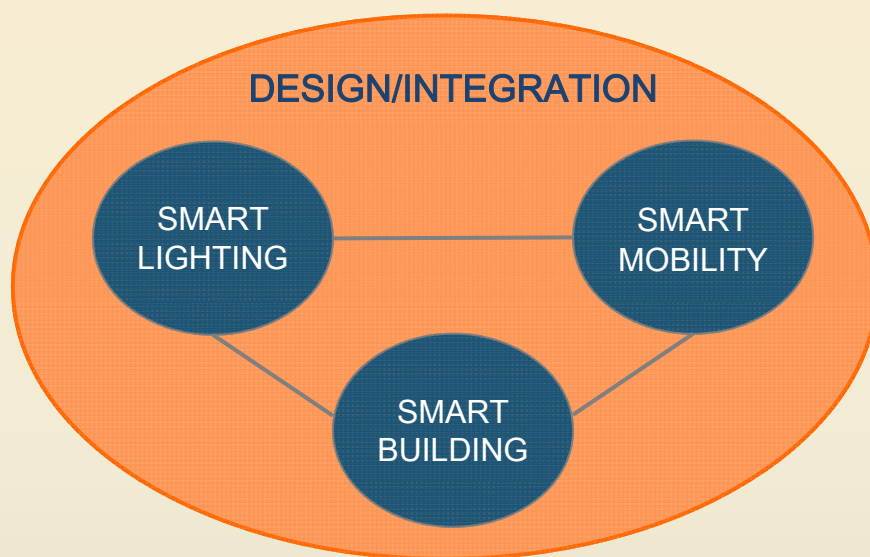
# Obiettivi

- Sviluppo della modellistica di una **Smart Street** basata sull'integrazione di illuminazione pubblica, mobilità sostenibile e gestione innovativa di reti di edifici.
- Utilizzo della rete dell'illuminazione come struttura portante di una rete di sensori, di trasmissione dati verso applicazioni intelligenti.
- Obiettivo annuale: modellistica innovativa basata sul concetto **energy on demand**
- Obiettivo strategico: aggregazione di un team di Laboratori ENEA ed eccellenze italiane della ricerca.

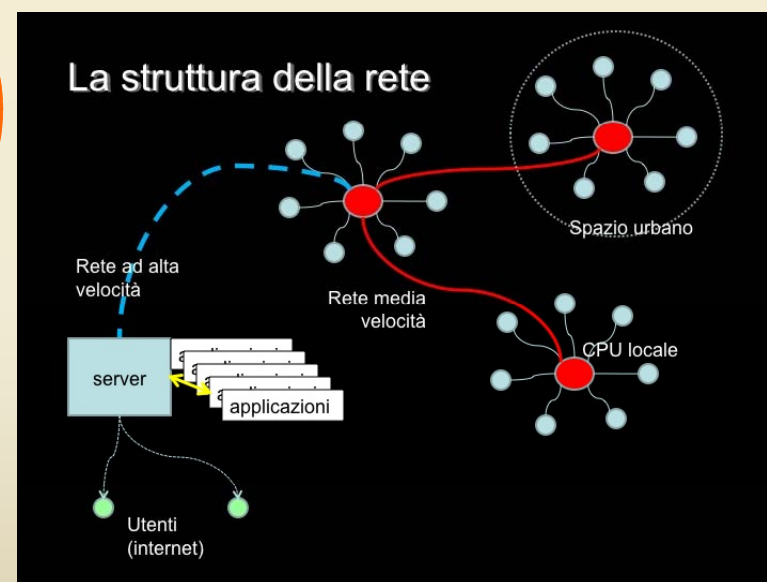
# Gli obiettivi specifici



# Piattaforma integrata aperta

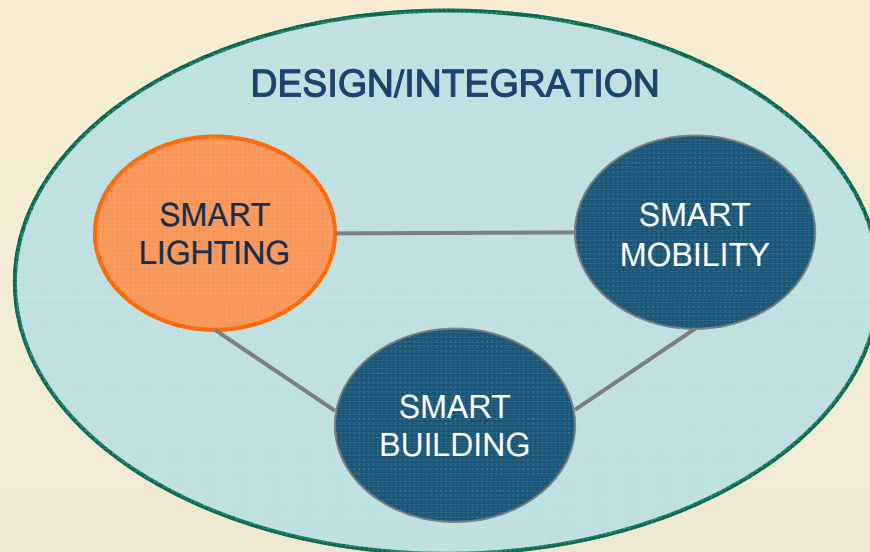


- Condivisione dei sensori/dati/applicazioni
- Progetto piattaforma integrata per Smart Town
- Framework prototipale





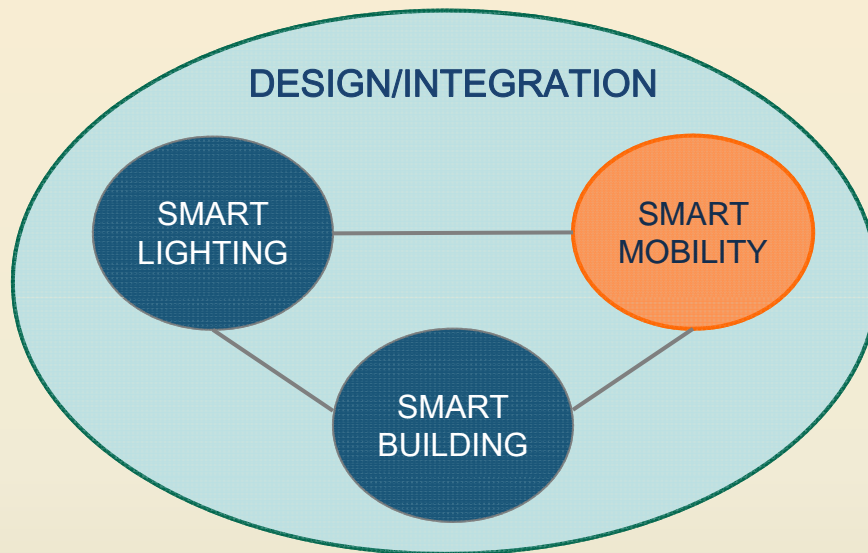
# Smart Lighting



- Lampione intelligente
- Predizione richiesta short/long term
- Controllo adattivo potenza
- Controllo della strada



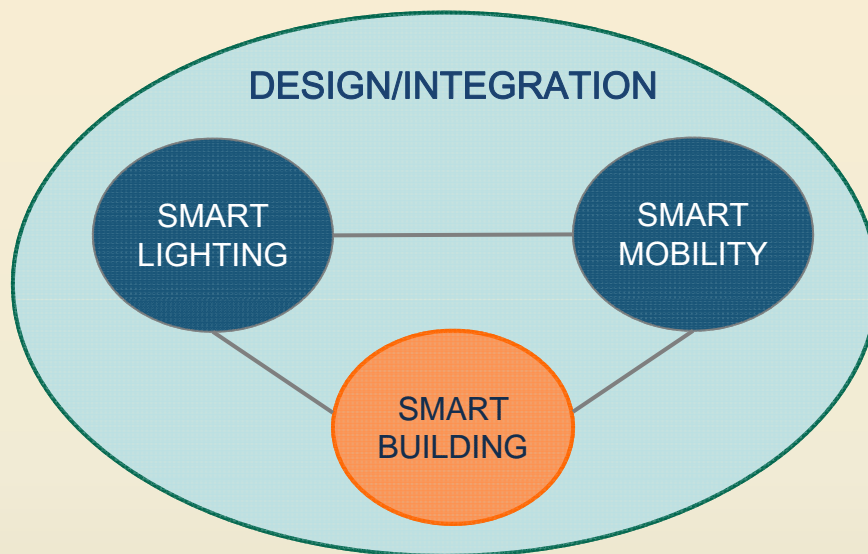
# Smart mobility



- Tutor urbano low cost
- Interazione veicolo pubblico-semaforica
- Gestione remota veicolo elettrico



# Smart Building Network



- Modelli predittivi della rete
- Interazione rete-edificio-utente





# Modello Smart Town



SMART  
TOWN  
MODEL

- Partecipazione ai network europei (EERA, EII, Urban Europe)
- Studi fattibilità per modello di Smart Town competitivo (Monza-Brianza, Zola Predosa)

# City 2.0

Durata: triennale (ottobre 2013)

Budget: 1.45 ML Euro

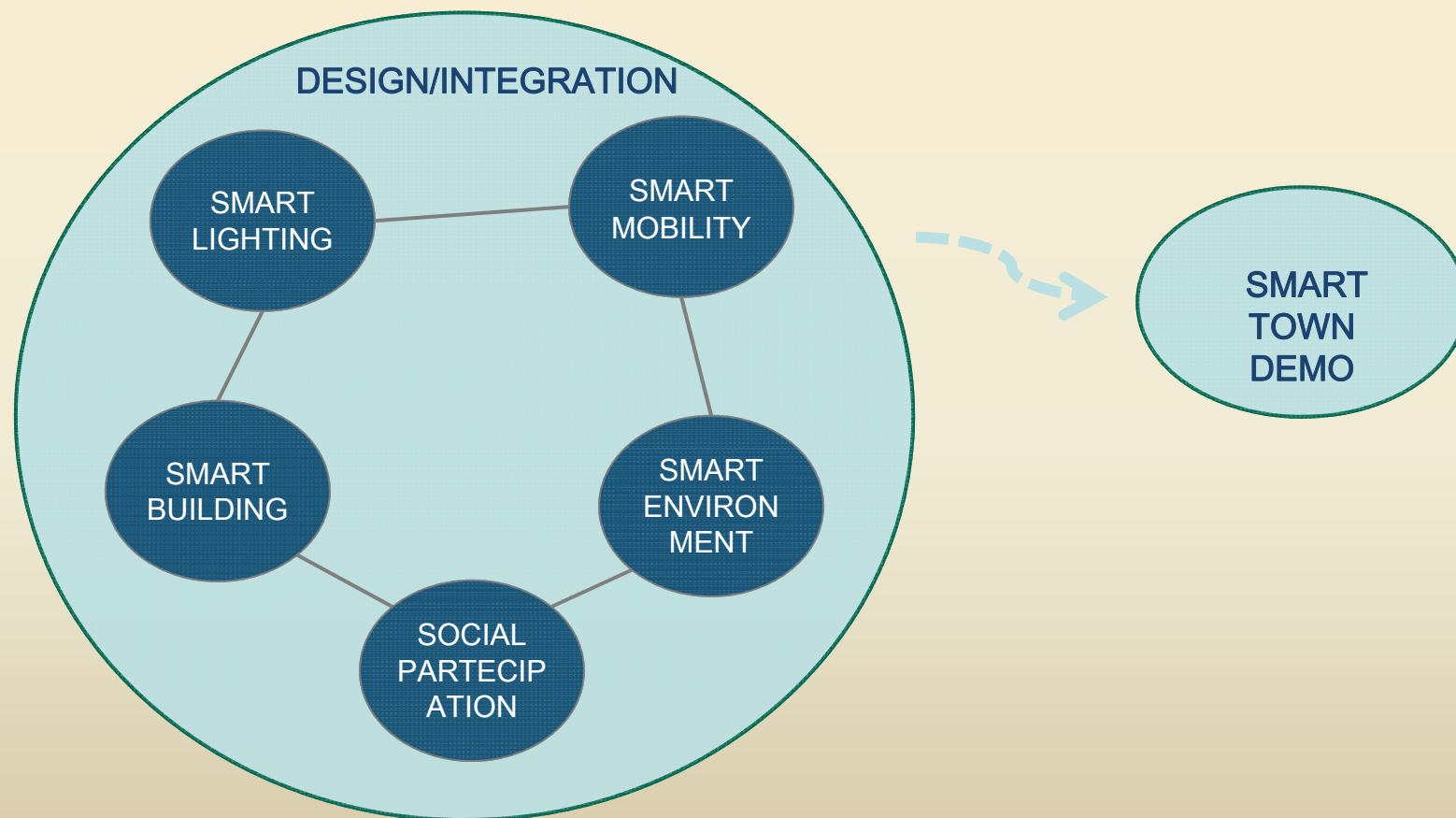
Finanziamento: Miur

Partners: CNR + Telecom/ENEL + univ. italiane

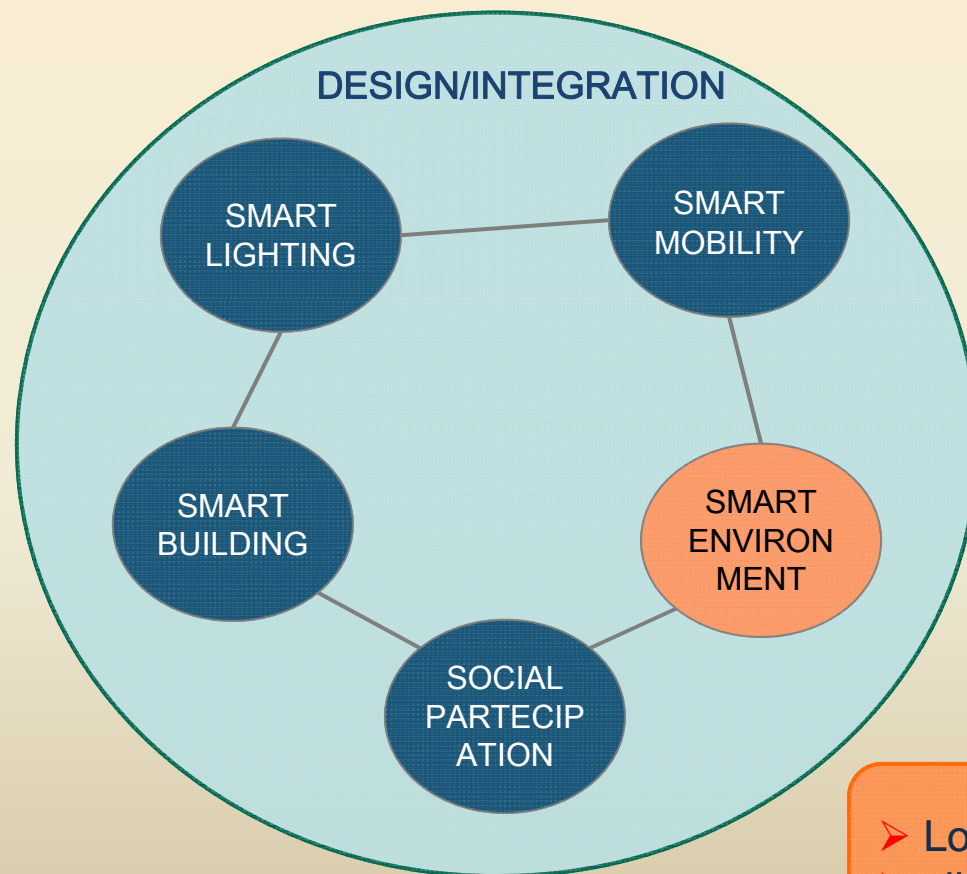
# Obiettivi

- Sviluppo di una piattaforma tecnologica integrata (sensor network, trasmissione, architettura dati, intelligenza, attuazione) per un modello **Smart Town**.
- Realizzazione prototipale di un dimostrativo in scala urbana e sperimentazione.
- Obiettivo triennale: piattaforma tecnologica prototipale per **città di medie dimensioni** (10.000/50.000 ab.)
- Obiettivo strategico: aggregazione di una filiera industria-ricerca.

# Gli obiettivi



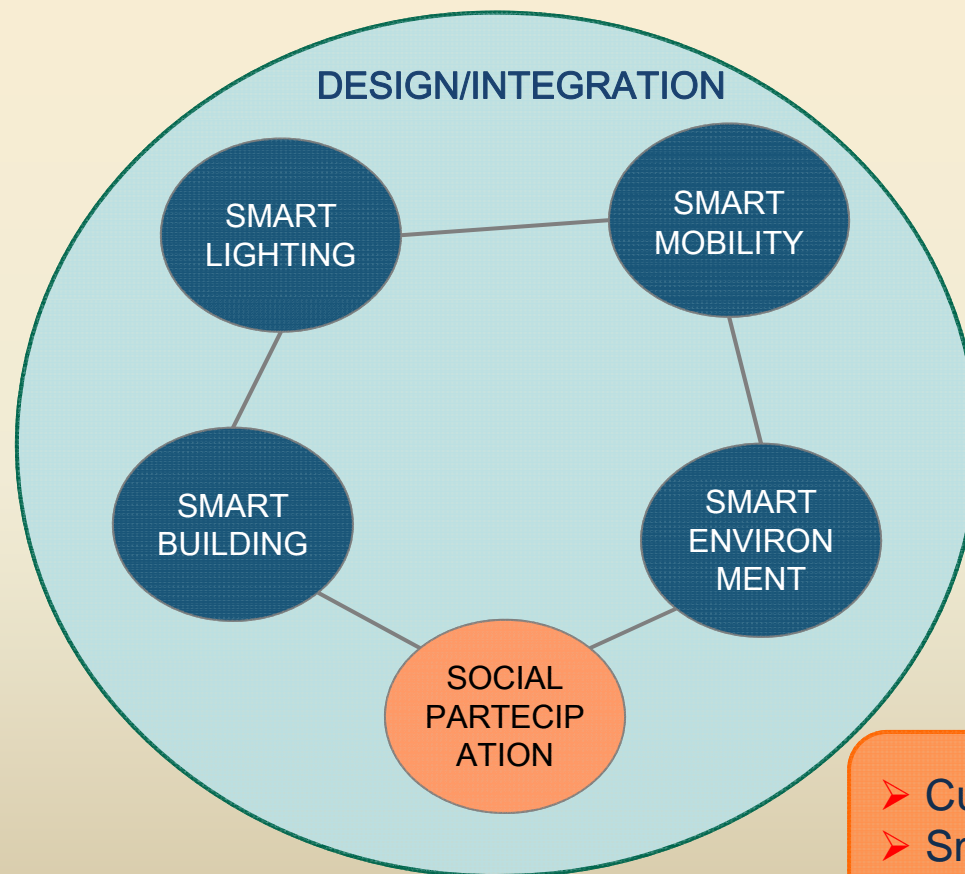
# Smart Environment



- Low cost air quality monitoring
- climatic variables monitoring



# Social participation



- Cultural heritage
- Smart Node: citizen communication
- Urban Safety





# ALTRE PROPOSTE PROGETTUALI IN FASE DI COSTRUZIONE

VII PQ EU (CORDATA EERA – JOINT PROGRAM)  
(DA DEFINIRE)

**SMART CITY INDUSTRIAL INITIATIVE:**

SMART STREET NELLE PROPOSTE GENOVA SMART  
CITY E/O BARI SMART CITY



*Thank you for your attention*

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