Regional sustainable energy action planning - CoM

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Presentation structure

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The presentation synopsis

On the presentation the following topics are illustrated:

- Medium term energy planning: opportunities and requirements;
- Methodology for the Energy Consumption Inventory;
- Approach for medium-range energy demand assessment;
- Draft preliminary target measures for efficiency-based energy saving;
- Example of energy consumption reduction targets compliance;
- Suggested model for regional public/private implementation platform;
- Financial model options for sustainable energy planning implementation;
- Proposed regional energy management platform.

Energy consumption targets for 2014 - 2020

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European Covenant of Mayors

Target: 20% CO_2 reduction by 2020

Adherents: +3000 European municipalities

Main tool: integrated planning and monitoring

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Medium term goals

Combining energy sustainability, regional competitiveness and innovation attractiveness integrated targets planning

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Proposed strategy

Multisectoral integration

Budgetary soundness

Investment attraction

Local commitment

Cost-effectiveness

Symbiotic development

Proposed instruments

Inventory

Action planning

Predictive analysis

Partnership

Monitoring

Innovation platform

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Energy balance and consumption inventory

Małopolska's example

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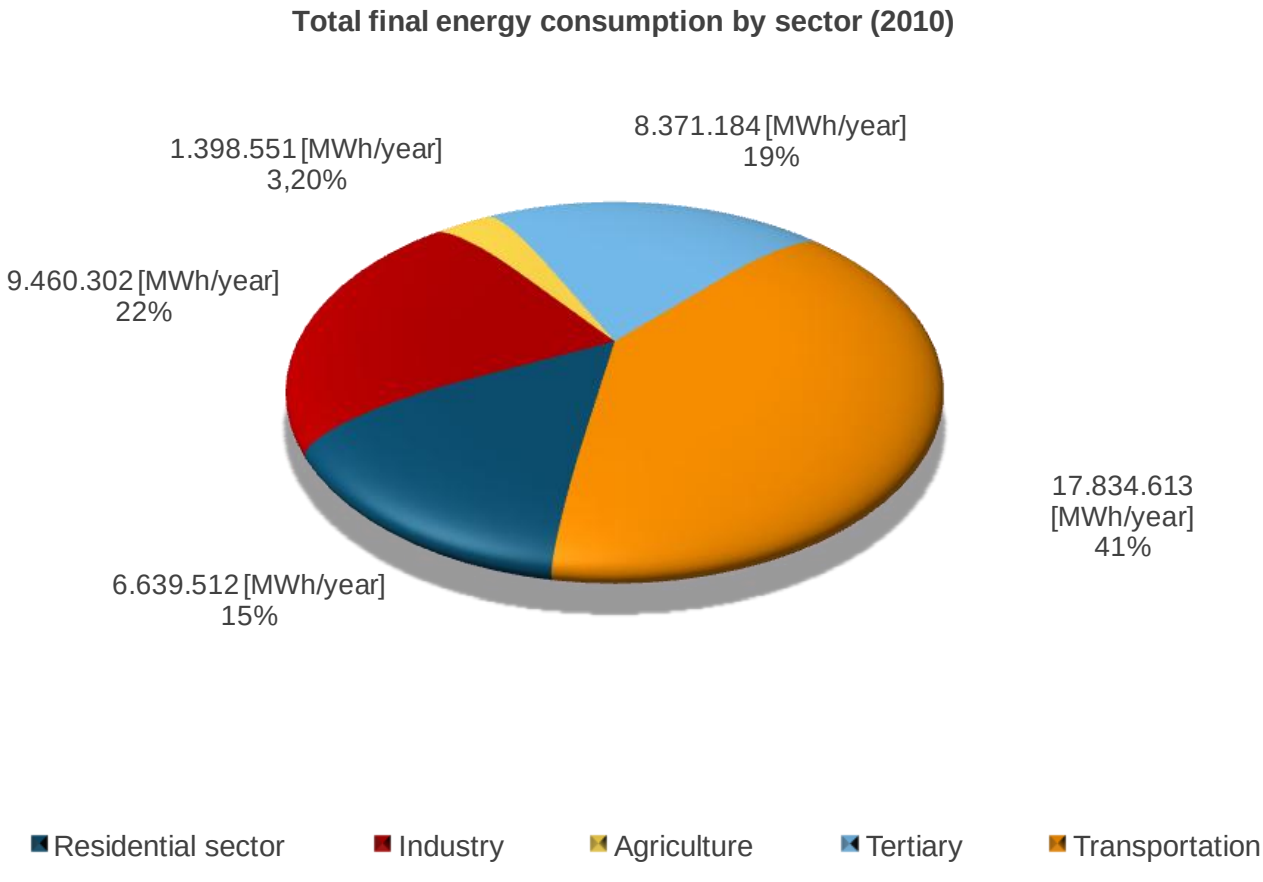
The energy balance and consumption inventory

Statistic data and knowledge-based estimation was used.

More detailed data and analysis is indispensable for project level analysis of benefits.

The same applies if municipal adhesions to the Covenant of Mayors may use the proposed methodology and framework is considered.

Energy Demand Inventory
Consumption per sector 2010



Estimated energy demand profile for main activity sectors for Małopolska

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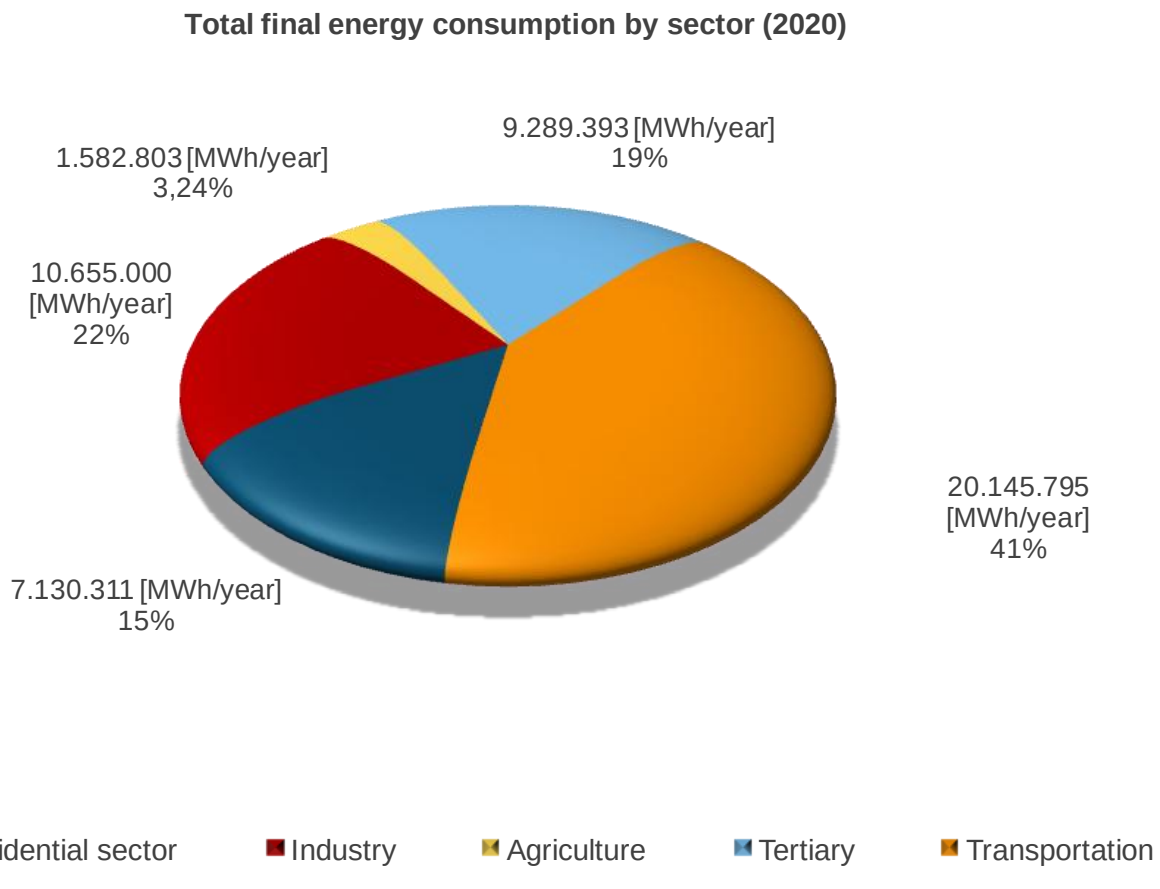
Energy Demand Inventory
Consumption per sector 2020



Estimated energy demand profile for main activity sectors for Małopolska

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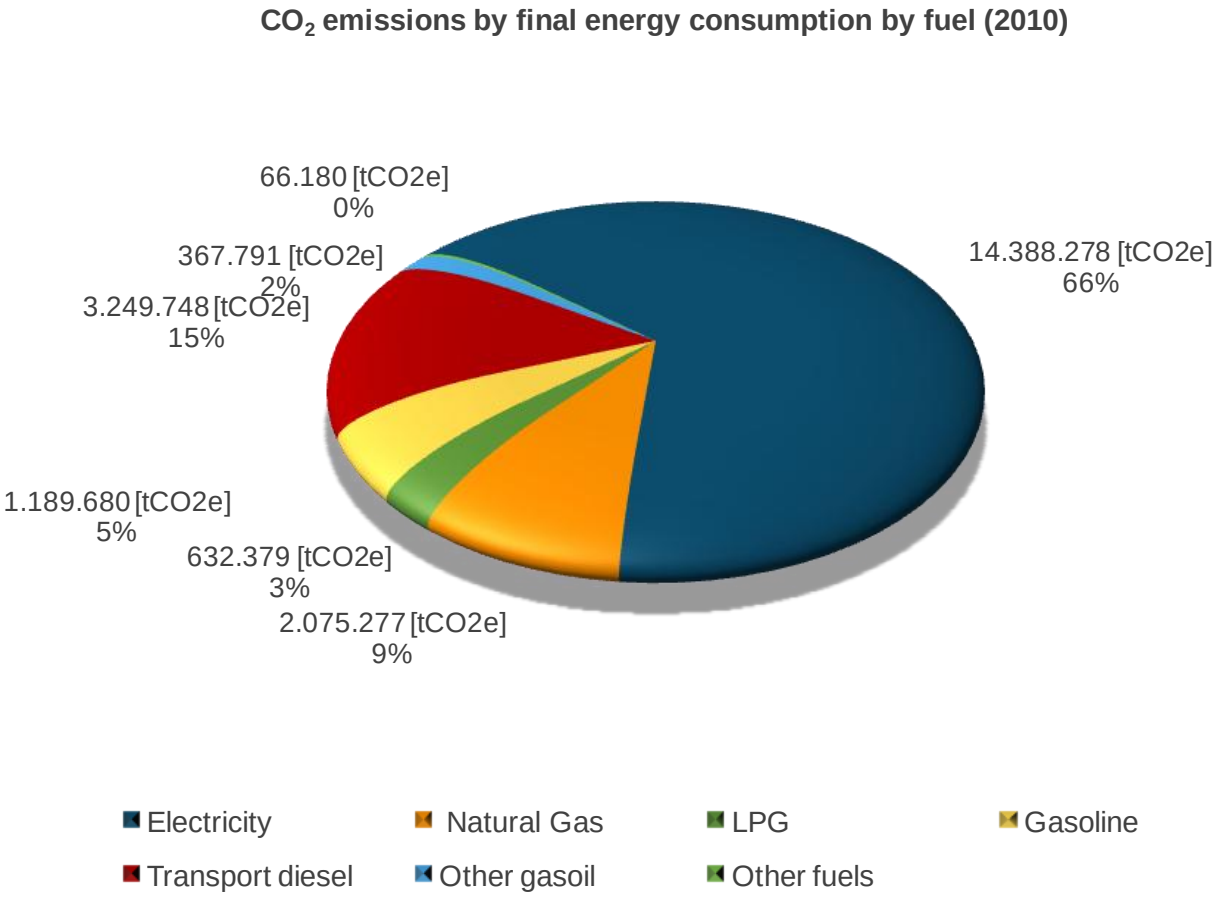
Energy Demand Inventory
CO_2 emissions per fuel 2010



Estimated fuel originated CO_2 emissions for main activity sectors for Małopolska

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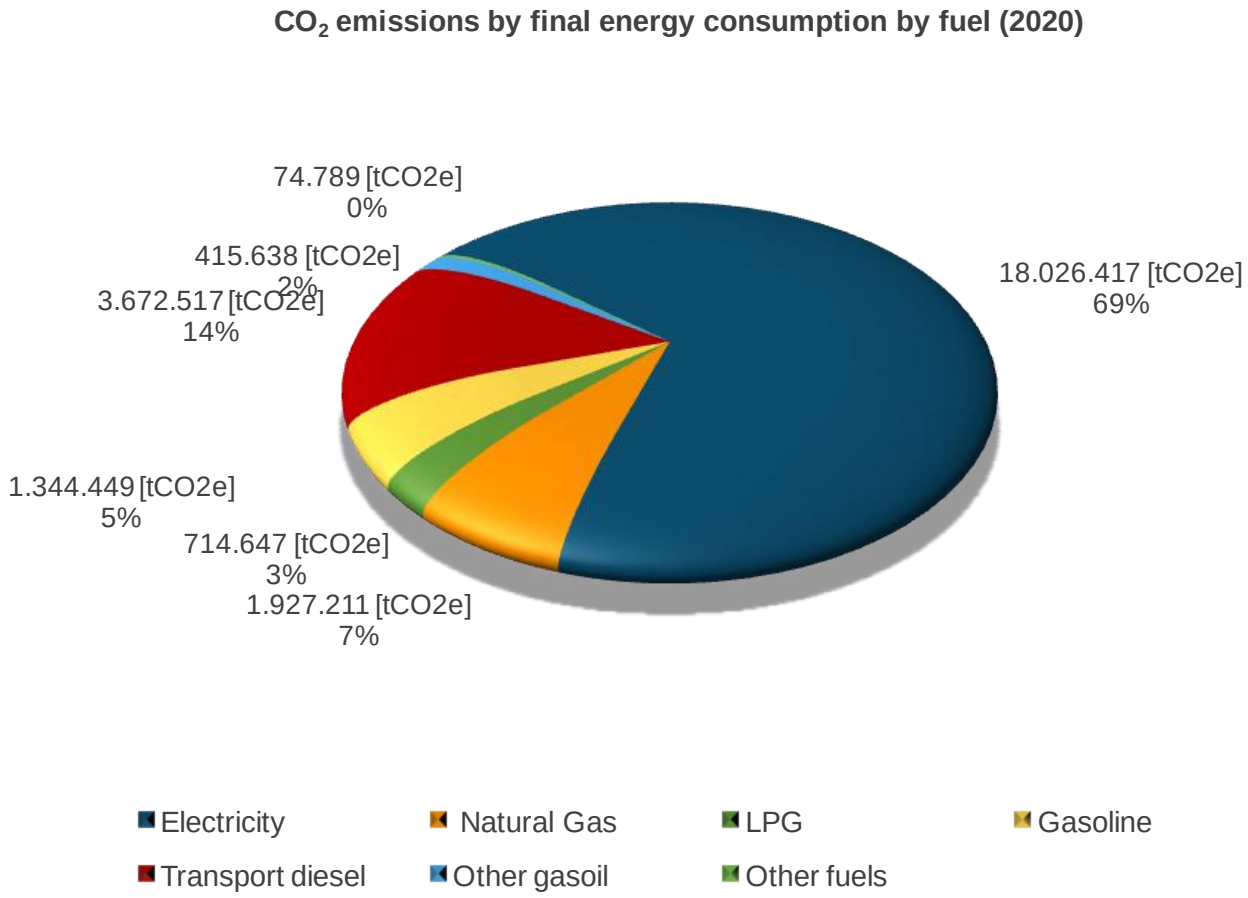
Energy Demand Inventory
CO_2 emissions per fuel 2020



Estimated fuel originated CO_2 emissions for main activity sectors for Małopolska

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Sustainable energy action planning

Part 3

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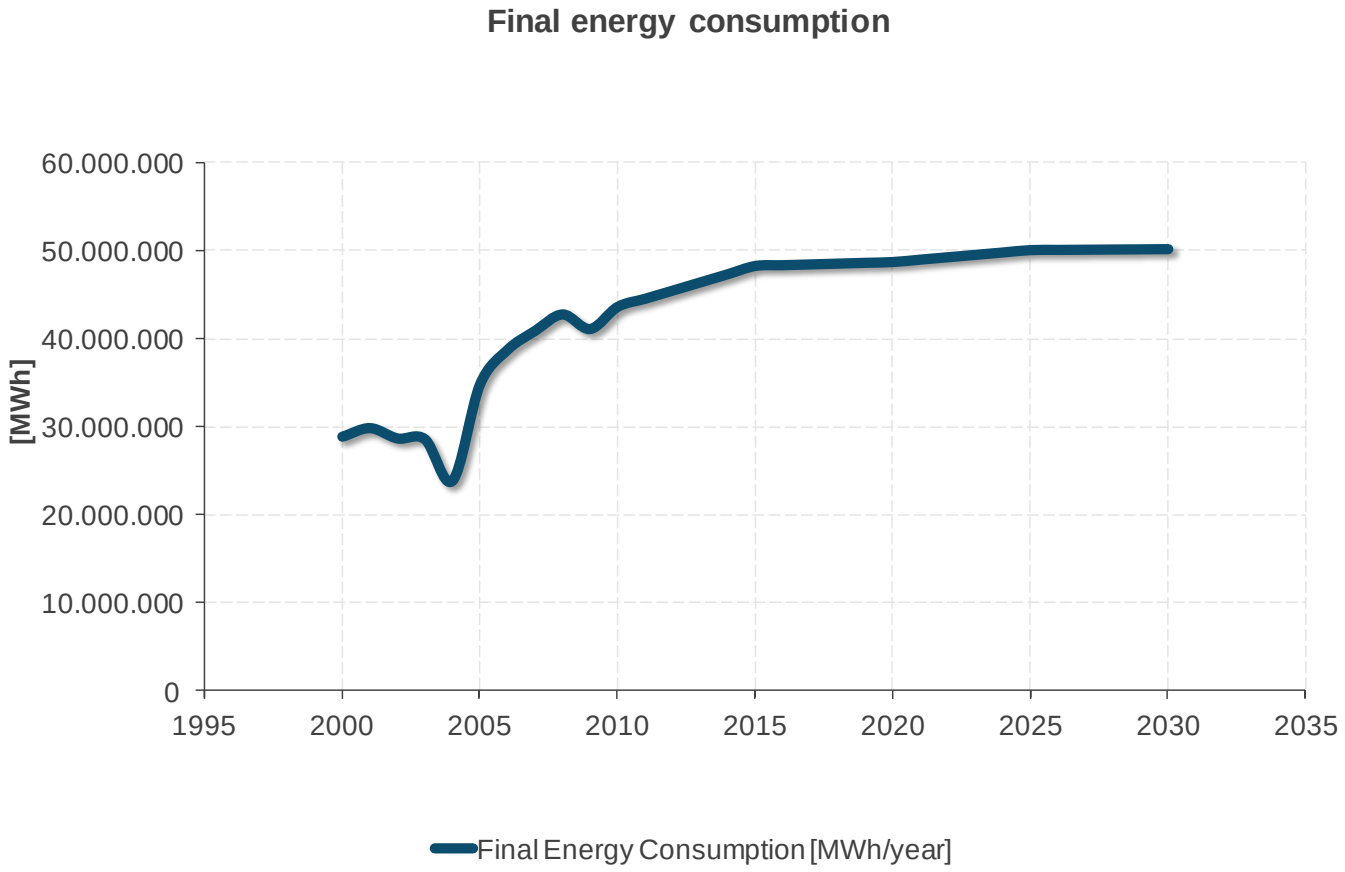
The sustainable energy action plan

Business-as-usual scenario, considered for sustainable energy measures' impacts modelling, is presented.

The model-based methodology used to assess measures' cost-benefit and expected contribution to the overall energy sustainability targets is illustrated.

Statistic data and knowledge-based estimation was used.

Dynamic business as usual scenario
Final energy consumption



Małopolska´s example.
Sustainable energy measures' impacts modelling

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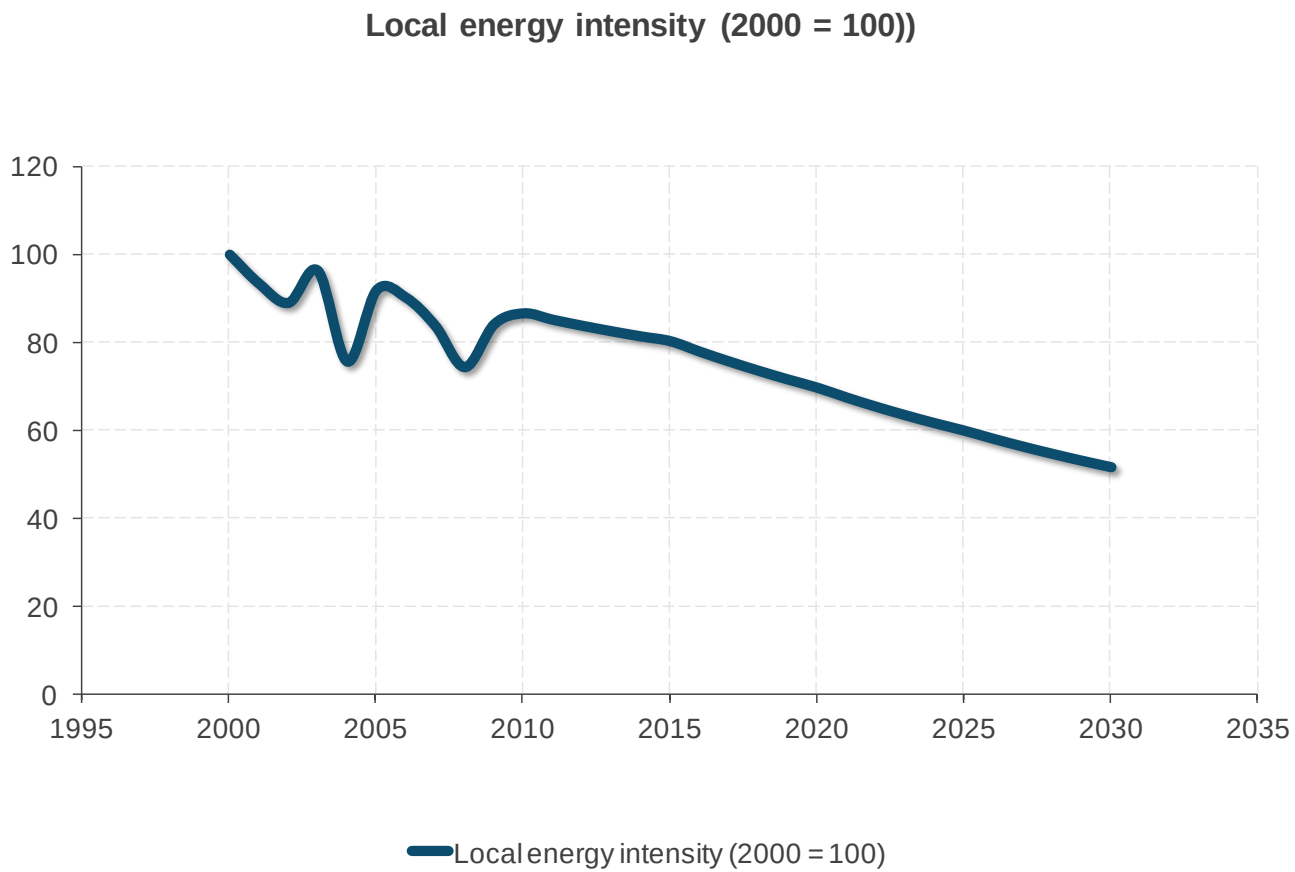
Dynamic business as usual scenario

Overall energy intensity



Małopolska´s example.
Sustainable energy measures' impacts modelling

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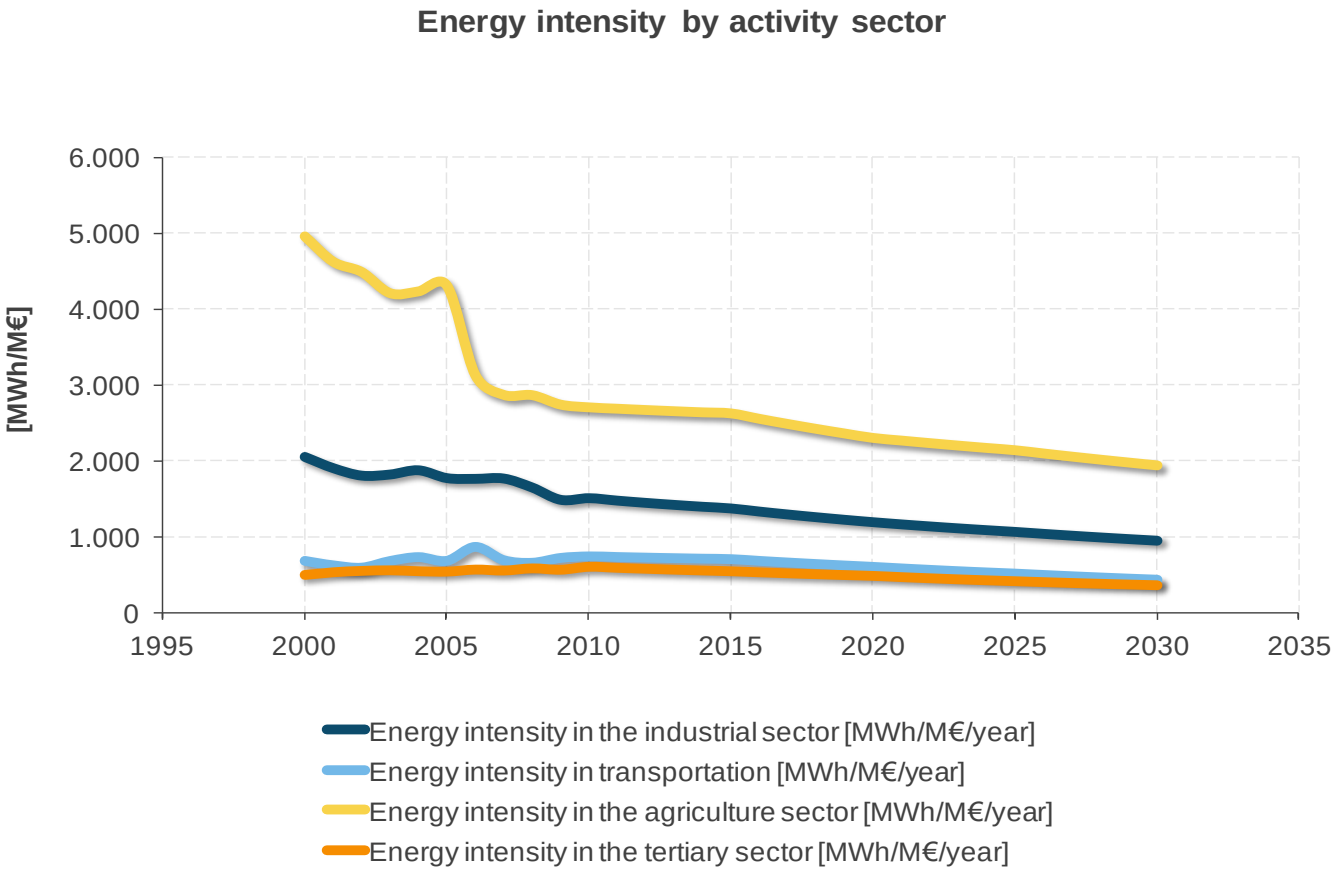
Dynamic business as usual scenario

Energy intensity per sector



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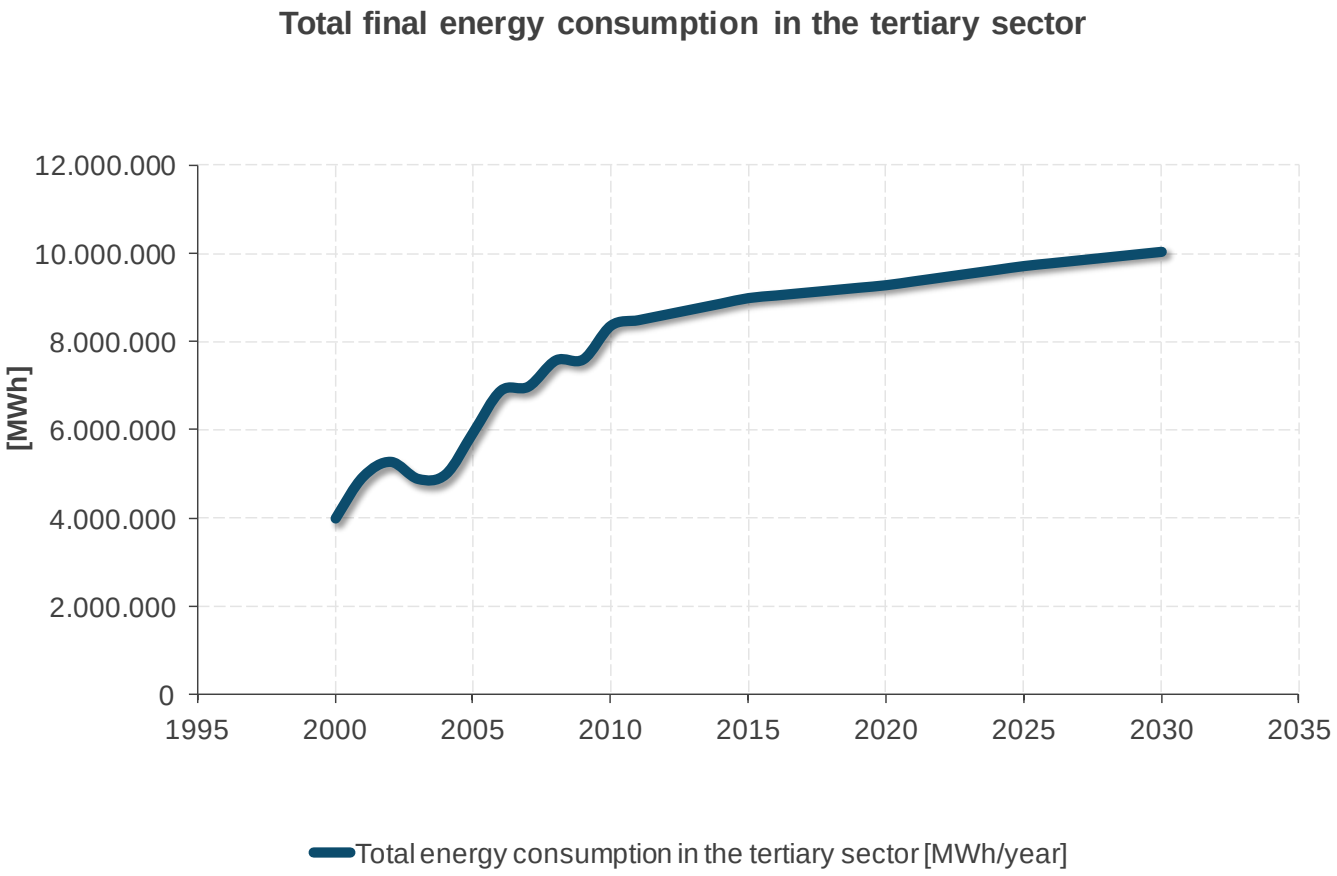
Dynamic business as usual scenario

Total energy intensity in terciary



Małopolska´s example.
Sustainable energy measures' impacts modelling

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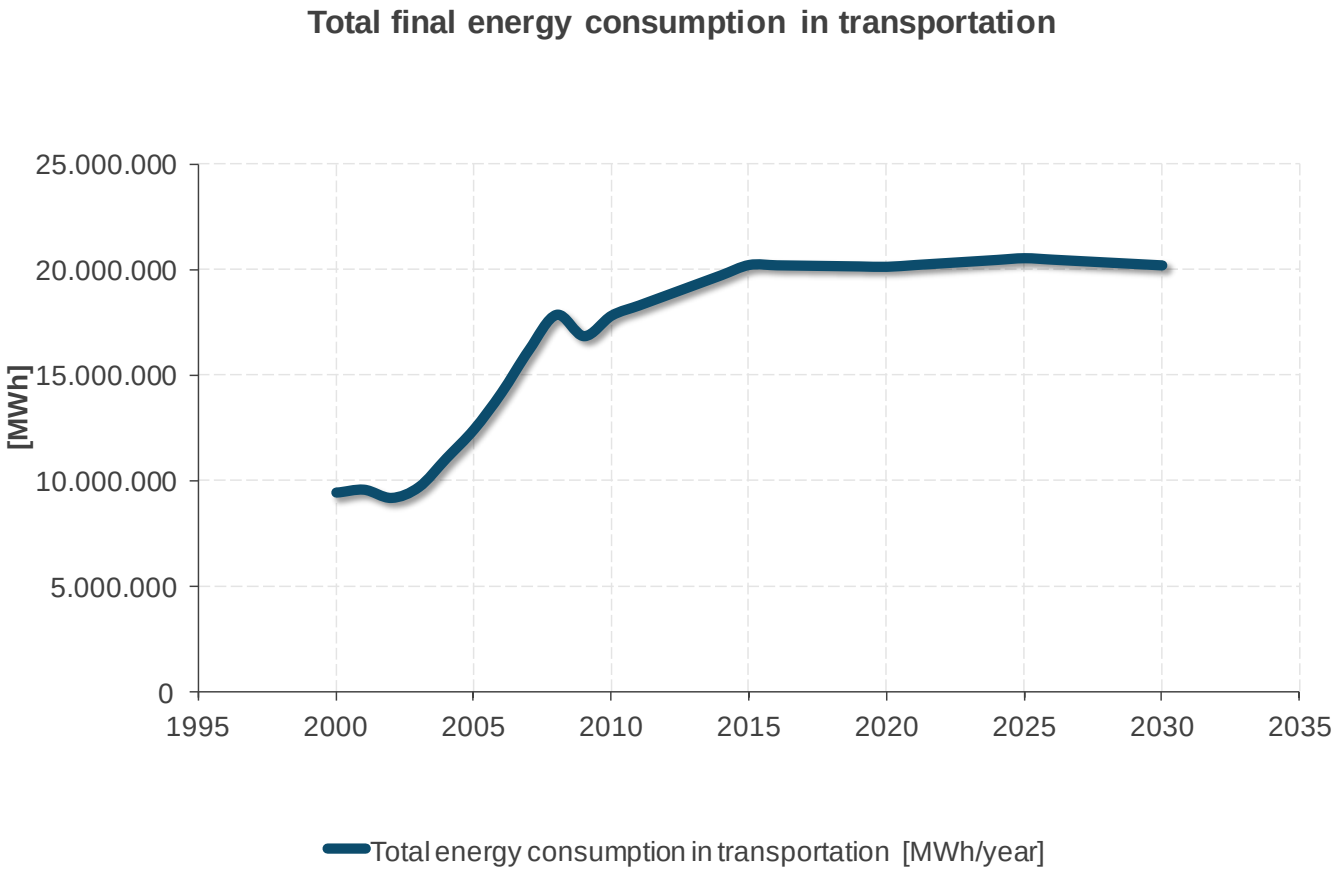
Dynamic business as usual scenario
Energy consumption in transportation



Małopolska´s example.
Sustainable energy measures' impacts modelling

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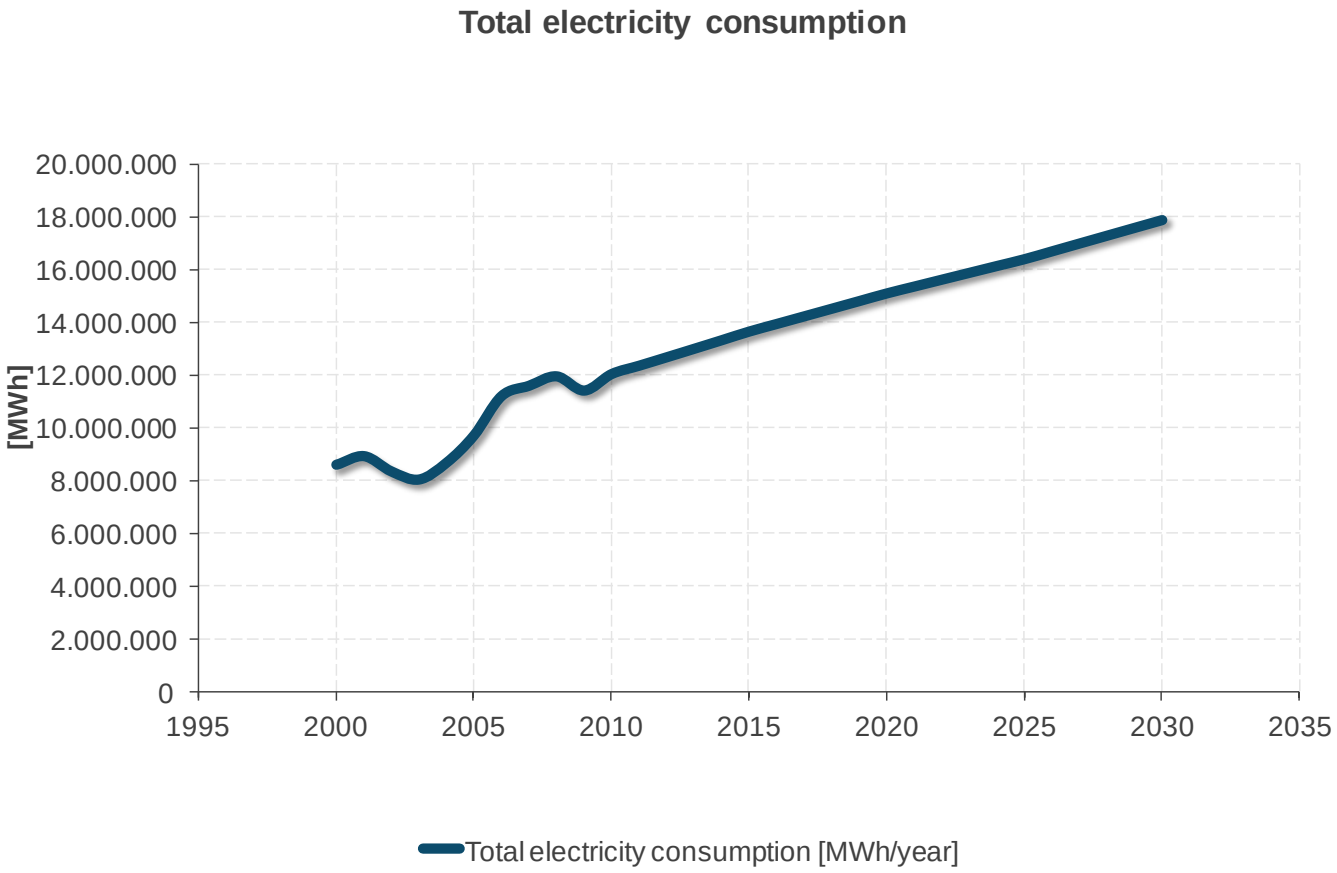
Dynamic business as usual scenario

Total power consumtion



Małopolska´s example.
Sustainable energy measures' impacts modelling

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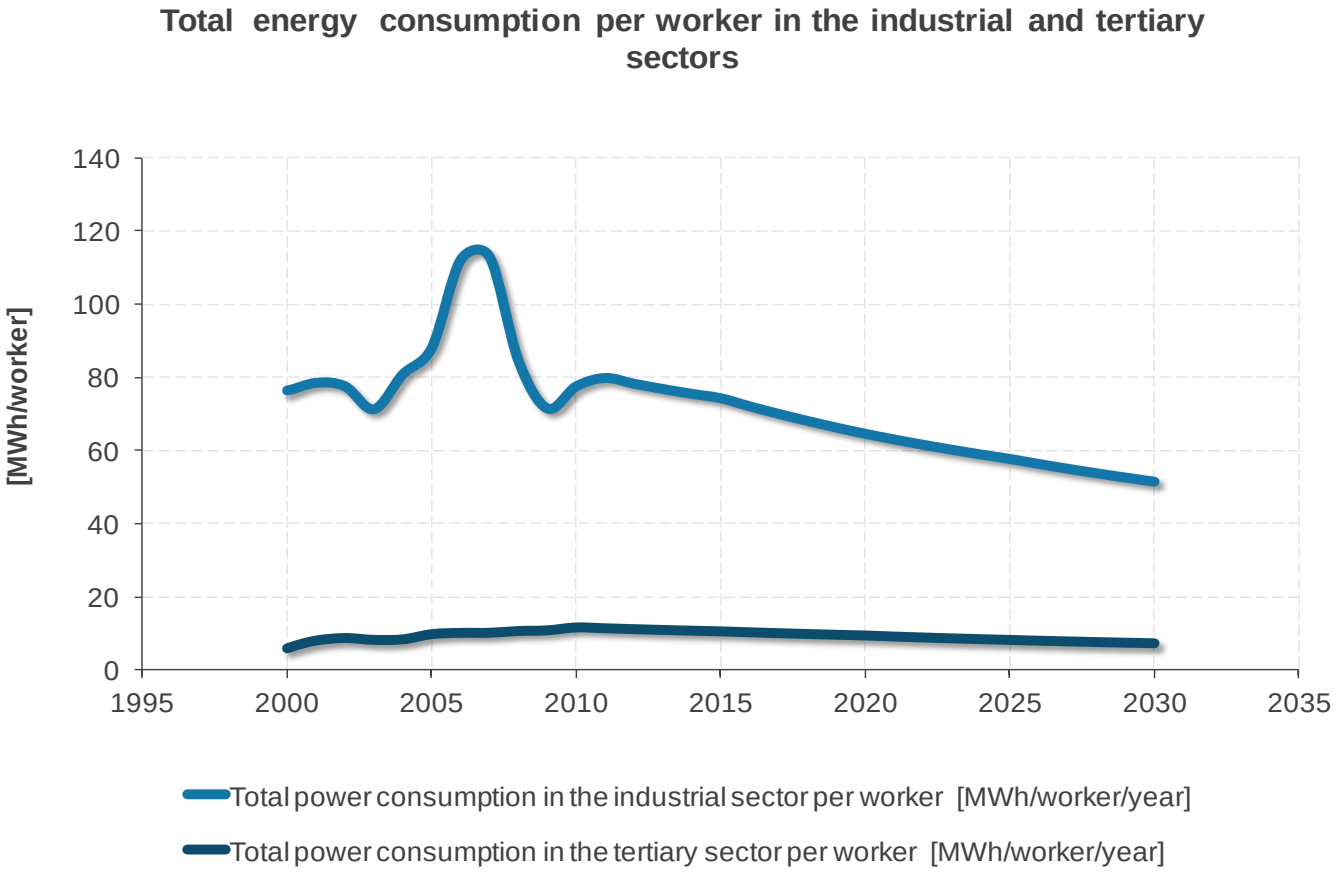
Dynamic business as usual scenario

Energy consumption per work



Małopolska´s example.

Sustainable energy measures' impacts modelling

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Example of energy saving targets and scenarios

DRAFTED SUSTAINABLE ENERGY PLANNING MEASURES IMPACT	REDUCTION
Energy consumption	18,4%
CO_2 emissions	31,1%
Energy bill reduction (at 2010 prices)	24,2%

DRAFTED SCENARIOS	YEAR	ENERGY CONSUMPTION [GWh]	CO_2 EMISSIONS [$ktCO_2$]	OVERALL ENERGY BILL [M PLN_{2011}]
Base scenario without measures	2010	42,844	19,804	16,636
Medium-term scenario without measures	2020	48,231	22,785	18,635
Medium-term scenario with measures	**2020**	**39,379**	**15,699**	**14,122**

Business as usual scenario compared to possible regional framework targets

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Example of integrated measures' contribution to energy saving targets

ENERGY SUSTAINABILITY MEASURES	ENERGY SAVINGS (%)
Efficient lighting	0,97
Efficient street lighting	0,44
Tertiary buildings certification and labelling	0,44
Efficient vehicles, parts and fleets	5,90
Electric vehicles	1,78
Transport network improvements	2,11
Equipment modernisation and plants retrofitting	0,15
Active monitoring (direct effect)	0,11
LED and innovative lighting systems	0,58
Solar energy	0,17
Heat pumps	0,05
Biomass heating and hot water	0,05
Efficient boilers	0,05
Biodiesel	0,91
Urban rehabilitation and accessibilities improvement	0,04
Water management	0,10
Waste management	0,11

Modelled measures' contribution to a regionally projectable energy saving target

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Example of integrated measures' contribution to energy saving targets

ENERGY SUSTAINABILITY MEASURES	ENERGY SAVINGS (%)
Urban supply fleets	0,21
Office equipment renovation and retrofitting	0,33
Natural gas consumption expansion	0,01
Domestic equipment renewal	0,75
Public awareness, education, awards	0,19
Energy management in housing common facilities	0,04
Voluntary carbon reduction programmes	0,01
Cycling and walking	1,92
Industry and business mobility efficiency planning	0,53
Large events mobility optimisation	0,13
Public procurement (green procurement)	0,01
Urban planning	0,16
Improvement of support mechanism for green industries	0,01
Professional performance improvement	0,02
TOTAL	**18,27**

Modelled measures' contribution to a regionally projectable energy saving target

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Energy and environment integrated vision

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The energy sustainability and urban environment integrated vision

Symbiotic development of (energy) sustainability and innovation is a classic example of policies integration.

Among the “integratable” environment related, the following predominate:

Air quality;

Urban waste management;

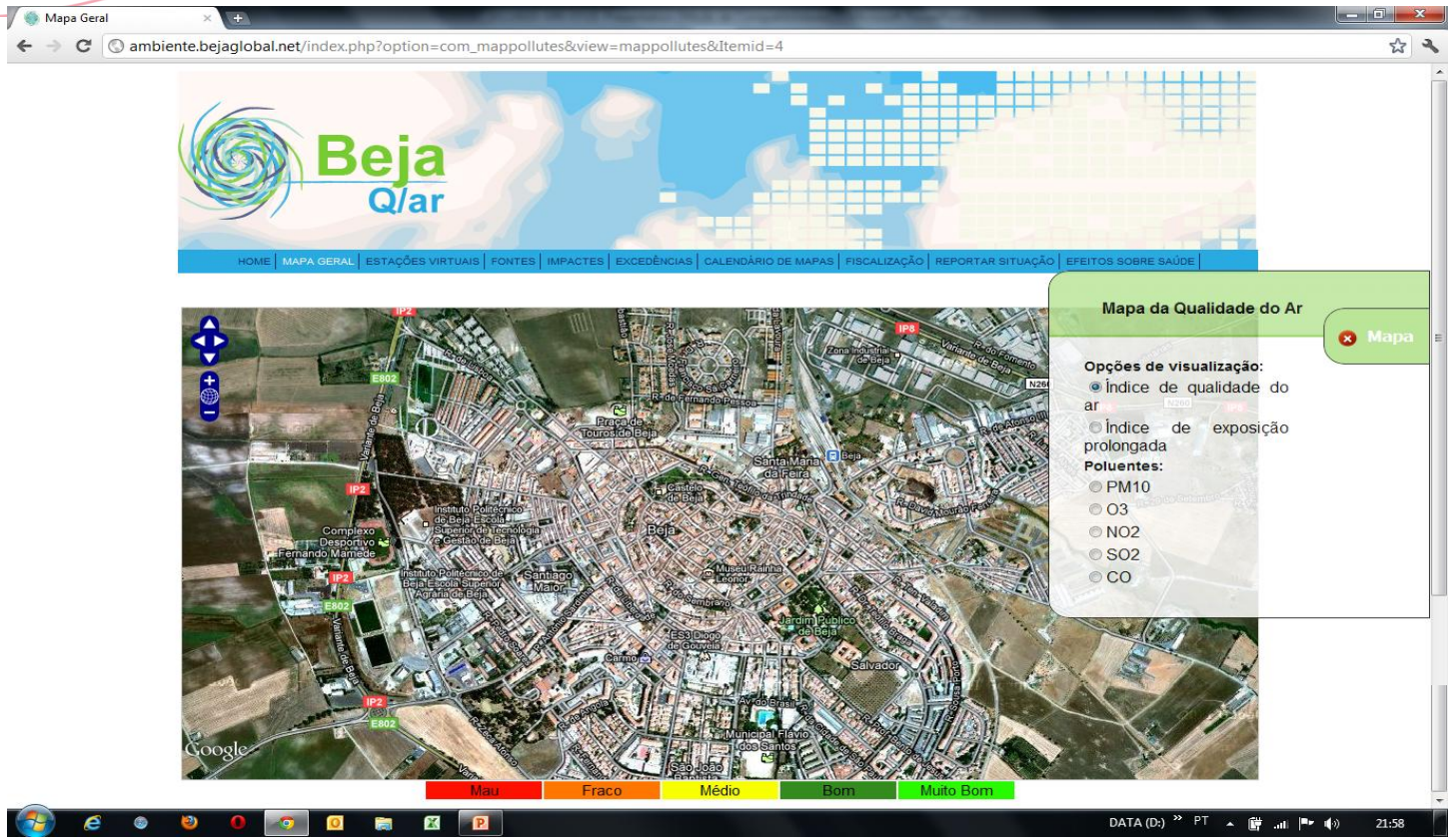
Water supply and waste water treatment;

Public realm management;

Biomass and biowastes management and upgrading;

Urban environment and quality of life.

Coordinated monitoring of energy and environment data



Illustrated in the figure: on-line data on electric mobility impacts on air quality

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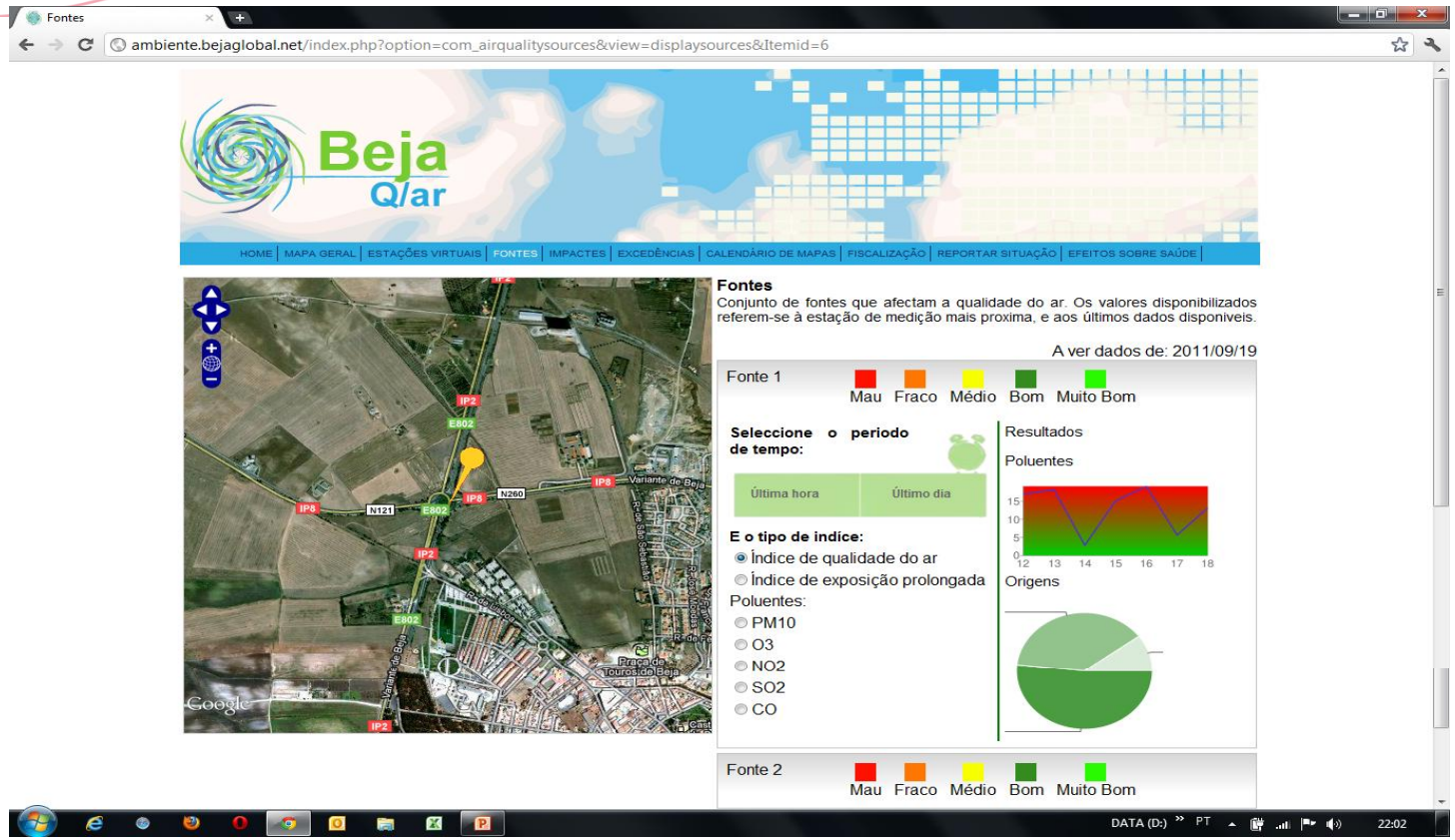
Coordinated monitoring of energy and environment data



Illustrated in the figure: on-line data on electric mobility impacts on air quality

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Energy and competitiveness integrated vision

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Sustainability and competitiveness integrated vision

Considered innovation paradigm assesses six dynamic innovation factors and the corresponding key-indicators is proposed:

knowledge → Indicator: research and development;

qualification → Indicator: skills training;

technology → Indicator: transfer;

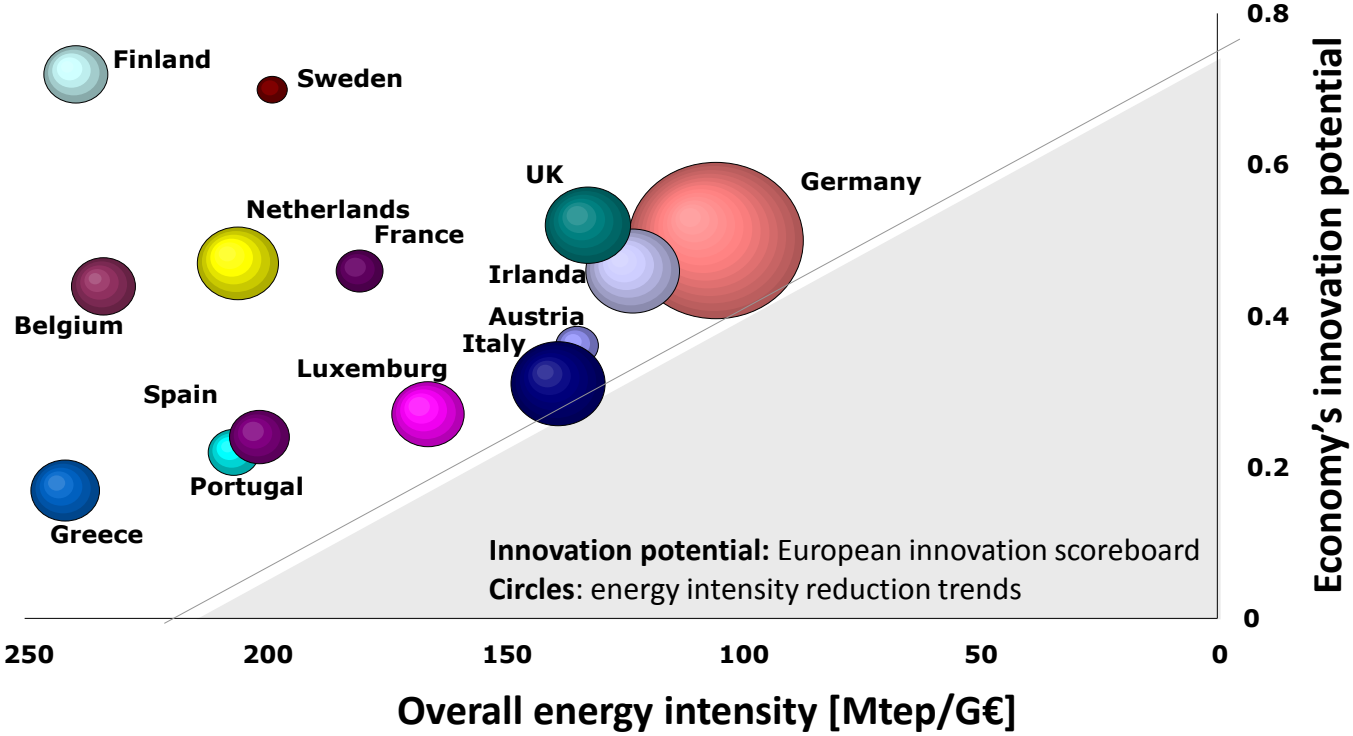
mobility → Indicator: cross-sectoral and trans-regional;

investment → Indicator: financial mechanisms, resources;

initiative → Indicator: entrepreneurship, business expansion.

By favouring these factors energy sustainability measures are expected to operate as an innovation driver for competitiveness and growth.

Integrating energy and innovation strategies is a key for success and growth



Evidence on the need of conducting sustainability and innovation twofold policies to succeed energy targets is well apparent

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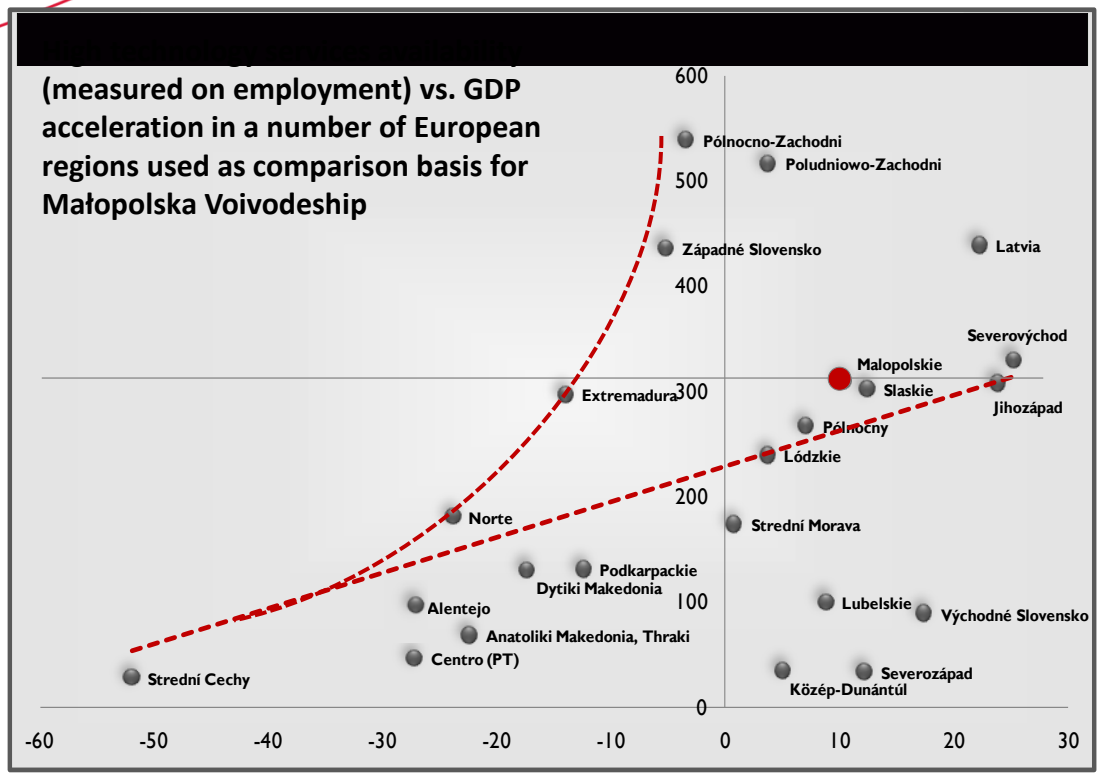
Integrating energy and innovation strategies is a key for success and growth



High-tech services, often procured in implementing advanced energy saving measures, such as smartgrids, are vital to secure economic growth

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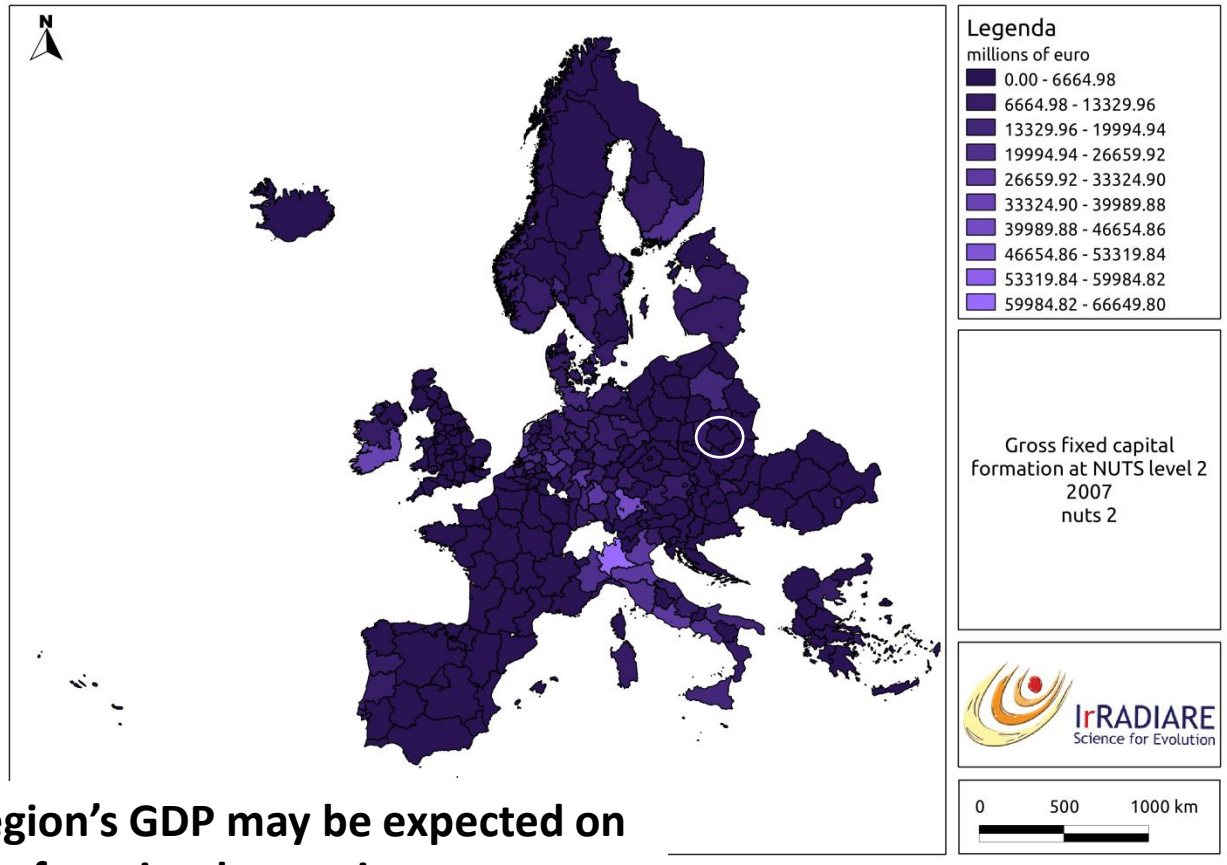
Comparing **Małopolska's** with other European regions key-data - GFCF



Impacts in region's GDP may be expected on the long-term from implementing energy sustainability measures such that a 20% reduction magnitude may be attained

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Regional innovation platform

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The regional innovation platform

A Web platform may support SEAP implementation, communication among involved stakeholders.

In order to simplify documenting on the running projects, maintaining an on-line observatory as part of the supporting Web platform is highly recommended.

Monitoring and evaluating results is important for following-up on the main achievements.

The same Web platform may be also of use to support the awareness rising.

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Funding and financing mechanisms

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Funding and financing mechanisms

On the basis of specific measures market profitability, public budget impacts and internalized social, economic and environmental benefits, the following funding sources may be combined:

- Structural funding (ERDF)
- Private investment from energy service companies (ESCO and EPC)
- Direct private (entrepreneurial) investment in tertiary sector
- Direct industrial investment
- Private (and CAP funded) investment in agriculture
- Private domestic investment in housing
- Private investment in transport sector
- Municipal investment in public services and urban management
- Municipal investment in fleets renewal
- Governmental programmes

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Private or public funding provision sources

FUNDING AND INVESTMENT SOURCES	INVESTMENT 2012-2020 [M PLN_{2011}]
Structural funding (ERDF)	1,393
Private investment from energy service companies (ESCO and EPC)	32
Direct private (entrepreneurial) investment in tertiary sector	737
Direct industrial investment	127
Private (and CAP funded) investment in agriculture	0.24
Private domestic investment in housing	2,405
Private investment in transport sector	7,891
Municipal investment in public services and urban management	3,784
Municipal investment in fleets renewal	71
Governmental programmes	4,596
Private investment in renewable power generation	7,095
TOTAL	21,036

Modelled measures' related long term investment focused on 2020 targets

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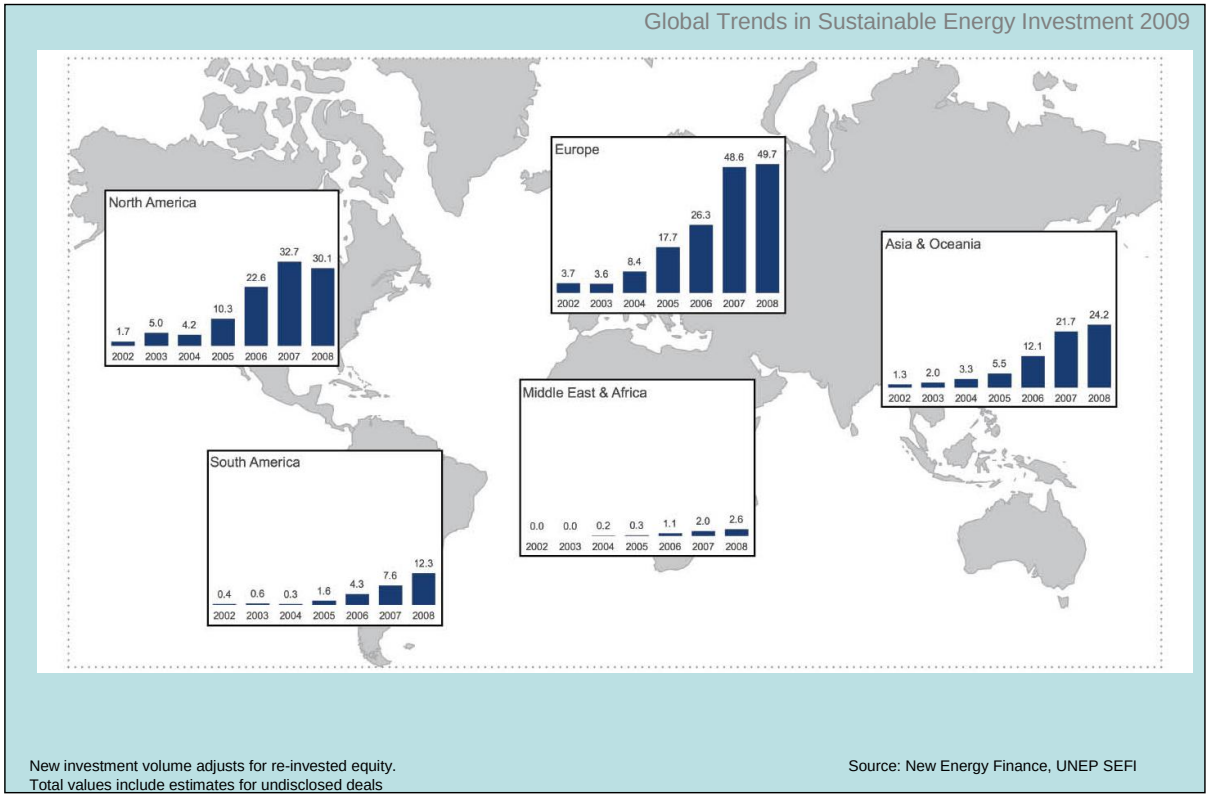
European investment panorama in sustainable energy solutions



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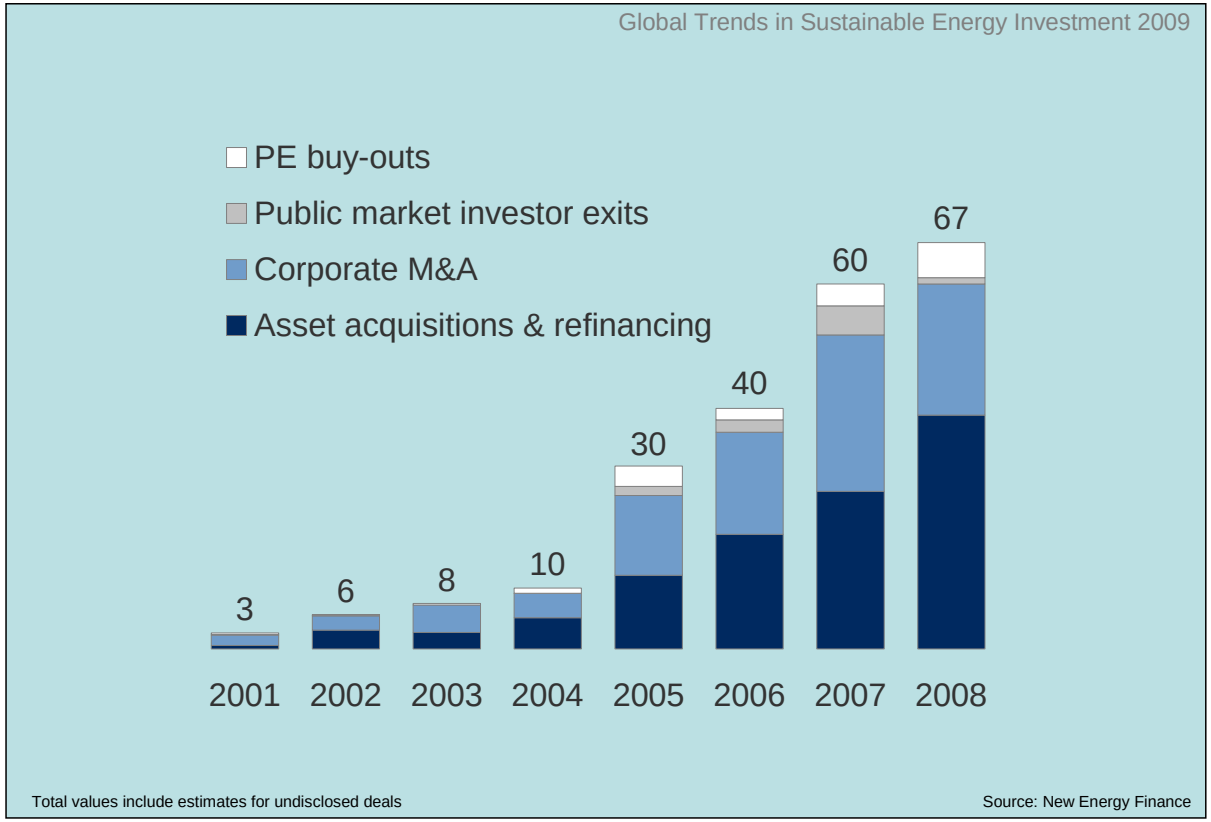
European investment panorama in sustainable energy solutions



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Programme management and implementation

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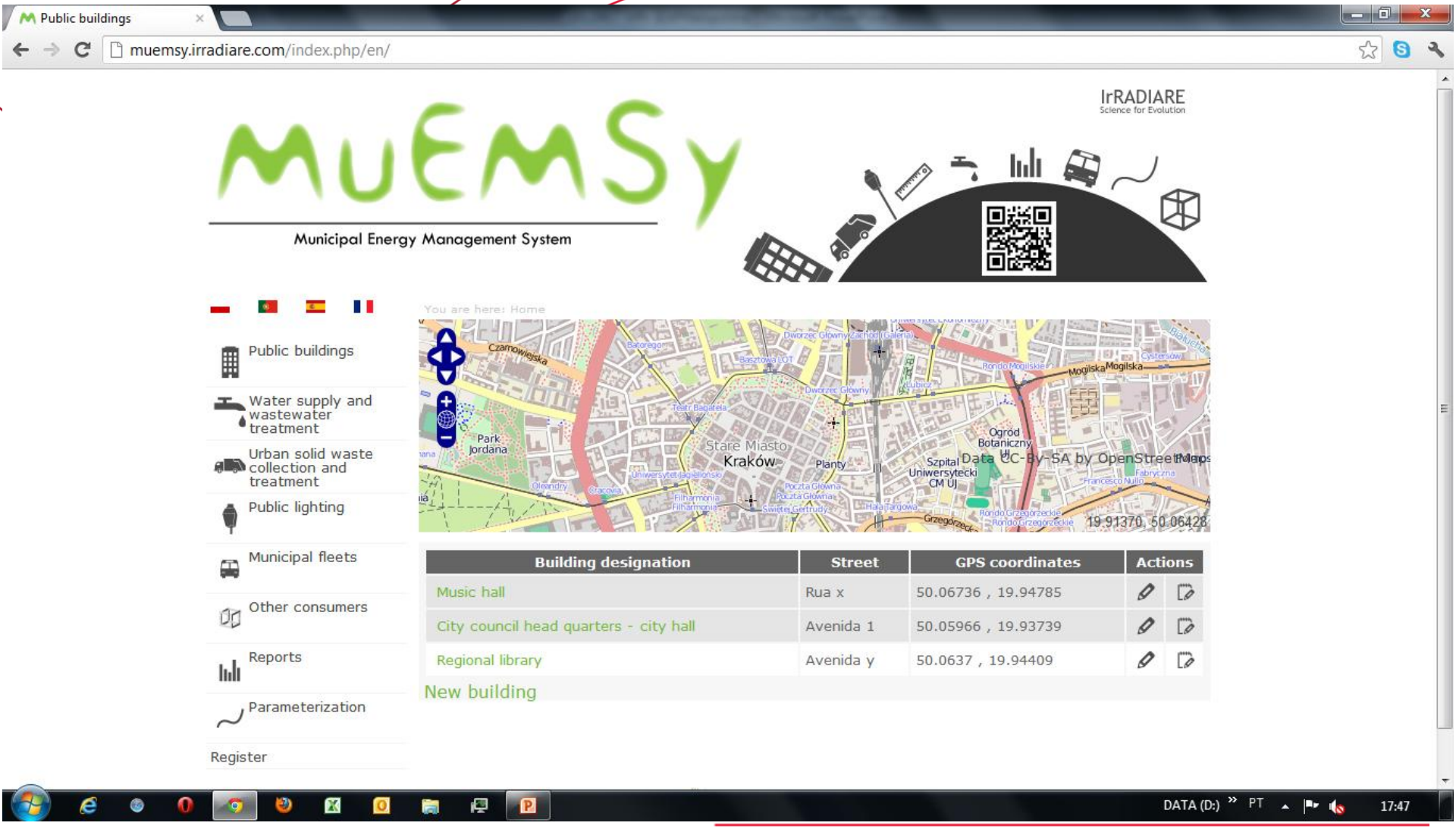
Programme management and implementation

Energy sustainability planning and inventory efforts may be effectively integrated with other sectors:

urban environment, rural development, science, innovation, competitiveness, attractiveness, employment and, more generically, sustainability are adjacent sectors to energy.

Thus, integrated planning instruments – in which energy demand and supply foresight is assessed together with causes and impacts on other sectors – allow converging visions, resources and goodwill.

Public buildings



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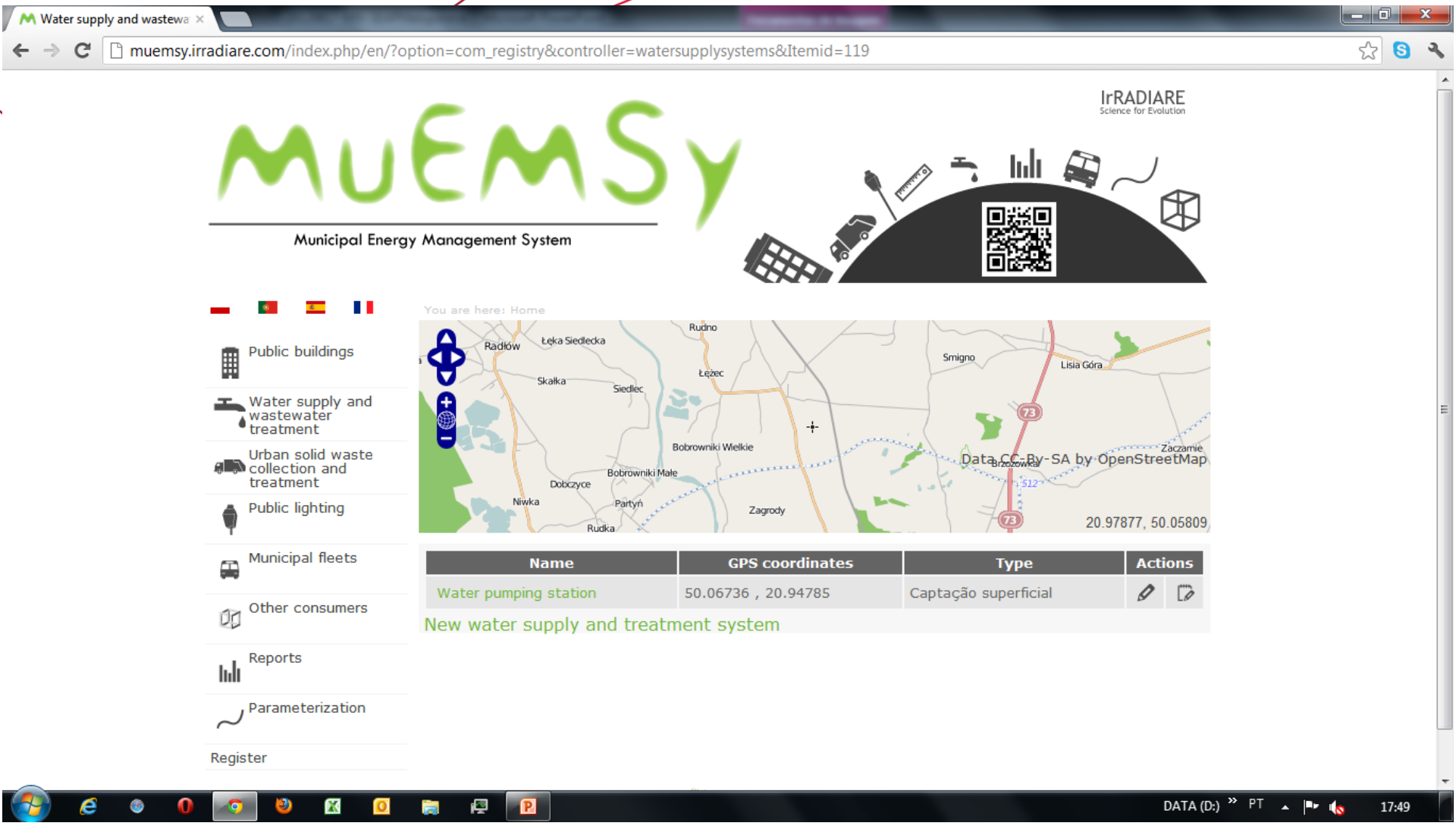
Water and sanitation



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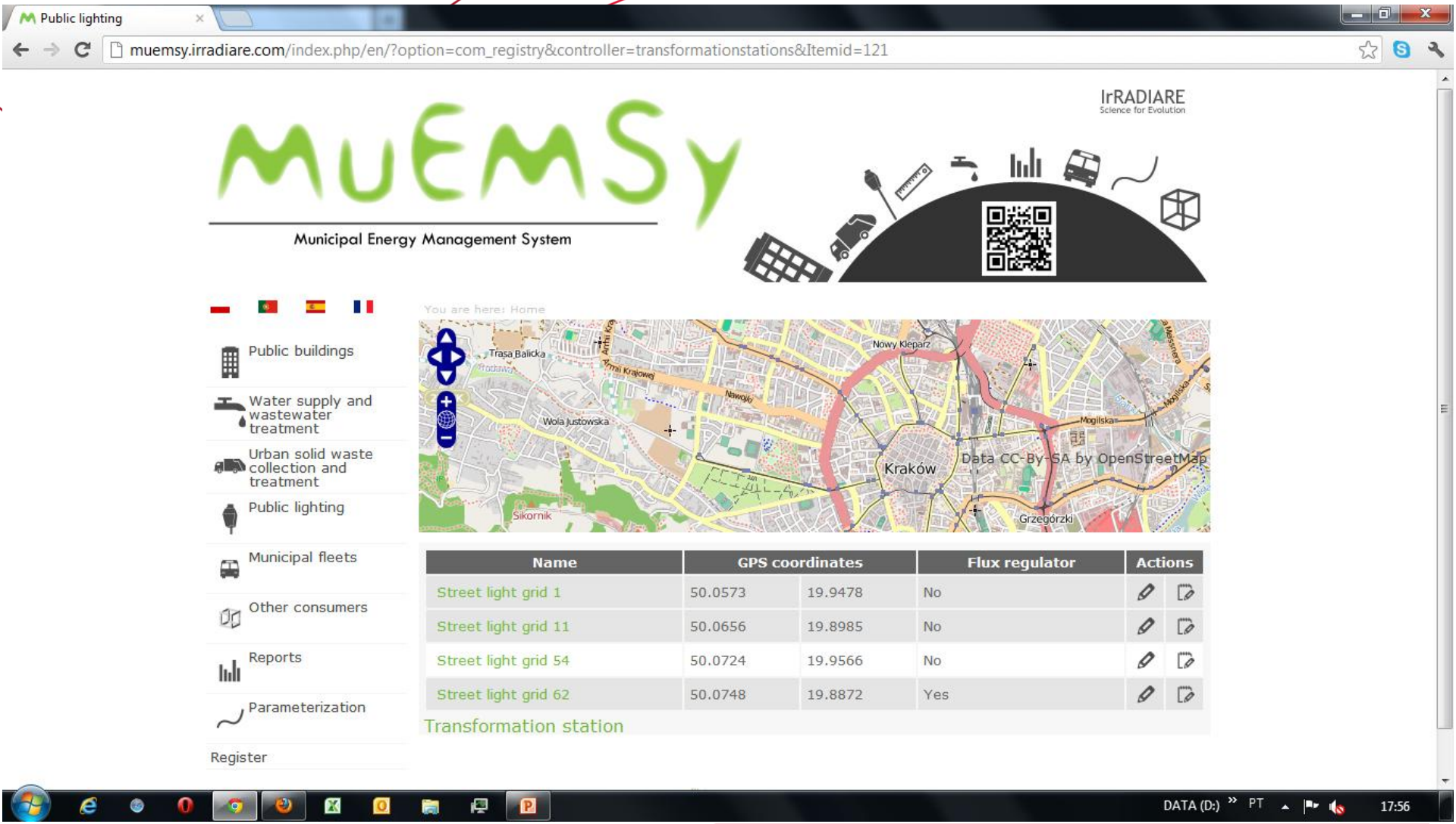
Street lighting



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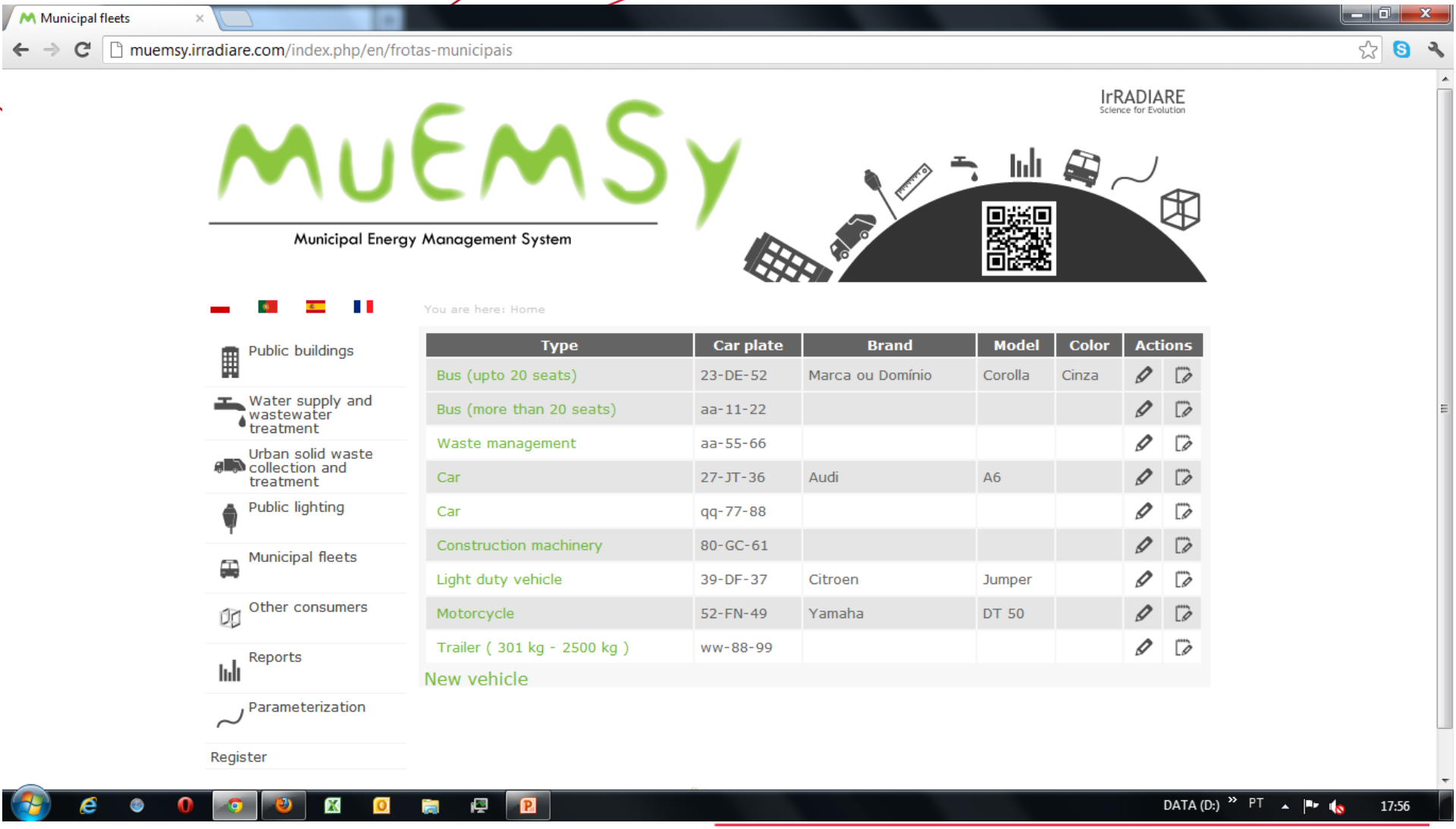
Fleets



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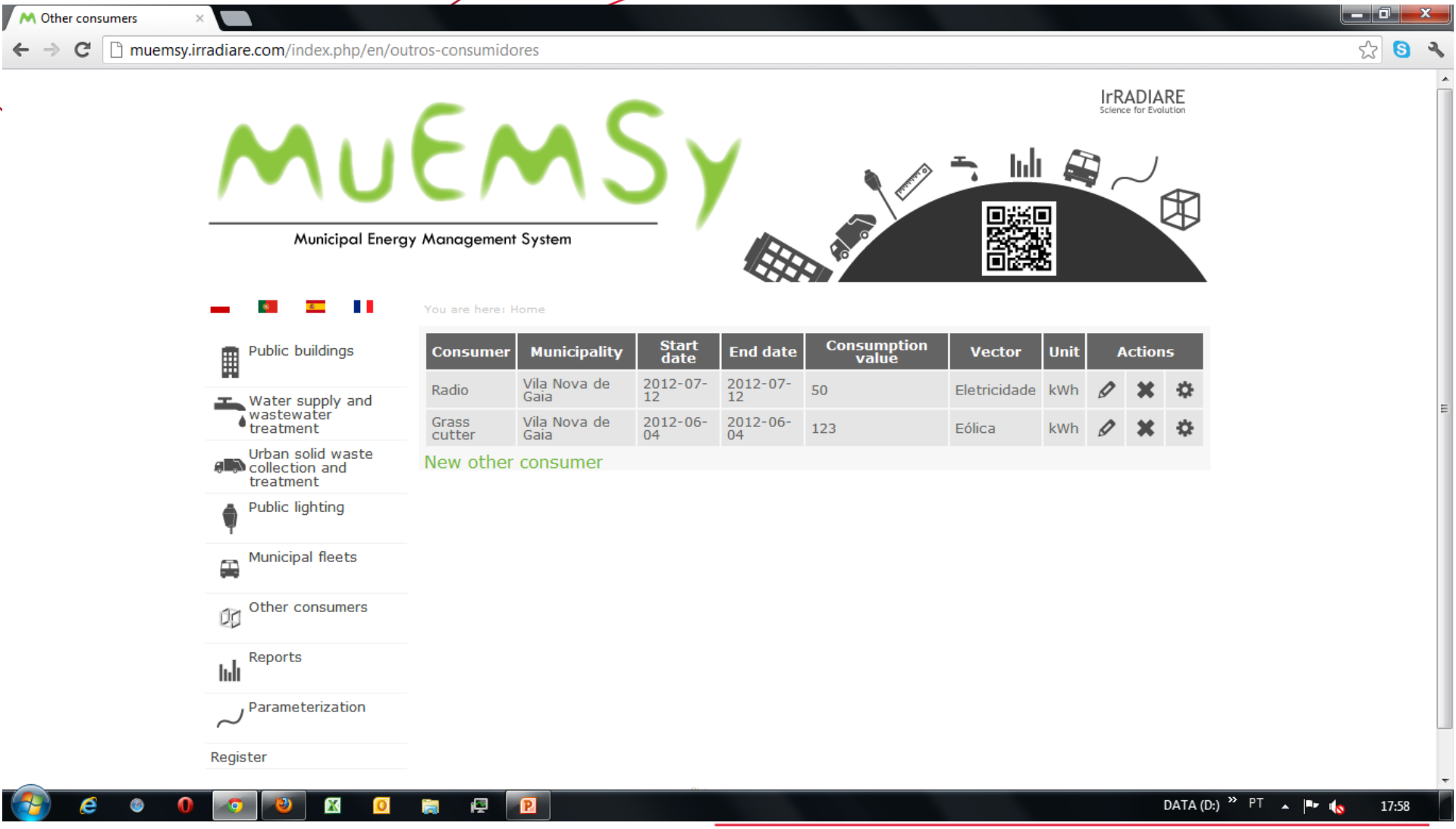
Other energy consumptions



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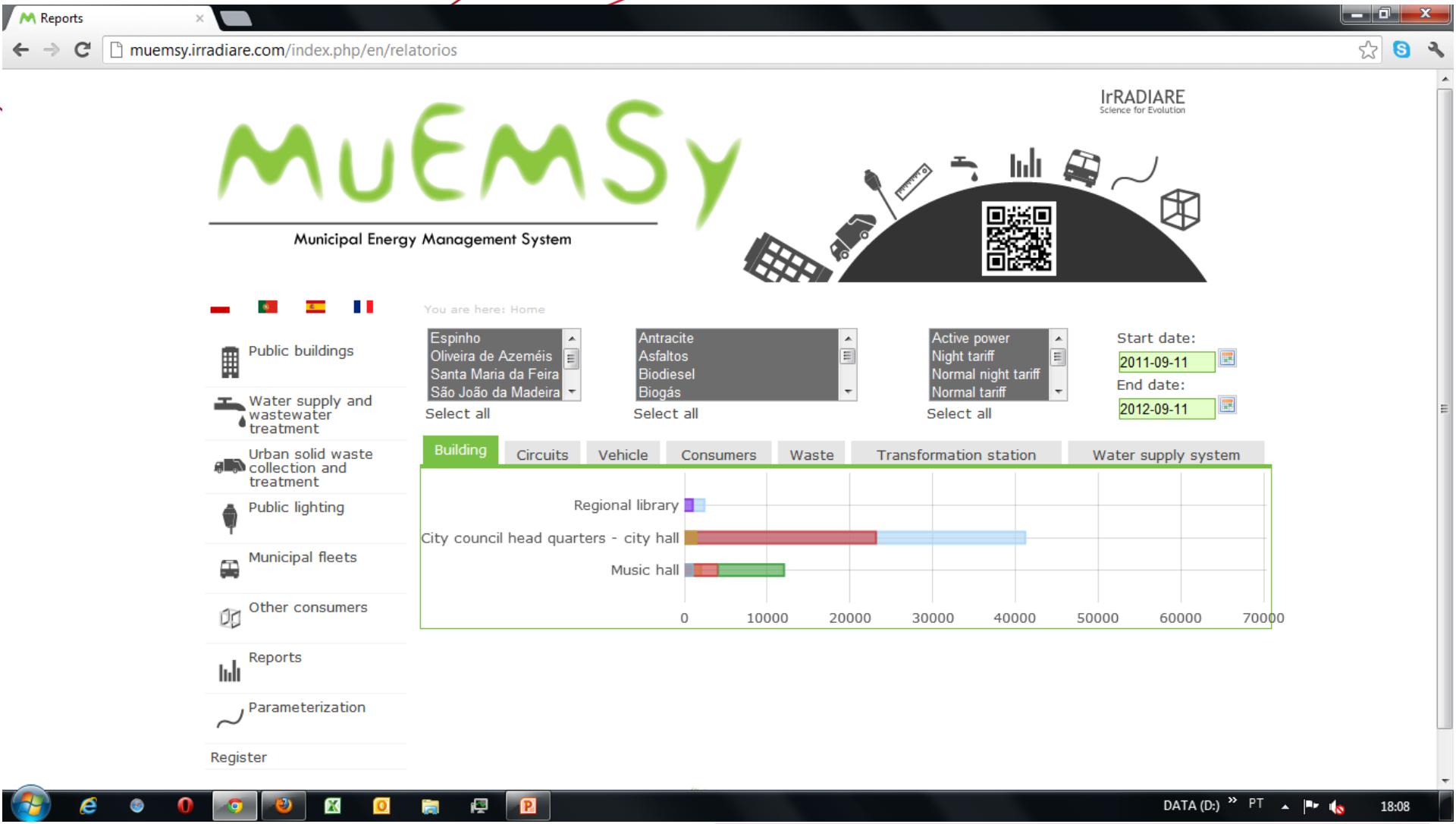
Dynamic reporting



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Model and platform parameterization

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Project-based financial assessment

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Financial assessment parameters

Simple payback (PP)

Net Present Value (NPV)

Benefit-cost ratio (C/B)

Internal Rate of Return (IRR)

Simple payback (PP)

It was calculated the year in which the NPV reaches zero, going from negative to positive.

$$PP = n_{NPV=0} - n_{t0}$$

Where:

PP - Simple payback [years]

n_{t0} – Year of project start [years]

$n_{VAL=0}$ – Year in which the NPV reaches zero years]

Net Present Value (NPV)

It was calculated by the sum of the difference between income obtained and investment until a year t, where the income obtained corresponds to energy invoice savings during this period.
The NPV calculation begins in the phase zero year until the year 2030.

$$NPV = \sum_{t=1}^{n} R_t - I_t$$

Where:

NPV – Net Present Value [years]

R_t – Income obtained in the year t [€]

I_t – Investment in the year [€]

n – Lifetime of the project [years], n =2030

Benefit-cost ratio (C/B)

The cost-benefit ratio was calculated dividing the NPV of the 15th year after the assessment / certification year by the investment in the project execution phase.

$$B/C_t = \frac{NPV_t}{I_{execution}}$$

Where:

B/C_t – Benefit-cost ratio in the year t, t =15 years

NPV_t – Net Present Value in the year t [€], t =15 years

$I_{execution}$ – Investment in the phase of execution [€]

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Internal Rate of Return (IRR)

Is the profit rate which, in the year 2025, makes the capital available to the NPV of 2025. The IRR calculation was based on the following equation:

$$CA_{P2012_n} = \frac{\sum_{t=1}^{n}\left(I_{PC_t} + \left(I_{CP_t} + \frac{CA_{CP_{t-1}}}{1 - i_t}\right) \times pr\right)}{\sum_{t=1}^{n}(1 + i_t)}$$

Where:

CA_{P2012_n} – Capital available at 2012 prices in the year t [€]

I_{CP_t} – Investment at current prices in the year t [€]

$CA_{CP_{t-1}}$ – Capital available at current prices in the year t−1 [€]

pr – Profit rate [%], $pr = IRR$

i_t – Inflation rate in the year t [%]

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Internal Rate of Return (IRR)

Equations base for IRR calculation:

$$CA_{P2012_n} = \frac{CA_{CP_n}}{\sum_{t=1}^{n}(1+i_t)} = \frac{\sum_{t=1}^{n}\left(I_{CP_t} + CF_{CP_t}\right)}{\sum_{t=1}^{n}(1+i_t)}$$

$$= \frac{\sum_{t=1}^{n}\left(I_{CP_t} + \left(I_{CP_t} + \frac{CD_{CP_{t-1}}}{1-i_t}\right) \times pr\right)}{\sum_{t=1}^{n}(1+i_t)}$$

Where:

CA_{P2012_n} – Capital available at 2012 prices in the year t [€]

CA_{CP_t} – Capital available at current prices in the year t [€]

i_t – Inflation rate in the year t [%]

I_{CP_t} – Investment at current prices in the year t [€]

CF_{CP} – *Cash-flow* at current prices in the year t [€]

$CA_{CP_{t-1}}$ – Capital available at current prices in the year t−1 [€]

pr – Profit rate [%], $pr = IRR$

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Conclusions

Conclusions

The proposed methodology allows moving beyond of smart energy management pilots towards full regional scale implementation.

The integrated planning and management allows combining investment resources throughout areas such as urban environment or economic competitiveness.

A cost effective approach is offer for sustainable energy policies and investments assessment and monitoring, namely for 2014-2020 funding period.

paldies

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