



MATRYCS

The MATRYCS project– Big Data applications for Energy in Buildings

Modular Big Data Applications
for Holistic Energy Services in
Buildings

Gema Hernández-Moral

CARTIF Technology Centre (Spain)



1. MATRYCS introduction
2. MATRYCS large-scale pilots (LSPs)
3. LSP7: Services to support SECAPs impact assessment, implementation and monitoring [ICLEI]
4. LSP9: Energy Performance Certificates [EREN]
5. LSP3: ESCO support services [VEOLIA]
6. LSP6: District Heating Networks [VEOLIA]

1. MATRYCS introduction

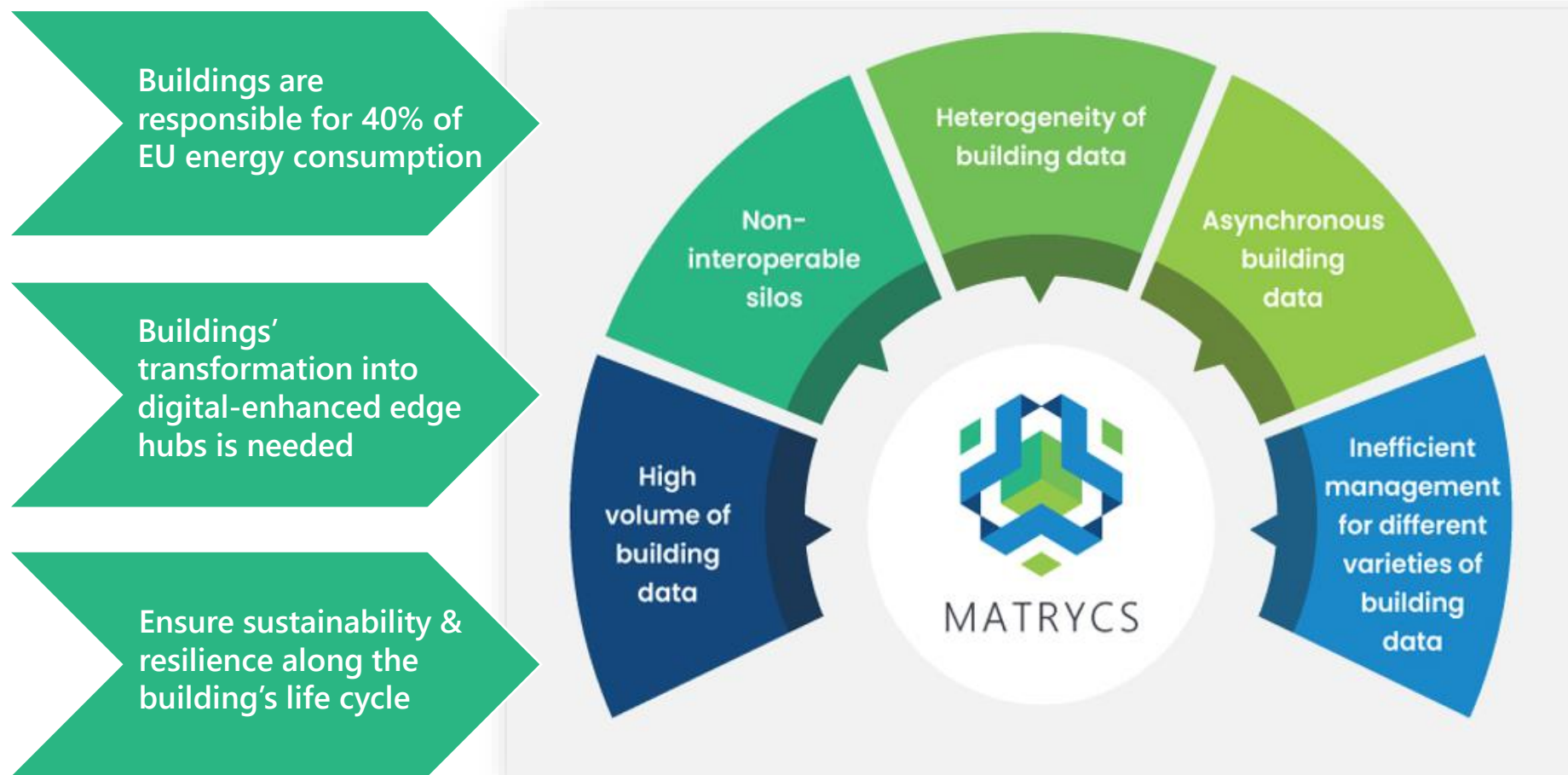


Research Centers/ Universities	Public Bodies/ Agencies	Non-Profit/ NGO	Large Enterprises/ Public Companies	Small Medium Enterprises
NTUA CARTIF RWTH EURAC	GDYNIA COOPERNICO EREN LEIF	ICLEI SEVEN HOUSING EUROPE	ENG ASM VEOLIA	HOLISTIC COMSENSUS BTC FASADA

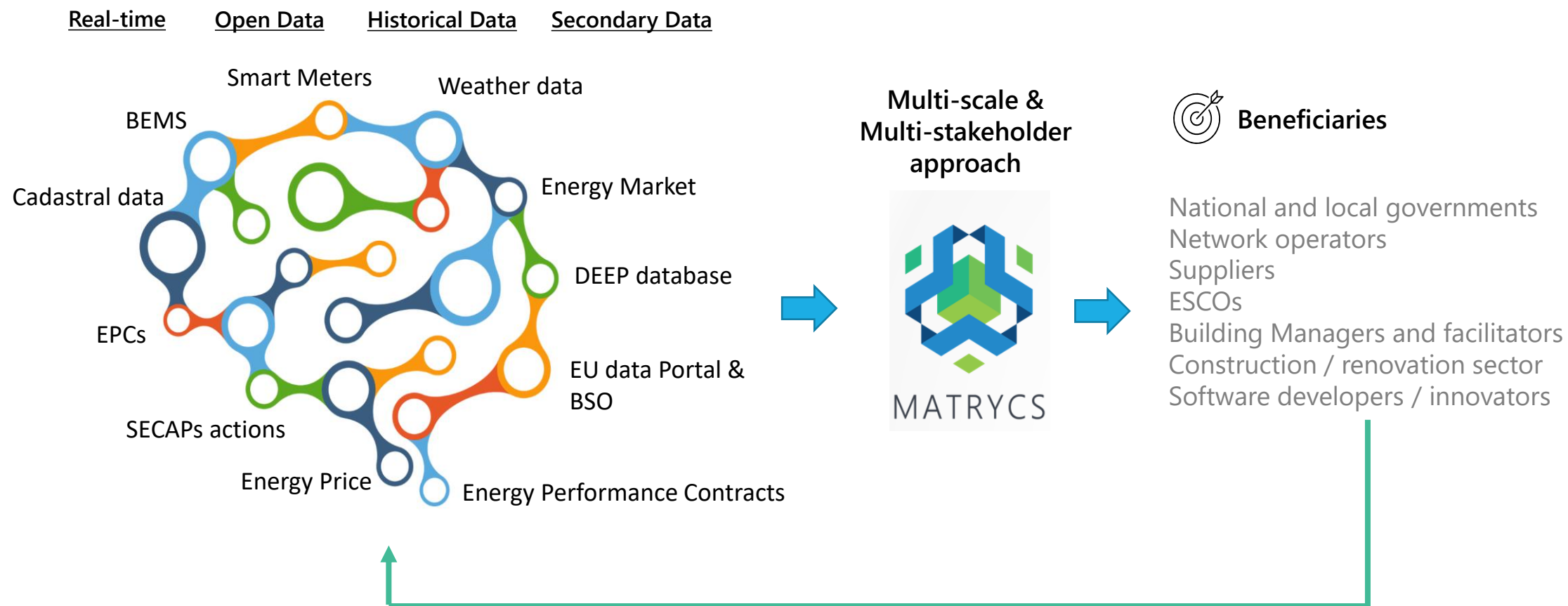
Title:	Modular Big Data Applications for Holistic Energy Services in Buildings
Funding:	European Union's Horizon 2020 Research and Innovation Program (H2020)
Budget:	4.577.835,00€
Lifetime:	October 2020 – September 2023 (36 months)
Coordination:	ENGINEERING - INGEGNERIA INFORMATICA SPA
Participants:	18
Call/Grant	H2020-LC-SC3-EE-2020-1/101000158



1. MATRYCS introduction



1. MATRYCS introduction



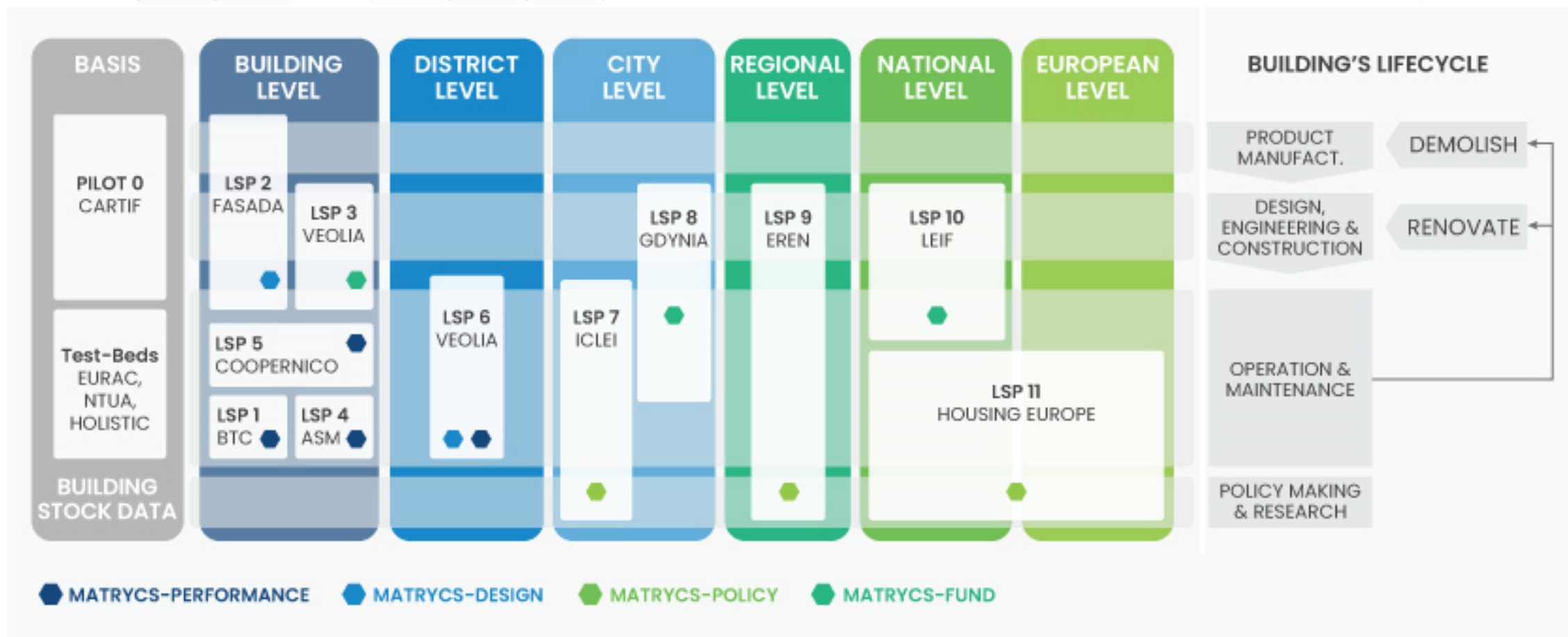
1. MATRYCS introduction



- Holistic, state-of-the-art AI-powered framework for decision-support models, data analytics and visualisations in real-life applications.
- Building energy management will be elevated to a new level through improved data processing, analysis and aggregation.
- MATRYCS envisions to become an energy marketplace of big data and services in the building sector.



2. MATRYCS large-scale pilots



- MATRYCS pilot's approach covers the **whole lifecycle of buildings:**
from the product manufacturing to the operation and maintenance, as well as policy making and research
- Buildings are considered from **different perspectives and scales:**
buildings as individual elements to their aggregation at varied scales

2. MATRYCS large-scale pilots



PERFORMANCE

Services and business models based on the **operational stage of buildings aims at monitoring and improving their energy performance**. Predictive capabilities related to comfort evaluation, energy demand, consumption or generation, will be complemented by optimization capabilities for the management of comfort-aware building energy consumption, management of District Heating networks or energy matching.



LSP1



LSP4



LSP5



LSP6



DESIGN

Services and business models aiming **at facilitating the design, refurbishment and development of building infrastructure**. In particular, focusing at building level design of retrofitting actions, as well as at district level design of networks.



LSP2



LSP6



POLICY

Services and business models to support **policy making and policy impact assessment**. They will be targeting three main elements revolving around policies at different scales: Sustainable Energy and Climate Action Plans, Energy Performance Certificates and impact assessment of EU policies for buildings.



LSP7



LSP9



LSP11



FUND

Services and business models aiming at addressing challenges for **enhanced reliability and reduced risks of energy efficiency investments**, tailored to ESCOs and financing institutions, hence contributing to better define Energy Performance Contract conditions. They will also tackle the centralization of building stock data, the analysis of refurbishment actions and the evaluation of their bankability through the testing of one-stop-shops at city level.



LSP3



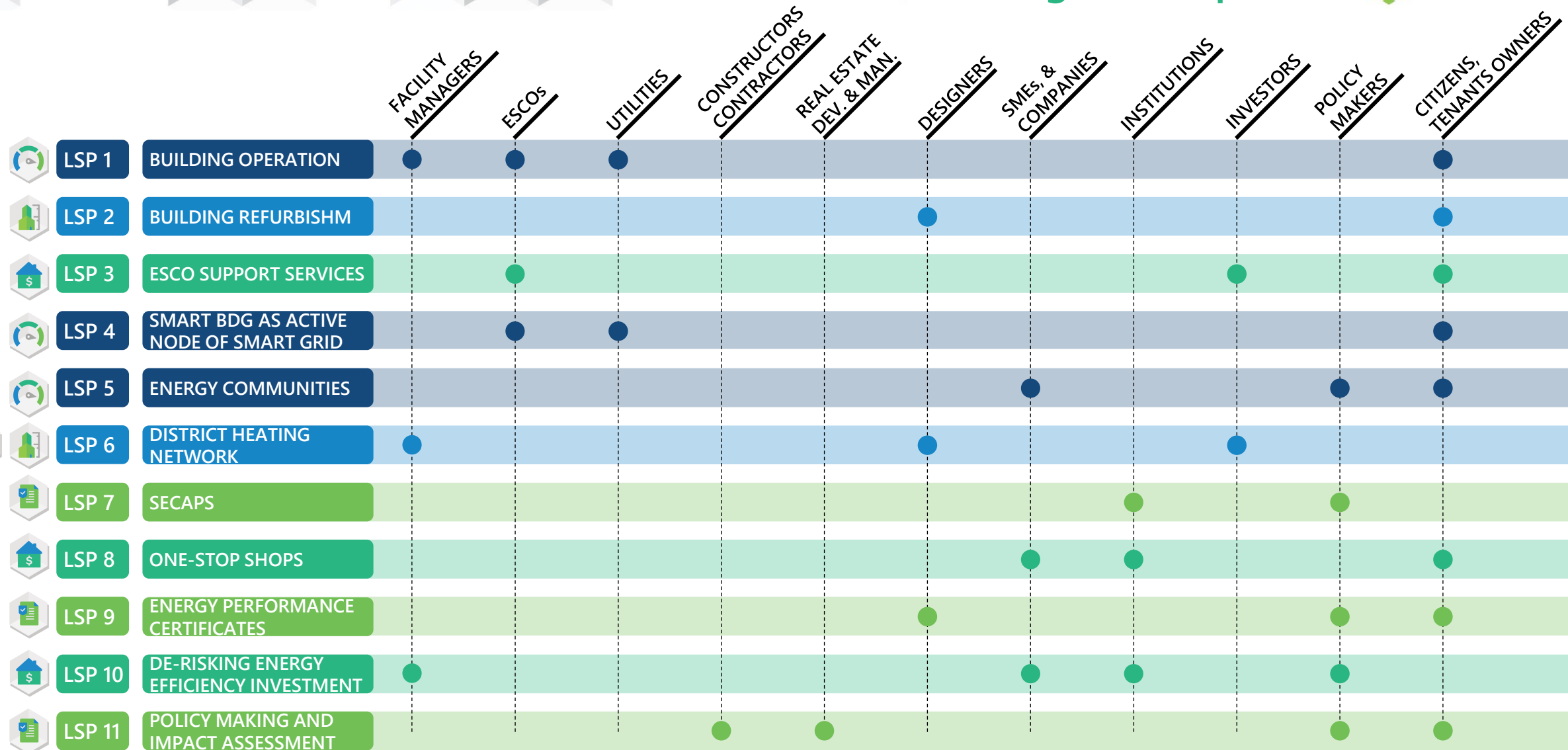
LSP8



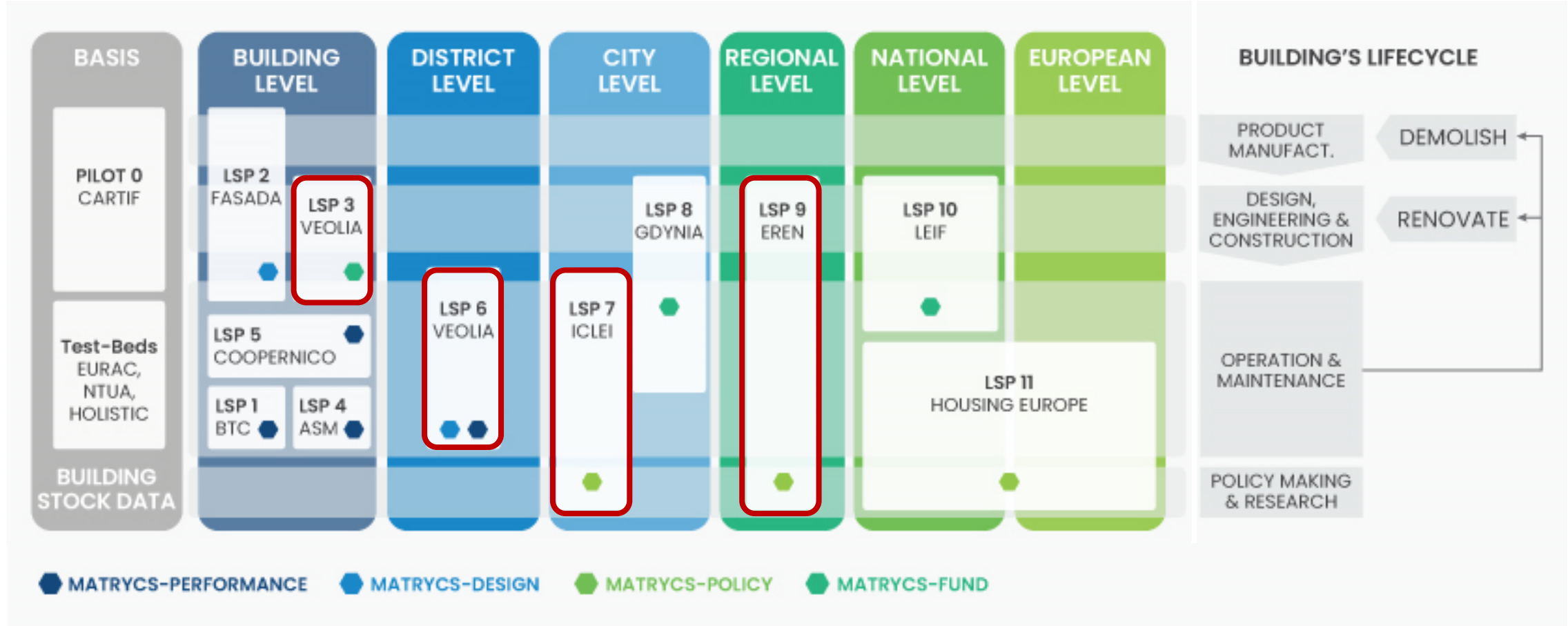
LSP10



2. MATRYCS large-scale pilots



2. MATRYCS large-scale pilots presentation



- MATRYCS pilot's approach covers the **whole lifecycle of buildings:**
from the product manufacturing to the operation and maintenance, as well as policy making and research
- Buildings are considered from **different perspectives and scales:**
buildings as individual elements to their aggregation at varied scales



MATRYCS

LSP presentations

Modular Big Data Applications
for Holistic Energy Services in
Buildings

Gema Hernández-Moral [CARTIF]

Marina Bartolomé Lorenzo [VEOLIA]





MATRYCS

LSP7 - SECAPS

Modular Big Data Applications
for Holistic Energy Services in
Buildings

Gema Hernández-Moral

CARTIF Technology Centre (Spain)

LSP7: Services to support SECAPs impact assessment, implementation and monitoring [ICLEI]



POLICY

LSP7: SECAPS

Services to support SECAPs impact assessment, implementation and monitoring [ICLEI]

Supporting cities in
Climate Change actions

Enhancing cities decision-
making process



Data-driven services and
insights for policy-making

Identifying solutions/best
practices for energy
efficiency

LSP7: Services to support SECAPs impact assessment, implementation and monitoring [ICLEI]



POLICY

LSP7: SECAPS

Services to support SECAPs impact assessment, implementation and monitoring [ICLEI]

THE DATA

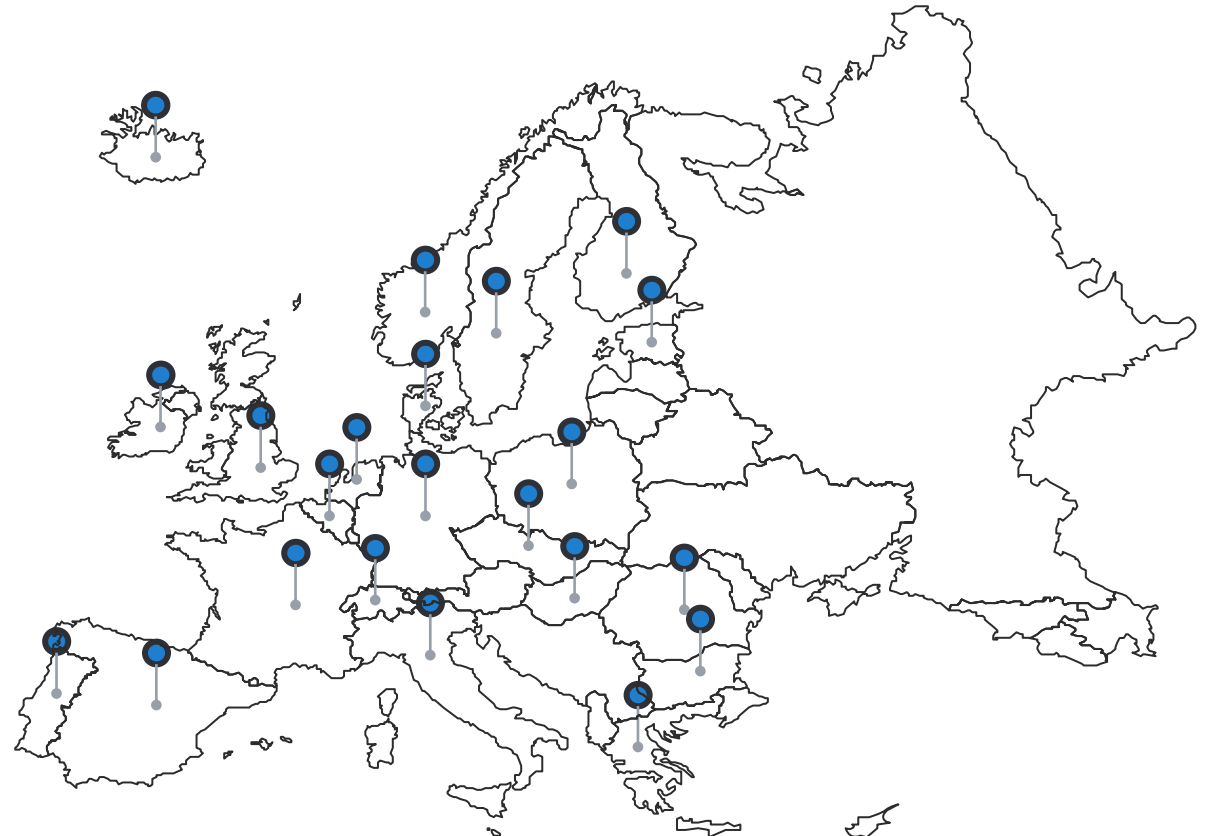
- Unified Reporting System
- Common Reporting Framework (CRF)
- 130+ questions (2021)
- 14 categories (2021)

THE CHALLENGES AND OPPORTUNITIES

- Nº. of municipalities is increasing annually
- 150+ European cities
- Heterogeneous data
- Complex and varied information
- Tabular form
- Cities are implementing smart solutions
- Necessity of generating valuable insights

WHO CAN BENEFIT FROM IT

- Elected city council members, urban planning professionals, city department directors



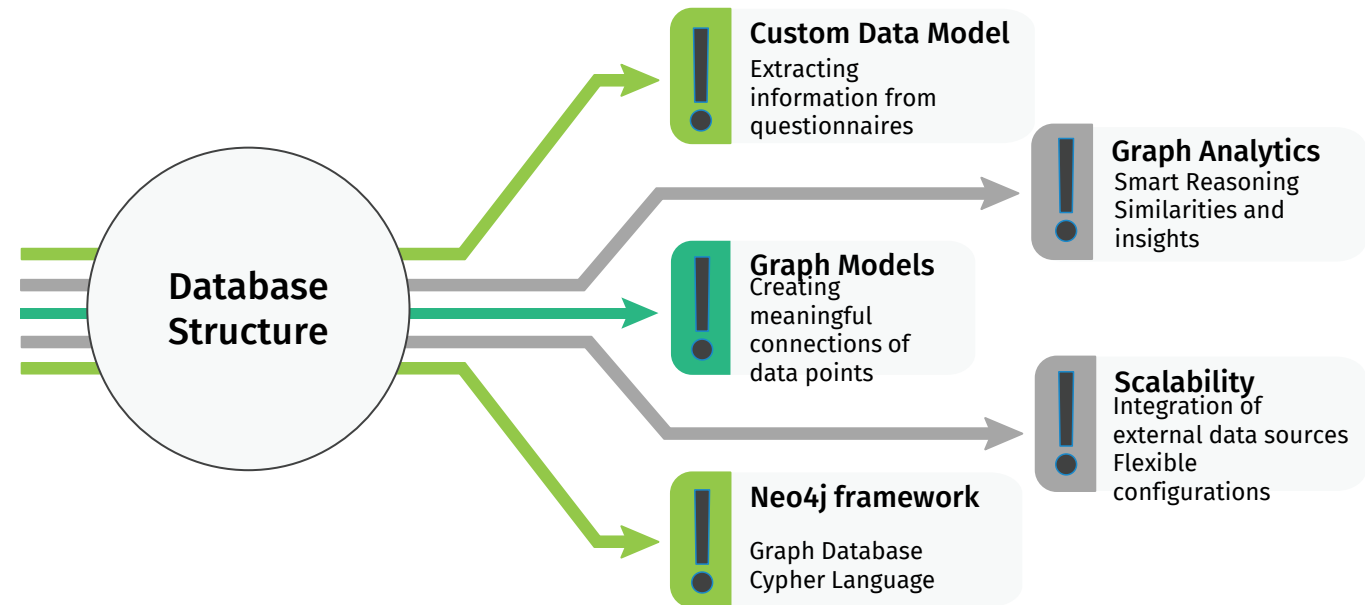
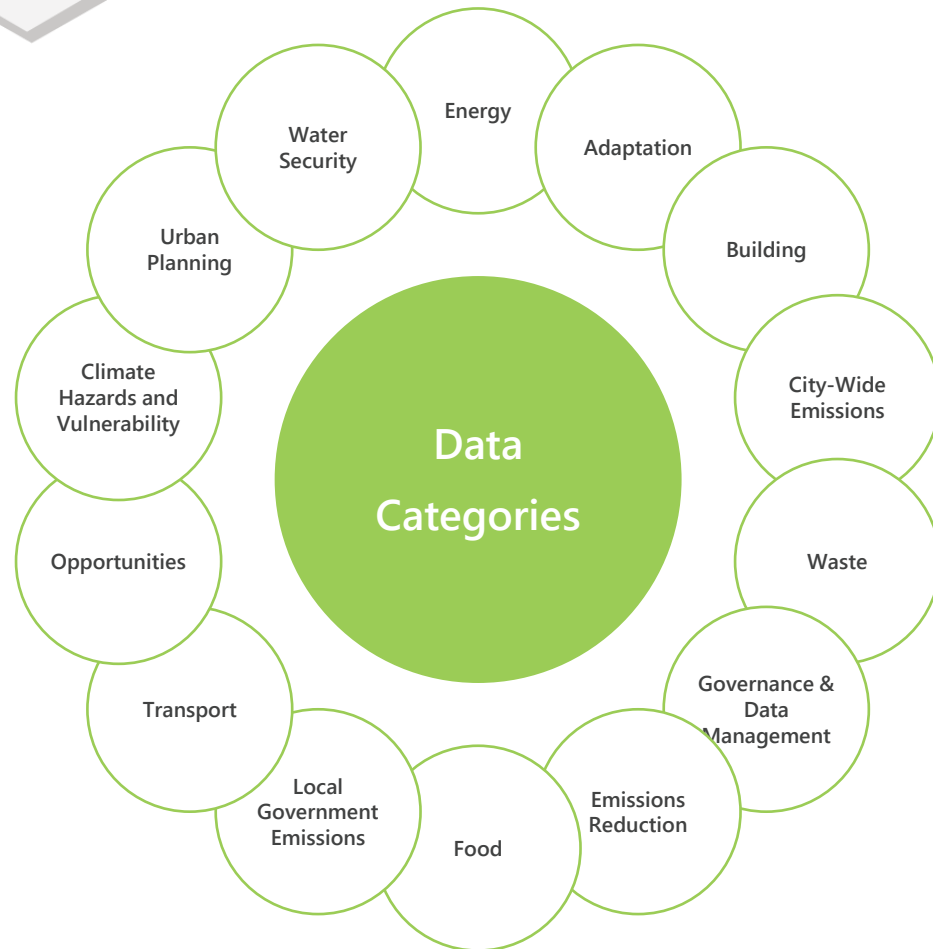
LSP7: Services to support SECAPs impact assessment, implementation and monitoring [ICLEI]



POLICY

LSP7: SECAPS

Services to support SECAPs impact assessment, implementation and monitoring [ICLEI]



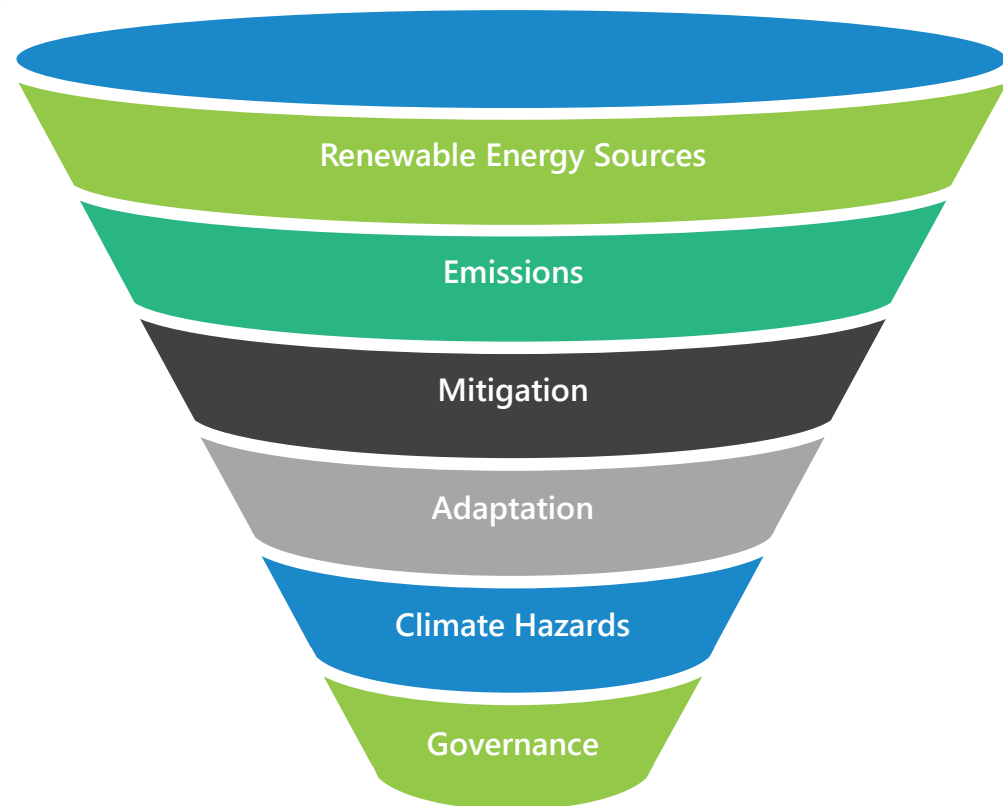
LSP7: Services to support SECAPs impact assessment, implementation and monitoring [ICLEI]



POLICY

LSP7: SECAPS

Services to support SECAPs impact assessment, implementation and monitoring [ICLEI]



- 1 Questions Selection**
Extracting relevant questions for each category
- 2 Score Calculations**
Depending on answers, scores are calculated
- 3 Categories Score**
For each category, cities are assigned a score
- 4 Normalisation**
Aggregation process to rank in each category
- 5 Final Score**
Cumulative scores and ranking

City Ranking Methodology

LSP7: Services to support SECAPs impact assessment, implementation and monitoring [ICLEI]



POLICY

LSP7: SECAPS

Services to support SECAPs impact assessment, implementation and monitoring [ICLEI]

 MATRYCS

[Main page](#) [Hazards](#) [Emissions](#) [Actions](#) [COMPARE CITIES](#)



Welcome to Matrycs!

MATRYCS aims to capitalise and combine existing modern technological breakthroughs in the areas of ML / DL and big data, in order to develop a new decision-making and data analytics solution for energy-efficient cities and buildings.

[Learn more on website](#)



Climate hazard consequences

Climate hazard consequences e.g sectors affected, social impact and population clusters affected for each climate hazard.

[LEARN MORE](#)



Adaptation actions

Adaptation actions undertaken buy cities for each climate hazard.

[LEARN MORE](#)



Energy mix

Check the cities energy sources and their capacity from renewable ones.

[LEARN MORE](#)

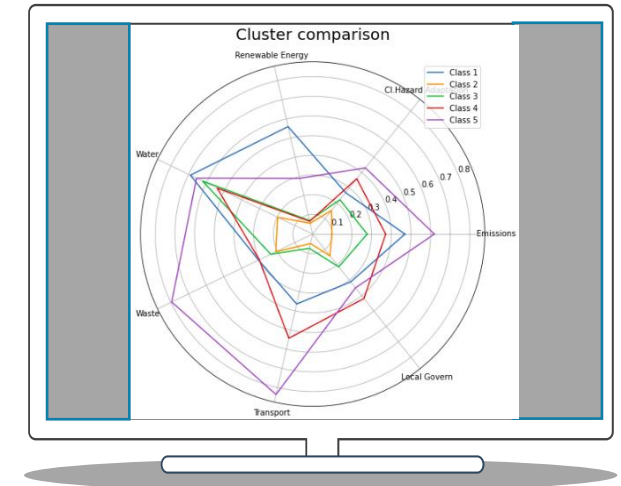
LSP7: Services to support SECAPs impact assessment, implementation and monitoring [ICLEI]



POLICY

LSP7: SECAPS

Services to support SECAPs impact assessment, implementation and monitoring [ICLEI]



Main page Hazards Emissions Actions [COMPARE CITIES](#)

City of Paris

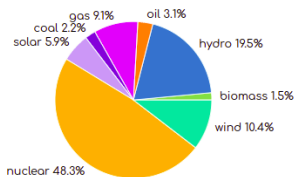
City's ranking

waste 90
mitigation 90
adaptation 90
renewable_energy 90
ghg_emissions 90
water_security 90
transportation 90
governance 90

City's smart hints

The total percentage of zero carbon sources is 37.2

■ biomass ■ other ■ hydro ■ oil ■ gas
■ geothermal ■ coal ■ solar ■ nuclear ■ wind



■ solar_thermal ■ ground_water_source ■ solar_pv
■ wind ■ district_heat_cooling



Main page Hazards Emissions Actions [COMPARE CITIES](#)

Hazard Filter

Action status

Finance status



- Clustering of cities based on the Questionnaires' Responses
- City ranking methodology utilised to create clusters
- Detection of similarities between cities
- Recommendation System
- Insights - Smart Hints





MATRYCS

LSP9 – Energy Performance Certificates

Modular Big Data Applications
for Holistic Energy Services in
Buildings

Gema Hernández-Moral

CARTIF Technology Centre (Spain)

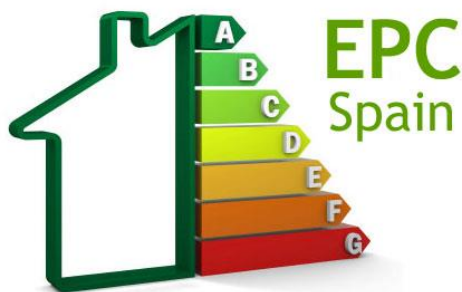


POLICY

LSP9: ENERGY PERFORMANCE CERTIFICATES

Next generation energy performance assessment and certification [EREN]

- › EREN, regional energy agency of Castilla y León region (94,200 km², 2.4 million inhabitants).
- › Main objectives: promotion of energy efficiency and renewable energies in the region.
- › EREN is in charge of the definition and management of regional strategies such as energy efficiency or bioenergy.
- › EREN runs the regional EPCs registry (in Spain EPCS registries are regionalized).
- › It currently has about 160,000 EPCs (18,000 new registrations per year).
- › The registration procedure is done through an xml file generated by the calculation programs approved by the central government.



Source: <https://www.epc-spain.com/>



Source: <https://invertirencastillayleon.com/>



Next generation energy performance assessment and certification [EREN]

Target groups

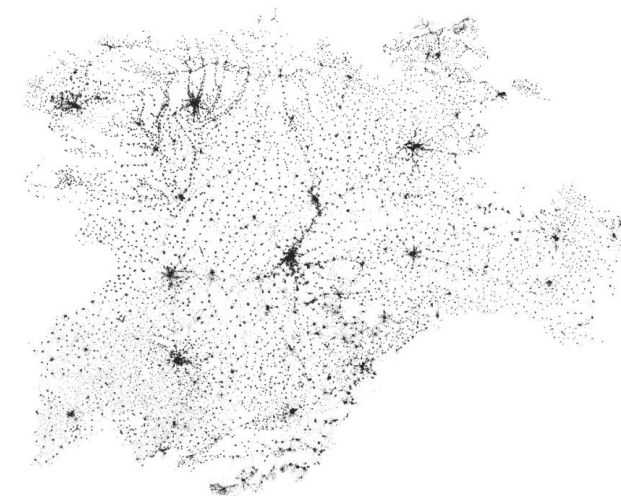
Policy makers

Designers

Citizens, owners and tenants

Data

- Energy Performance Certificates
- Energy data (from EREN data hub)
- Cadastral data
- Weather data
- Open Street Maps data
- Tabula-Episcopo data
- Building Stock Observatory data



- Better **harmonisation and data share** of EPCs.
- Facilitate **compliance with legal requirements** and calculations technical verification.
- **Raise public awareness** and confidence in improved new EPCs more accurate and reliable.
- Offer appropriate **retrofitting solutions** and **prioritizing areas of action** (neighborhoods or cities) based on data from next-generation of EPCs.
- Support in the design and implementation of **energy efficiency regional strategy** in the building sector





POLICY

LSP9: ENERGY PERFORMANCE CERTIFICATES

Next generation energy performance assessment and certification [EREN]

Upload the EPC to test

97457.xml

Check

Selecting the EPC to test

EPCs to check

- ☐ 12345.xml
- ☐ 12346.xml
- ☐ 12347.xml
- ☒ 12348.xml
- ☐ 12349.xml
- ☐ 12350.xml
- ☒ 12351.xml

1234

Check

Result of the checking

12343.xml	✗	Possible inconsistencies:	The value of the gross floor area differs from the value of the area considered in the Digital Building Twin in more than 10%	Please check!
12348.xml	✓	There are no inconsistencies in the EPC		
12351.xml	✗	Possible inconsistencies:	The value of the gross floor area differs from the value of the area considered in the Digital Building Twin in more than 10% Energy Cooling Demand differs from that expected for a building of its characteristics Outlier: "U" values for <i>fachada 3</i> has value out of range	Please check!

Download Report

Example of **s3.2 EPCs harmonisation and checking**



POLICY

LSP9: ENERGY PERFORMANCE CERTIFICATES

Next generation energy performance assessment and certification [EREN]

ZONES

Scale

☐ District

☒ Municipality

☐ Province

Locations to add to the report

☐ Municipality 12

☐ Municipality 13

☒ Municipality 14

☐ Municipality 15

☐ Municipality 16

☒ Municipality 17

INDICATORS

☒ Year of construction

☒ Surface

☒ Number of floors

☐ Number of dwellings

☐ Energy Heating demand

☒ Energy Heating demand Label

☐ Energy Cooling demand

☒ Energy Cooling demand Label

☐ Energy consumption

☐ Energy consumption Label

☐ CO2 Emissions

☒ CO2 Emissions Label

Create Report



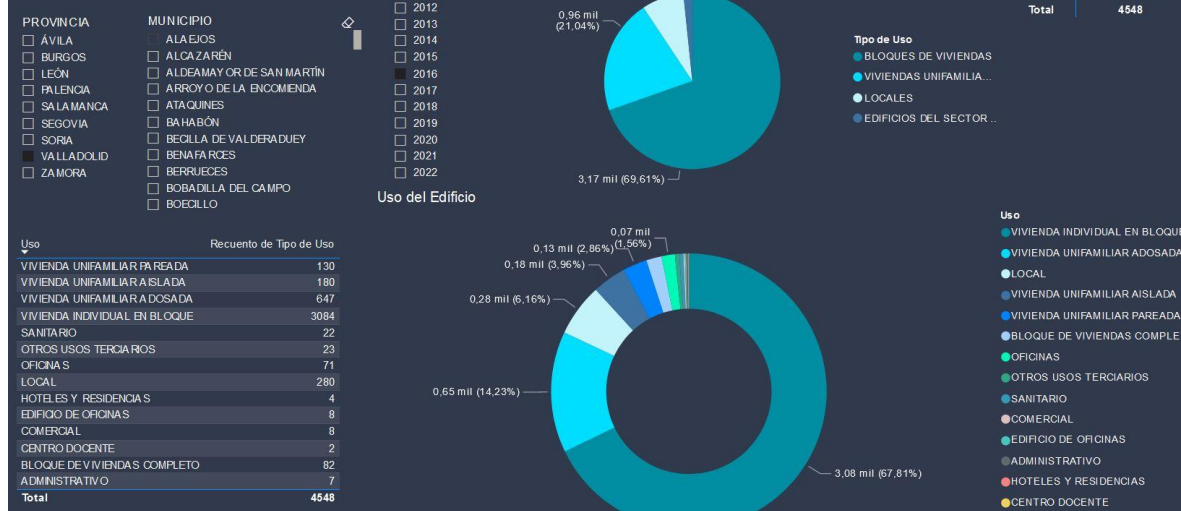
Example of s3.2 EPCs harmonisation and checking

POLICY

LSP9: ENERGY PERFORMANCE CERTIFICATES

Next generation energy performance assessment and certification [EREN]

Certificados energéticos en Castilla y León



Certificados energéticos en Castilla y León



Example of s3.2 EPCs harmonisation and checking

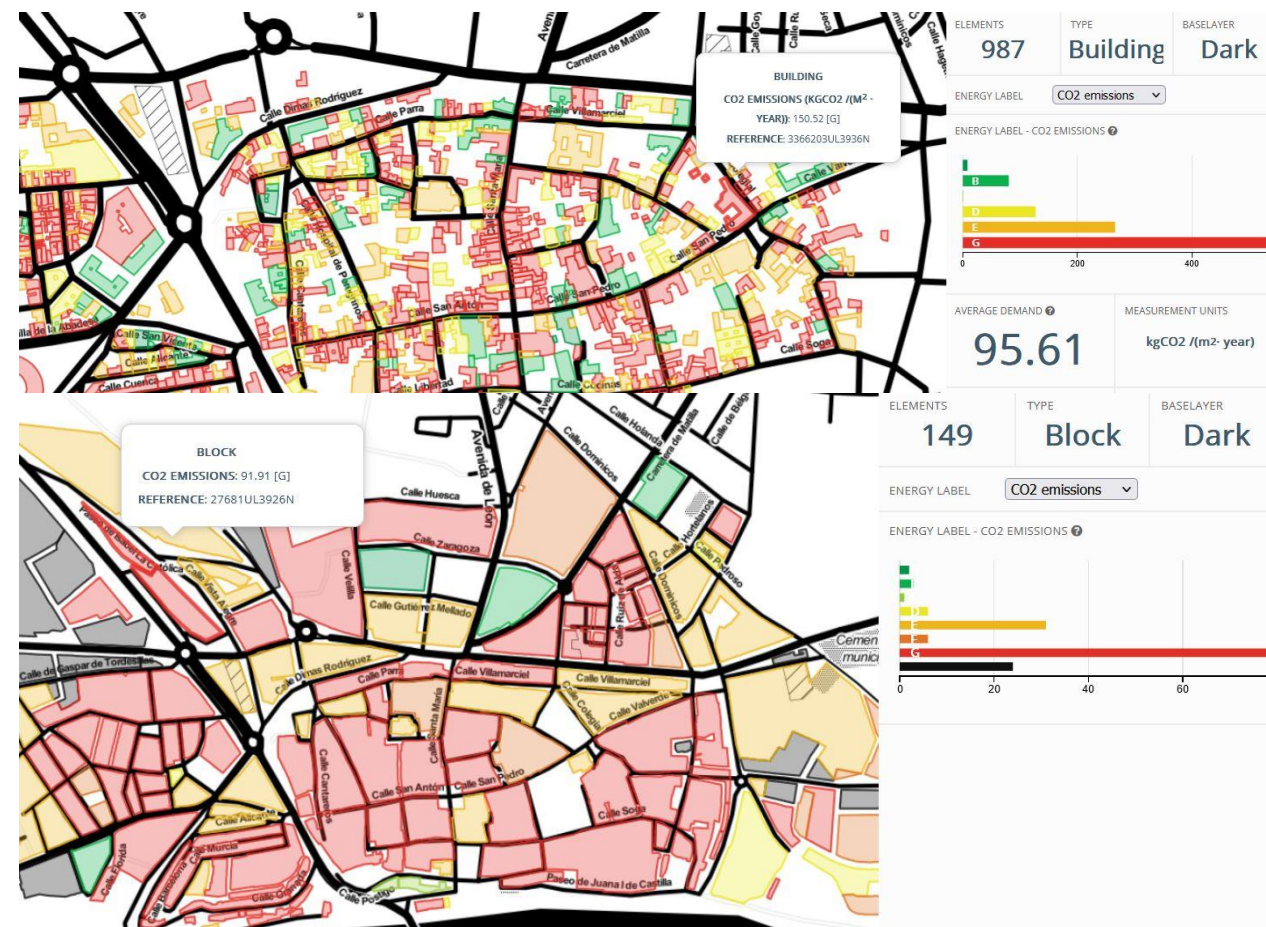
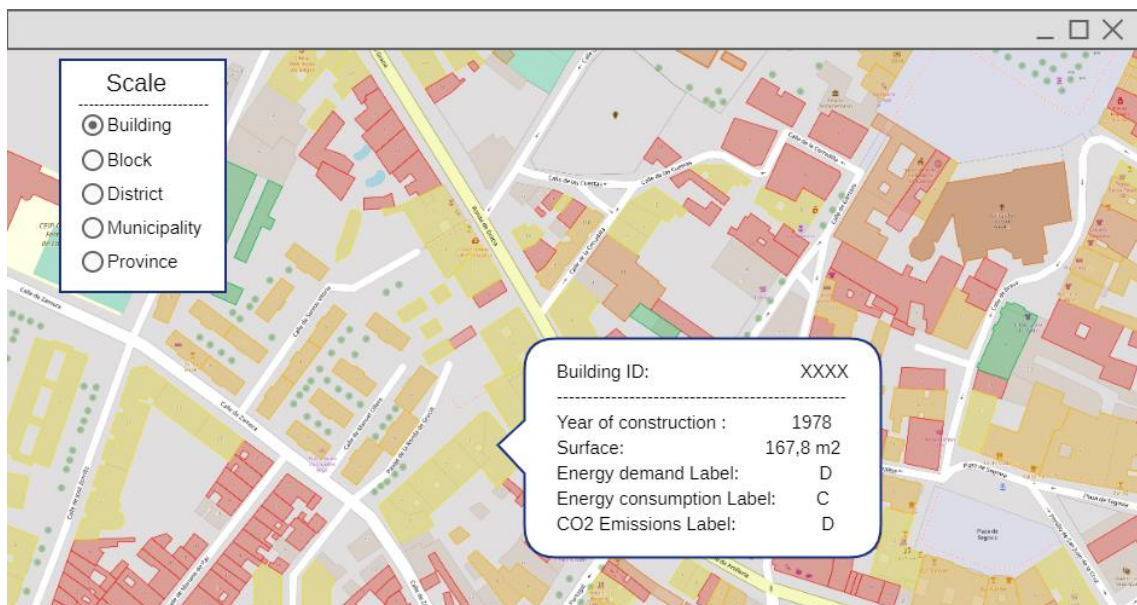


POLICY

LSP9: ENERGY PERFORMANCE CERTIFICATES

Next generation energy performance assessment and certification [EREN]

Screenshots and mock-ups of **s0.1 Digital Twin** and **s1.3 KPIs calculation**





MATRYCS

Modular Big Data Applications for
Holistic Energy Services in Buildings

Thank you!

Gema Hernández Moral

LSP Pilot coordinator

CARTIF Technology Centre

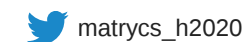
Visit our Website



Email us



Follow us



CARTIF



www.matrycs.eu

The MATRYCS project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no.101000158





MATRYCS

LSP3 – ESCO SUPPORT SERVICES LSP 6 – DISTRICT HEATING NETWORKS

Modular Big Data Applications
for Holistic Energy Services in
Buildings

Marina Bartolomé Lorenzo

VEOLIA (Spain)



Our 3 businesses

Veolia designs and deploys solutions for **water**, **waste** and **energy** management, participating in the sustainable development of cities and industries.



> WATER

95 million people supplied with drinking water
62 million people connected to WW systems
2,737 wastewater treatment plants managed
3,362 drinking water production plants managed



> WASTE

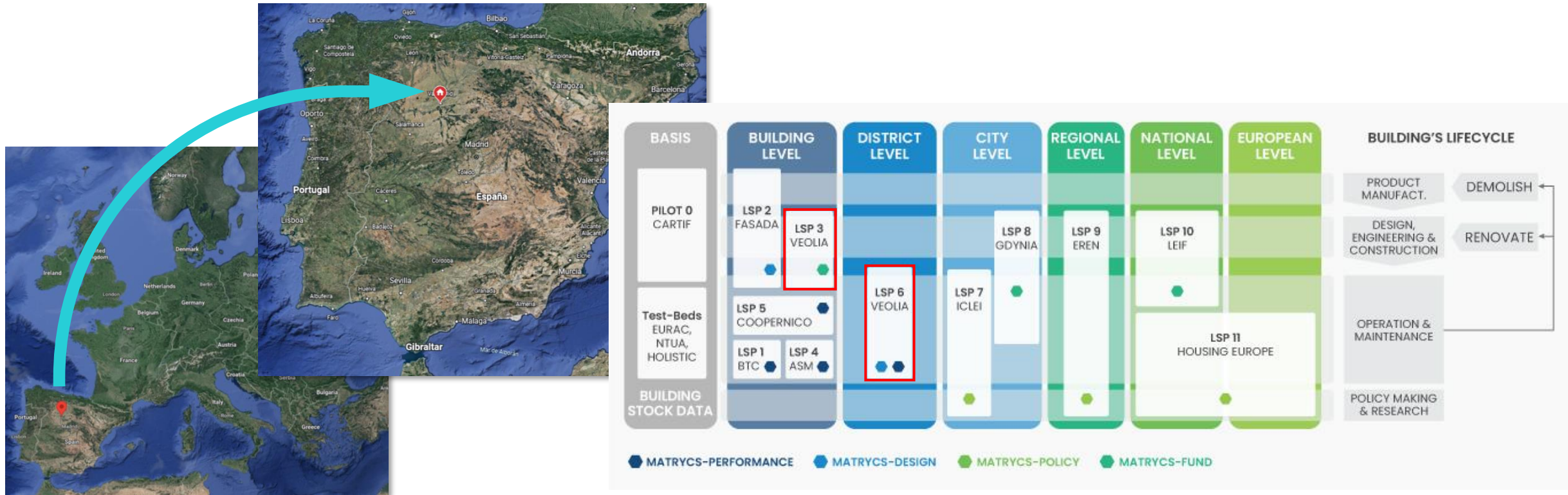
464,948 business clients
47 million metric tons of treated waste
685 waste processing facilities operated
40 million people provided with collection services



> ENERGY

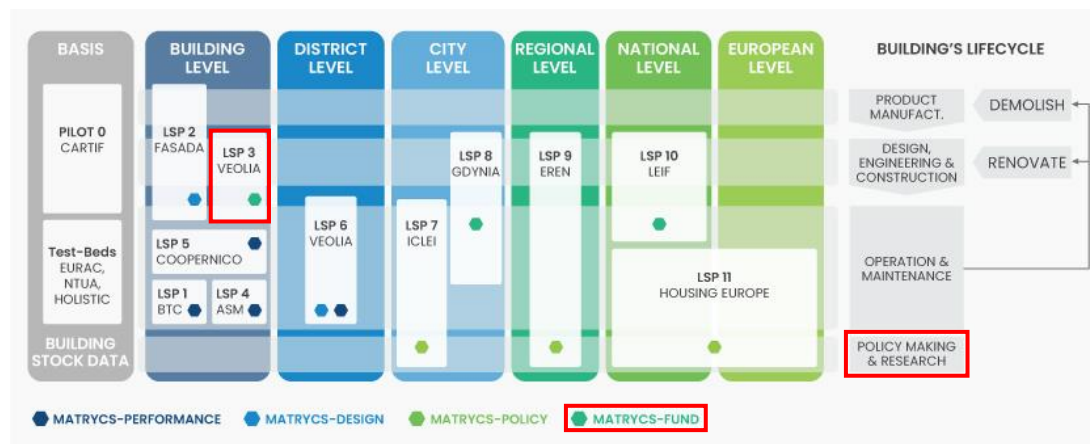
45,806 thermal installations managed
611 heating and cooling networks managed
43 million MWh produced
2,137 industrial sites managed

- LSP3 – ESCO SUPPORT SERVICES
- LSP6 – DISTRICT HEATING NETWORK (DHN)



LSP3 → Services for energy savings verification.

- Residential building powered by:
 - 2 gas boilers (0.64 MW).
 - Solar thermal energy.
- Scope:
 - To achieve innovative EnPCs.
 - To optimise the energy consumption.
 - To obtain real time savings calculation.





FUND

LSP3: ESCO SUPPORT SERVICES

Energy saving verification service for increasing the trust on Energy Performance Contracts [VEOLIA]

Services

S4.1 Energy savings M&V

Target groups

ESCOs

Investors

Citizens, owners and tenants

Data (Real-time & Historical)

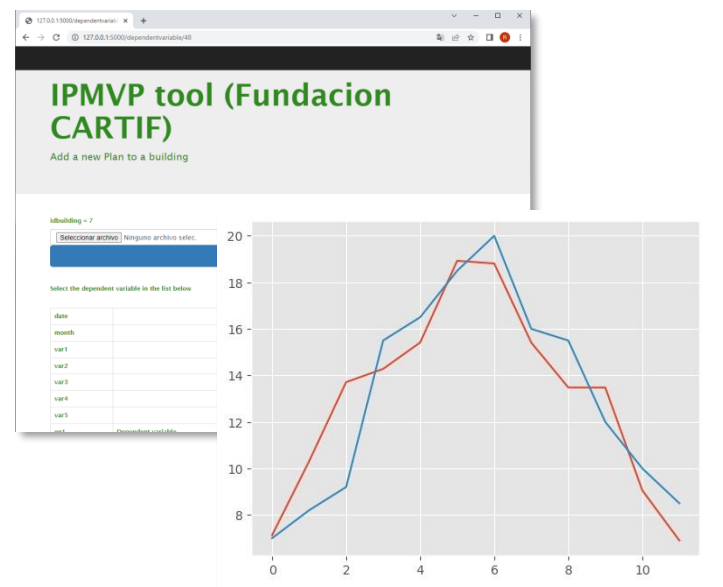
Building Monitoring data (Smart meters and sensors)

Local weather information

Energy prices information

Added value:

- ESCOs will be able to develop accurate mathematical models to **predict energy savings** in an **easier** way. Moreover, these models will have more veracity, **increasing** this way **the quality of the EnPCs** and the trusts of the clients on the contracts and also on the ESCO.
- Owners will receive a **more precise model** on which the savings predictions will be calculated. In addition, it will **increase the certainty or reliability** of the estimates provided by the company.

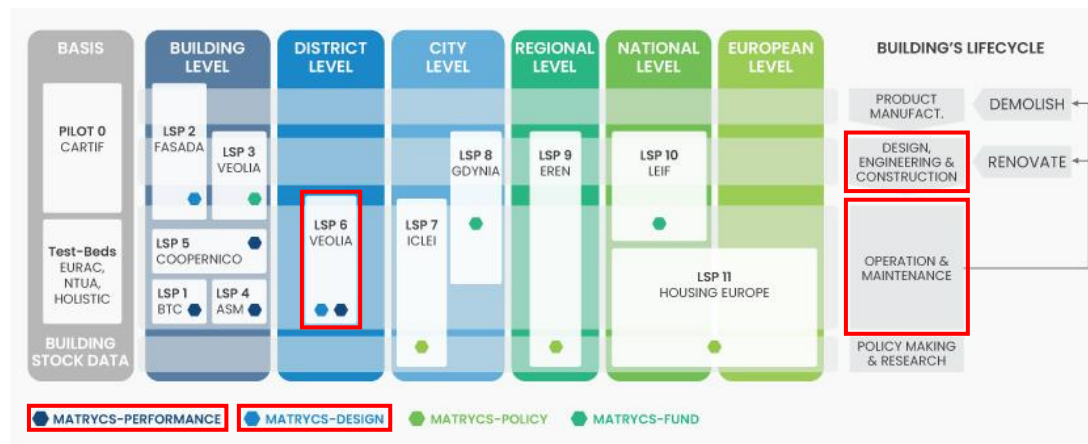


Hubgrade
VEOLIA



LSP6 → Services energy demand prediction to develop DHN and optimize the operation.

- DHN connected to 1488 households:
 - 3 biomass boilers (3.5 MW).
 - 3 gas boilers (8.7 MW).
- Scope:
 - To optimise the network.
 - To ease the optimal design of DHNs.





LSP6: DISTRICT HEATING NETWORK

Energy demand prediction to design and develop DHN and optimize the operation [VEOLIA]

Services

- S0.1** Digital twins
- S1.1** Energy prediction
- S1.3** KPIs calculation
- S1.5** Network optimisation
- S4.1** Energy savings M&V

Target groups

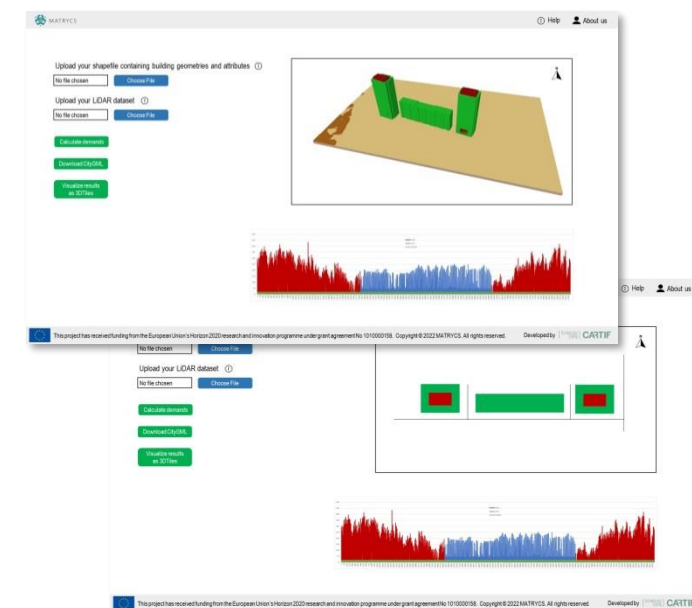
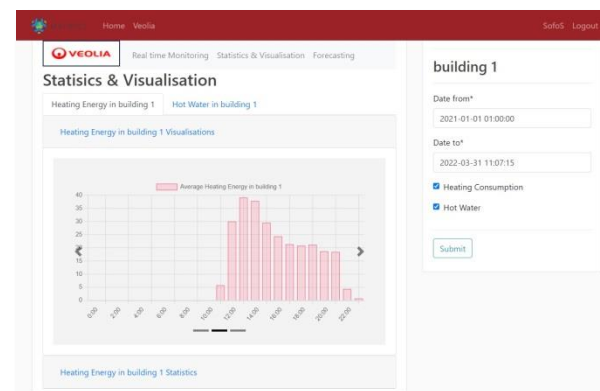
- ESCOs
- Facility managers
- Investors
- Designers
- Citizens, owners and tenants

Data (Real-time & Historical)

- DHN data (Smart meters and sensors)
- Weather information

Added value:

- Have access to **accurate mathematical models to predict energy savings** in an easier way.
- Easier to understand **how the installations operate** in an **accurate way**.
- **Manage the installation effectively**, it will be optimized for the maintenance and also it would be easier to operate it in an optimal way.
- **More efficient and effective design**, and provide greater investor confidence.
- In this way the investor will have **less uncertainty** when evaluating the **investment** in the new DHN or branch.





MATRYCS

Modular Big Data Applications for
Holistic Energy Services in Buildings

Thank you!

Marina Bartolomé Lorenzo, Veolia

marina.bartolome@veolia.com

Visit our Website



www.matrycs.eu

Email us



contact@matrycs.eu

Follow us



[matrycs_h2020](https://twitter.com/matrycs_h2020)



[MATRYCS](https://www.linkedin.com/company/matrycs)



[matrycs2020](https://www.facebook.com/matrycs2020)



www.matrycs.eu

The MATRYCS project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no.101000158

