D3.3. Report on BEIs and Energy Reviews

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1. Introduction

The aim of this document is to report on the development of **Baseline Emission Inventories** (following SEAP methodology) and **Energy Reviews** (following ISO 50001 methodology) in over 40 municipalities participating in the project.

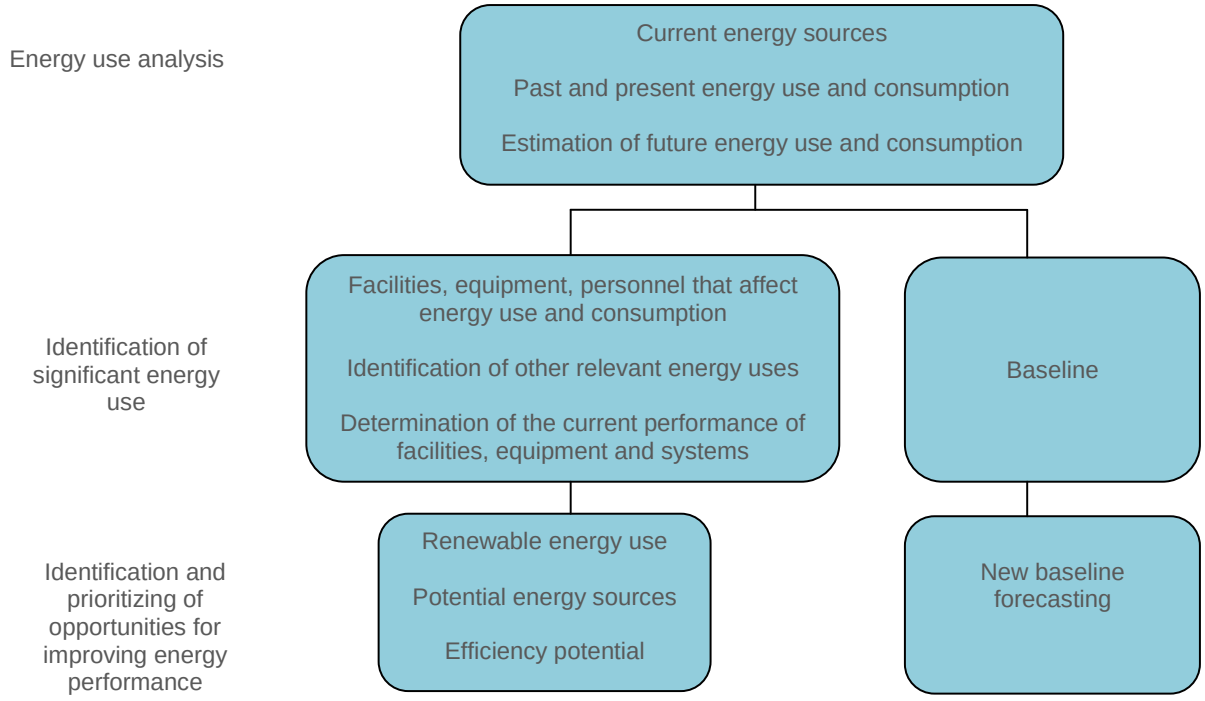
Both analyses are an important part of the energy planning process allowing the municipality to understand its current situation in terms of energy use and GHG emissions, which is a starting point for planning actions aiming at improving this situation. Knowing the starting point also helps the municipality to monitor the effects of the undertaken actions. Baseline Emission Inventory (BEI) developed in the CoM context quantifies the amount of energy used and GHG emitted from the municipality's territory in a given year, taking into consideration both the municipal and the private sector (residential, tertiary, industrial, etc.). Energy Review (ER) developed in the ISO 50001 context, on the other hand, usually concerns only municipality's own buildings, facilities and operations, but the analysis is more in-depth, including also the analysis of parameters influencing energy consumption or identification and prioritization of opportunities for improving energy performance. The 50000&1 SEAPs project aimed at integrating both approached allowing the municipalities to benefit from the strong points of both of them.

This report gives details of the BEIs and Energy Reviews conducted within the project, as well as highlights main lessons learnt during the process.

2. About Baseline Emission Inventory and Energy Review

Detailed analysis of the baseline situation is a crucial element of any planning process, allowing for better understanding of the current situation and finding the potential for improvements. In the CoM context such analysis is called Baseline Emission Inventory (BEI) and focuses on the calculation of current energy consumption and GHG emissions in different sectors, including both municipal and private one. In the ISO 50001 context the

analysis is called Energy Review (ER) and consists in identification of the main energy uses, main parameters influencing energy consumption and identification and prioritization of the opportunities for improvement. Generally, the ER's scope is broader than the BEI's but it focuses on a narrower area directly managed by the organisation implementing the EnMS (municipal sector in this case). The 50000&1 SEAPs project tried to integrate both approaches, creating synergies between them and making them go beyond the traditional scope. The graph below shows the integrated approach to baseline situation analysis:



Baseline Emission Inventory (following SEAP methodology)

Baseline Emission Inventory quantifies the amount of greenhouse gases (CO_2 or CO_{2eq}) emitted due to energy consumption on the territory of the municipality. It allows to identify main anthropogenic sources of CO_2 emissions and to prioritize measures accordingly. Moreover, by comparing the results of BEI with the results of future inventories, the municipality can check if the actions planned and implemented provide sufficient CO_2 reductions or further actions are necessary. According to the principles laid out in the Covenant of Mayors:

- BEI is based on final energy consumption, including both municipal and non-municipal consumption occurring on the territory.
- BEI must cover at least these sectors, in which the municipality intends to take action to meet the emission reduction target, i.e. all sectors that represent significant CO_2 emissions: municipal buildings and facilities, public lighting, residential buildings, tertiary buildings, industry, transport.
- BEI should be prepared on the basis of detailed, bottom-up data to be relevant to the local situation.
- BEI should be accurate or at least represent a reasonable vision of the reality.
- The data collection process, data sources and methodology for calculating BEI should be well documented.

Energy Review (following ISO 50001 methodology)

According to ISO 50001 standard, the municipality implementing an EnMS must record and maintain an energy review with certain documented methodology and criteria. An energy review is a process of determining municipality's energy performance based on gathered data and/or undertaken measurements. This process should result in identification of opportunities for improvement, as well as provide information for the selection of energy performance indicators (EnPIs). Main elements of the energy review are following:

- determination of past and present energy consumption;
- identification of significant energy uses;
- identification of parameters and elements of municipality's operation influencing energy consumption;
- identification of persons, whose activities can influence energy consumption.

3. BEIs and Energy Reviews in partner countries

Within 50000&1 SEAPs project the consortium supported over 40 pilot municipalities from 8 project countries in the development of integrated BEIs and Energy Reviews by training the staff involved in the process and helping them in its different stages, including:

- identification of possible data sources,
- data collection,
- data analysis,
- calculation of emissions based on the consumption data gathered,
- validation and analysis of the result with identification of the main categories of emission.

Below there is a summary of the work done in each project region.

BULGARIA.

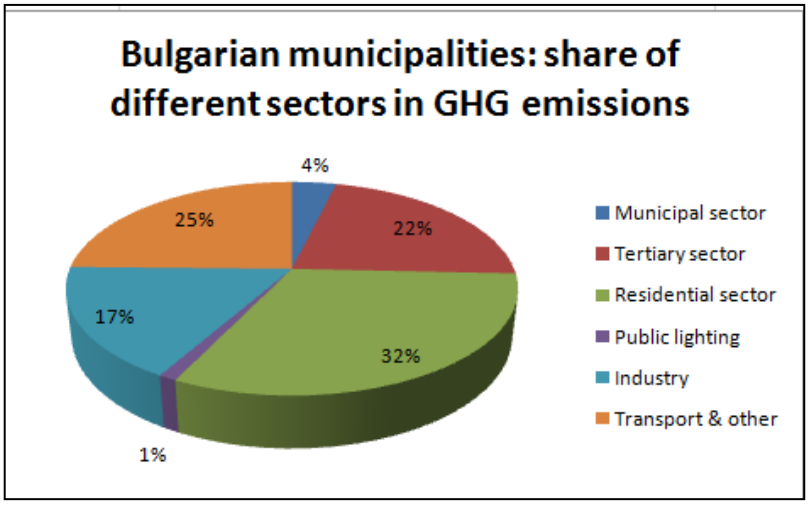
In Bulgaria there were 5 pilot municipalities implementing 50000&1 SEAPs approach: **Bratsigovo**, **Chepelare**, **Nedelino**, **Rudozem** and **Zlatograd**. Bulgarian partners, ARM and ECQ, supported them in this process, including the development of Baseline Emission Inventory and Energy Review. Below there are some more details concerning the assessment of the initial energy situation of Bulgarian municipalities.

Baseline Emission Inventory

The municipalities chose the baseline year, for which the calculations were made, depending on the availability of the data. It was 2009, 2011 or 2012. In each case standard emission factors were used to recalculate energy consumption into CO_2 emission. Regarding the data, ARM and ECQ made sure that they are as bottom-up as possible and well reflecting the situation of the municipalities. Main data sources used were: (1) energy utilities, (2) Bulgarian National Statistical Institute, (3) municipalities own data bases and (4) reports submitted to the Sustainable Energy Development Agency. Analysis of the baseline energy consumption and GHG emissions was complemented by the development of BAU scenario

for the year 2020. Below there are the main results of the inventory conducted for Bulgarian municipalities:

Municipality	GHG emissions TOTAL	GHG emissions Municipal sector	GHG emissions Tertiary sector	GHG emissions Residential sector	GHG emissions Public lighting	GHG emissions Industry	GHG emissions Transport and other
Bratsigovo	**25632,82**	857,911	515,35354	12932,17	251,20286	4181,02	6895,17
Chepelare	**46488,51**	2173,933	22325,77	9084,32	344,799	5778,18	6781,51
Nedelino	**8952,22**	498,3	705,1	2992,98	212,6	1316,63	3226,61
Rudozem							
Zlatograd	**32683,54**	830,496	1317,553	10862,521	406,54	8096,857	11169,57
TOTAL	**113757,09**	**4360,64**	**24863,78**	**35871,99**	**1215,14**	**19372,69**	**28072,86**



As it can be seen from the table above and the graph, the most GHG emissive sectors in Bulgarian municipalities are residential sector and transportation sector. This is where pilot LGs need to take action in the first place to improve their overall energy situation. Municipal building and facilities are responsible only for 4% of the total emissions, therefore development and implementation of a successful SEAP will require cooperation with citizens and local stakeholders.

Energy Review

Energy review goes beyond the traditional scope and includes both the municipal and the private sector. Below there are summarised the main elements and outcomes of conducted reviews:

- current energy sources used:
  Bratsigovo: electricity, biofuel-biodiesel, diesel, biomass (incl. wood pellets)
  Chepelare: electricity, coal, diesel, petrol, wood
  Nedelino: electricity, diesel, biomass (incl. wood pellets)
  Rudozem: electricity, wood
  Zlatograd: electricity, diesel, biomass (incl. wood pellets), gasoline
- main variables/parameters influencing energy consumption in a municipality: weather conditions; use of devices and appliances; insulation and retrofitting of buildings; behavioral aspects; transport; waste
- main persons/groups of stakeholders influencing energy consumption: citizens (residential sector); industrial enterprises; municipal services, private transport
- sectors which consume most energy:
  Bratsigovo: residential buildings, industry, transport
  Chepelare: services, housing sector, industry
  Nedelino: residential buildings, agriculture, industry
  Rudozem: residential buildings and services
  Zlatograd: residential buildings, industry, transport

Chepelare also identified the main opportunities for improvement in the area of EE and RES use. These are: use of solar energy and alternative fuels, energy renovations of public and private buildings, organisation of trainings for public and private workers on good energy practices, development of long-term strategies.

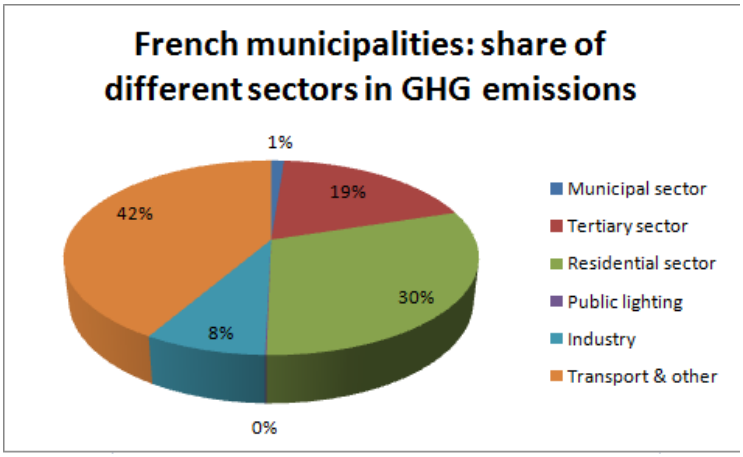
FRANCE

In France there were 2 pilot municipalities and 2 federations of municipalities implementing 50000&1 SEAPs approach: **Communauté d'agglomération du Muretain (CAM), Lorient, Tours and Communauté d'agglomération Tours Plus (CATP).** French partners, AMORCE and MT PARTENAIRES, supported them in this process, including the development of Baseline Emission Inventory and Energy Review. Below there are some more details concerning the assessment of the initial energy situation of French municipalities.

Baseline Emission Inventory

For CAM and Lorient the inventory is prepared for the year 2011, while for Tours and CATP for the year 2007. In both cases standard emission factors were used to recalculate energy consumption into CO_2 emission, and the methodology used to develop BEI was GHG emission protocol. Data mostly come from other documents, for which they have been gathered in the past. Analysis of the baseline energy consumption and GHG emissions was complemented by the development of BAU scenario for the year 2020. The results of the inventory are following:

Municipality	GHG emissions TOTAL	GHG emissions Municipal sector	GHG emissions Tertiary sector	GHG emissions Residential sector	GHG emissions Public lighting	GHG emissions Industry	GHG emissions Transport and other
CAM	**362150**	1232	33759	82480	0	8766	235913
Lorient	**543458**	3701	80000	100000	393	15022	344342
Tours	**580700**	13036	140160	224004	553	66893	136054
CATP	**1392955**	17656	289700	463000	923	138263	483413
TOTAL	**2879263**	**35635**	**543619**	**869484**	**1869**	**228944**	**1199722**



As it can be seen from the table above and the graph, the most GHG emissive sectors in French municipalities are transportation & other sector (with other standing for agriculture and waste management) and residential sector. This is where pilot LGs need to take action in the first place to improve their overall energy situation. Municipal building and facilities are responsible only for 1% of the total emissions, therefore development and implementation of a successful SEAP will require cooperation with citizens and local stakeholders.

Energy Review

Energy Review follows its original scope and focuses on the municipal sector and municipal operations. Below there are summarised the main elements and outcomes of conducted reviews:

- current energy sources used:
  CAM: electricity (ERDF - Électricité Réseau Distribution France); natural gas (GRDF - Gaz Réseau Distribution France); diesel oil (for waste collection)
  Lorient: electricity, gas, district heating partly by biomass
  Tours: electricity (ERDF - Électricité Réseau Distribution France); natural gas (GRDF - Gaz Réseau Distribution France)
  CATP: electricity (ERDF - Électricité Réseau Distribution France); natural gas (GRDF - Gaz Réseau Distribution France)
- main variables/parameters influencing energy consumption in a municipality: energy efficiency of buildings and infrastructure, energy-related behaviour, temperature outside (for heating)
- main persons/groups of stakeholders influencing energy consumption: building users, vehicle drivers
- sectors which consume most energy:
  CAM: public buildings (heating and cooking appliances; swimming pools) and waste collection. The biggest consumers are the Nautical Center Aqualudia, the central kitchen and West Collection Trucks.
  Lorient: public lighting and public buildings (heating). The biggest consumers are Mouscron sport complex, City Hall, Public lighting
  Tours: public lighting and public buildings (heating).
  CATP: wastewater treatment, LA assets (especially sports facilities)
- main opportunities for improvement in the area of EE and RES use
  CAM: use of solar energy, biogas production from waste, energy renovations of public buildings (thermal insulation of walls and roofs, replacement of windows and heating systems), replacement of the current public lighting system with LED, raising awareness of citizens & employees
  Lorient: use of solar energy (thermal and PV), energy renovations of public buildings (thermal insulation of walls and roofs, replacement of windows and heating systems),

replacement of the current public lighting system with LED, raising awareness of citizens & employees

Tours: use of solar energy, energy renovations of public buildings (thermal insulation of walls and roofs, replacement of windows and heating systems), replacement of the current public lighting system with LED, raising awareness of citizens & employees

CATP: use of solar energy, biogas production from methanisation, energy renovations of public buildings (thermal insulation of walls and roofs, replacement of windows and heating systems), replacement of the current public lighting system with LED, raising awareness of citizens & employees

GREECE

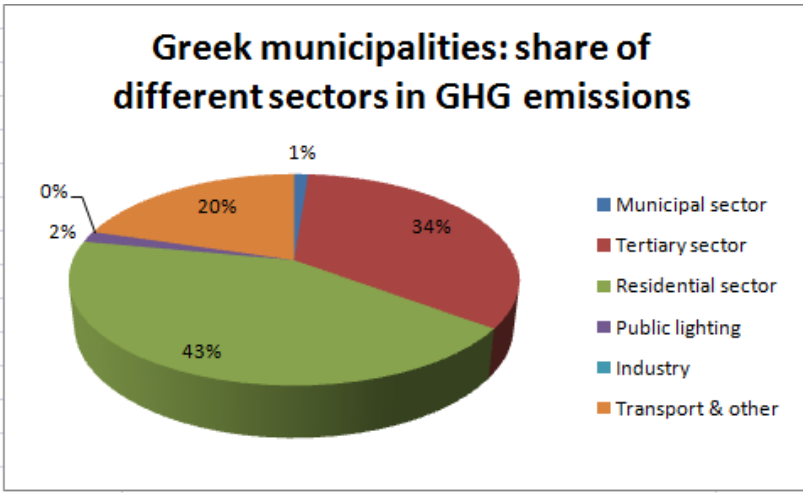
In Greece initially there were 5 pilot municipalities implementing 50000&1 SEAPs approach: **Metamorfosi**, **Filothei-Psychiko**, **Iraklelio**, **Alimos** and **Lavreotiki (Lavrio).** In the second part of the project Alimos decided to withdraw, despite the fact that a lot of work has been already done and BEI and SEAP were practically finished. CRES, Greek partner, replaced Alimos with another municipality **Papagou - Cholargou**, who committed to develop SEAP integrated with EnMS. The report includes BEI and Energy Review results for all 6 municipalities, since relevant work has been done by CRES.

Baseline Emission Inventory

The municipalities chose the baseline year, for which the calculations were made, depending on the availability of the data (ranging from 2011 to 2015). In each case standard emission factors were used to recalculate energy consumption into CO_2 emission. Regarding the data, CRES made sure that they are as bottom-up as possible and well reflecting the situation of the municipalities. Main data sources used were: (1) municipalities own data, (2) data from energy utilities and (3) data from the Hellenic Statistical Authority. In case of Alimos the analysis of the baseline energy consumption and GHG emissions was complemented by the development of BAU scenario for the year 2020.

By the end of the project BEIs were finalized for 4 municipalities. Below there are summarised their main results:

Municipality	GHG emissions TOTAL	GHG emissions Municipal sector	GHG emissions Tertiary sector	GHG emissions Residential sector	GHG emissions Public lighting	GHG emissions Industry	GHG emissions Transport and other
Metamorfosi	**202818,07**	2488,37	74613,95	82734,87	2561,93		40418,95
Filothei-Psychiko	**152740,76**	1937,11	45788	71129	3353,65		30533
Iraklelio							
Alimos	**276170**	2978	103405	109620	3857		56310
Lavreotiki (Lavrio)							
Papagou - Cholargou	**249635**	3068	75575	113936	5347		51709
TOTAL	**881363,83**	**10471,48**	**299381,95**	**377419,87**	**15119,58**		**178970,95**



As it can be seen from the table above and the graph, the most GHG emissive sectors in Greek municipalities are residential sector and tertiary sector. This is where pilot LGs need to take action in the first place to improve their overall energy situation. Municipal building and facilities are responsible only for 1% of the total emissions, therefore development and implementation of a successful SEAP will require cooperation with citizens and local stakeholders.

Energy Review

Energy Review follows its original scope and focuses on the municipal sector and municipal operations. Below there are summarised the main elements and outcomes of conducted reviews:

- current energy sources used:
  Metamorfosi, Iraklelio, Alimos and Lavreotiki (Lavrio).: electricity, natural gas, oil
  Filothei-Psychiko: electricity, natural gas, oil, biomass, thermal collector

Papagou - Cholargou: electricity, natural gas, oil, biomass, thermal collectors

- main variables/parameters influencing energy consumption in a municipality: energy efficiency of buildings and infrastructure, energy-related behaviour, economic situation/resources
- main persons/groups of stakeholders influencing energy consumption: building users, vehicle drivers
- sectors which consume most energy (starting from the most consuming):

  Metamorfosi: municipal fleet, public buildings, public lighting

  Filothei-Psychiko: public buildings, public lighting, municipal fleet

  Lavreotiki (Lavrio): municipal fleet, public lighting, public buildings

  Papagou - Cholargou: public lighting, public buildings, municipal flee
- main opportunities for improvement in the area of EE and RES use

  Metamorfosi: installation of PVs on municipal buildings, raising energy awareness of the citizens; energy renovation of public buildings (thermal insulation of walls and roofs, replacement of windows and heating systems), replacement of the current public lighting system with LED, raising awareness of drivers; improving energy management through further training of the personnel;

  Filothei-Psychiko: installation of PVs on municipal buildings, raising energy awareness of the citizens, including municipal employees, teachers and pupils; energy renovation of public buildings (thermal insulation of walls and roofs, replacement of windows, shadings, etc.), replacement of the current public lighting system, proper maintenance of fountains, gradual replacement of municipal vehicles; installation of green roofs, installation of geothermal heat pump at the municipal swimming pool, installation of metering systems and sensors in public buildings, innervations in irrigation facilities, implementation of ISO 50001

  Alimos: installation of PVs on municipal buildings, raising energy awareness of the citizens; energy renovation of public buildings, replacement of the current public lighting system with LED, replacement of old vehicles with electric ones, raising awareness of employees regarding energy efficiency; installation of green roofs, connection to the natural gas grid, construction of bicycle paths, implementation of ISO 50001

  Lavreotiki (Lavrio): installation of PVs on municipal buildings and schools, construction of a PV plant; energy renovation of public buildings and facilities,

replacement of the current public lighting system with LED, replacement of old vehicles with electric ones, raising awareness of employees regarding energy efficiency;

Papagou - Cholargou: installation of PVs on municipal buildings and schools, construction of a PV plant; energy renovation of public buildings (thermal insulation of walls and roofs, replacement of windows, shadings, etc.), replacement of the current public lighting system, proper maintenance of fountains, raising energy awareness of the citizens, including municipal employees, teachers and pupils; installation of green roofs, installation of metering systems and sensors in public buildings, interventions in irrigation facilities, implementation of ISO 50001

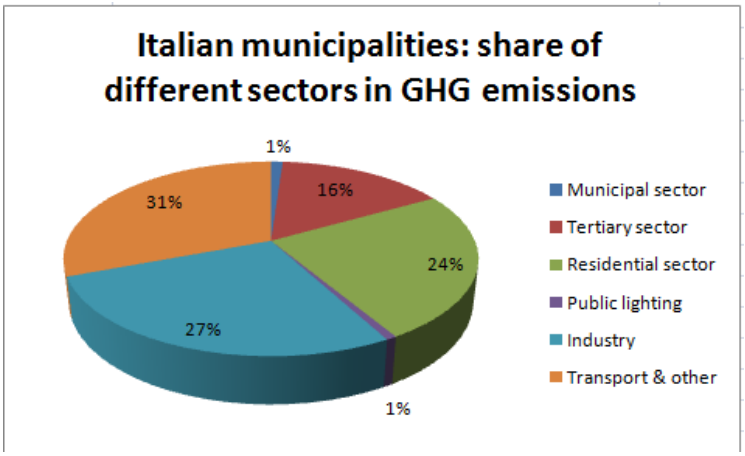
ITALY

In Italy there were 3 pilot municipalities and 1 federations of municipalities implementing 50000&1 SEAPs approach: **Pordenone, Montecchio Maggiore, Marostica** and **Federazione dei Comuni del Camposapierese**. Italian partner, SOGESCA, supported them in this process, including the development of Baseline Emission Inventory and Energy Review. Below there are some more details concerning the assessment of the initial energy situation of Italian municipalities.

Baseline Emission Inventory

The baseline year has been chosen either as 2008 or 2010, depending on the availability of the data, and standard emission factors were used to recalculate energy consumption into CO_2 emission. SOGESCA made sure that the data are as bottom-up as possible and well reflecting the situation of the municipalities. Main data sources used were energy bills of the municipalities, as well as DSOs and national, regional and provincial databases. Analysis of the baseline energy consumption and GHG emissions was complemented by the development of BAU scenario for the year 2020. Below there are the main results of the inventory for respective municipalities:

Municipality	GHG emissions TOTAL	GHG emissions Municipal sector	GHG emissions Tertiary sector	GHG emissions Residential sector	GHG emissions Public lighting	GHG emissions Industry	GHG emissions Transport and other
Pordenone	**281354,217**	6 859,8	75 839,9	90 333,6	2 611,5	22 889,2	82820,2
Montecchio Maggiore	**179775,001**	1 200,5	14 868,3	37 118,9	904,0	77 266,1	47417,2
Marostica	**87785**	773,00	11 021,00	22 640,00	372,00	25 839,00	27140
Fed. Camposapierese	**575486,4**	3 271,00	75 238,00	126 756,00	3 411,00	178 765,00	188045,04
TOTAL	**1124400,618**	**12104,3**	**176967,2**	**276848,5**	**7298,5**	**304759,3**	**345422,44**



As it can be seen from the table above and the graph, the most GHG emissive sectors in Italian municipalities are "transport and other sources of emission" sector (with other standing for waste management treatment) and industry sector. This is where pilot LGs need to take action in the first place to improve their overall energy situation. Municipal building and facilities are responsible only for 1% of the total emissions, therefore development and implementation of a successful SEAP will require cooperation with citizens and local stakeholders.

Energy Review

Energy review goes beyond the traditional scope and includes both the municipal and the private sector. Below there are summarised the main elements and outcomes of conducted reviews:

- current energy sources used: in each case various energy sources are used in the municipality, including electricity, natural gas, gasoline, diesel, methane, liquid gas, RES.

- main variables/parameters influencing energy consumption in a municipality: weather conditions (degree days are used to identify if winter or summer was hot / cold); use of devices and appliances; behavioral aspects; thermal plants characteristics; insulation and retrofitting of buildings; windows characteristics.
- main persons/groups of stakeholders influencing energy consumption: citizens (for residential sector), industrial enterprises and vehicle drivers.
- sectors which consume most energy: residential sector, industry and private transport.
- main opportunities for improvement in the area of EE and RES use:

  Pordenone: Installation of PV plants on public parking areas and public buildings and facilities, supporting PV plants installation in private sector, development of feasibility study on mini-hydroelectric plants, implementation of EE measures in public lighting, replacement of heat sources in residential sector, implementation of energy audits in industrial sector, implementation of sustainable urban mobility plan, implementation of EE measures in public transport vehicle fleet; development of e-mobility.

  Montecchio Maggiore: Installation of PV plants on buildings and facilities, supporting PV plants installation in private sector, implementation of EE measures in public buildings and public lighting, implementation of energy audits in residential and industrial sector, development of e-mobility.

  Marostica: Installation of PV plants on buildings and facilities, supporting PV plants installation in private sector, implementation of EE measures in public buildings and public lighting, implementation of energy audits in residential and industrial sector, development of e-mobility.

  Federazione dei Comuni del Camposapierese: Installation of PV plants on buildings and facilities, supporting PV plants installation in private sector, exploring potential of using biogas from agriculture and waste management for energy generation, implementation of EE measures in public buildings and public lighting, development of e-mobility.

LATVIA

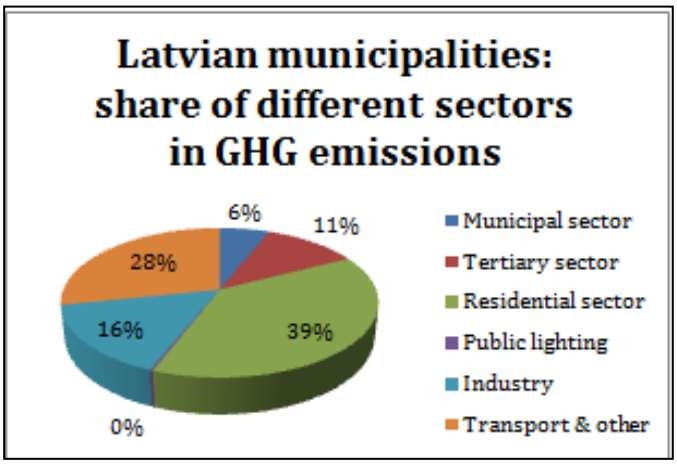
In Latvia there were 5 pilot municipalities implementing 50000&1 SEAPs approach: **Daugavpils**, **Cēsis**, **Smiltene**, **Sigulda** and **Adazi.** Latvian partner, EKODOMA, supported

them in this process, including the development of Baseline Emission Inventory and Energy Review. Below there are some more details concerning the assessment of the initial energy situation of Latvian municipalities.

Baseline Emission Inventory

The municipalities chose the baseline year, for which the calculations were made, depending on the availability of the data (ranging from 2008 to 2012). In each case standard emission factors were used to recalculate energy consumption into CO_2 emission. Regarding the data, EKODOMA made sure that they are as bottom-up as possible and well reflecting the situation of the municipalities. The data mostly came from energy and fuel bills gathered by the municipality, as well as the databases of utilities and service providers. Below there are the main results of the inventory for respective municipalities:

Municipality	GHG emissions TOTAL	GHG emissions Municipal sector	GHG emissions Tertiary sector	GHG emissions Residential sector	GHG emissions Public lighting	GHG emissions Industry	GHG emissions Transport and other
Daugavpils	**252174,131**	10920	34170	99669	546	32751	74119
Cēsis	**33552,062**	3160	2933	15202	388	5431	6438
Smiltene	**10972,4**	219	482	1223	57	3356	5635
Sigulda	**20866**	275	630	3264	81	10030	6586
Adazi	**23838**	5702	851	11706	66	1740	3773
TOTAL	**341402,593**	20276	39066	131064	1138	53308	96551



As it can be seen from the table above and the graph, the most GHG emissive sectors in Latvian municipalities are residential sector and "transport and other sources of emission" sector. This is where pilot LGs need to take action in the first place to improve their overall energy situation. Municipal building and facilities are responsible only for 6% of

the total emissions, therefore development and implementation of a successful SEAP will require cooperation with citizens and local stakeholders.

Energy Review

Energy Review follows its original scope and focuses on the municipal sector and municipal operations. Below there are summarised the main elements and outcomes of conducted reviews:

- current energy sources used: most of the municipalities use electricity, district heating, biomass and transport fuels. Adazi doesn't have district heating but the natural gas network, which is used as the main source of heating.
- main variables/parameters influencing energy consumption in a municipality: outside temperatures (for heating); hours of lighting; number of passenger km.
- main persons/groups of stakeholders influencing energy consumption: building users (depending on the type of building).
- sectors which consume most energy: in most cases two sectors were identified as the main consumers and will be covered by the EnMS - buildings (heating and electricity) and lighting. The exception is Daugavpils, whose EnMS will cover three sectors - buildings, lighting and public transport. From this three, buildings have the highest energy consumption and GHG emissions (there are 98 public buildings in total).
- main opportunities for improvement in the area of EE and RES use:

  Daugavpils: implementation of fuel switch project; connecting new buildings to DH, energy management and energy renovation.

  Cēsis: implementation of fuel switch project;, energy management and energy renovation.

  Smiltene: ensuring rational use of resources; implementing quality criteria in the procurement for biomass; checking of the provided biomass; energy management and energy renovation of buildings.

  Sigulda: ensuring rational use of resources; implementing quality criteria in the procurement for biomass; checking of the provided biomass; energy management and energy renovation of buildings.

Adazi: implementation of fuel switch project;, energy management and energy renovation.

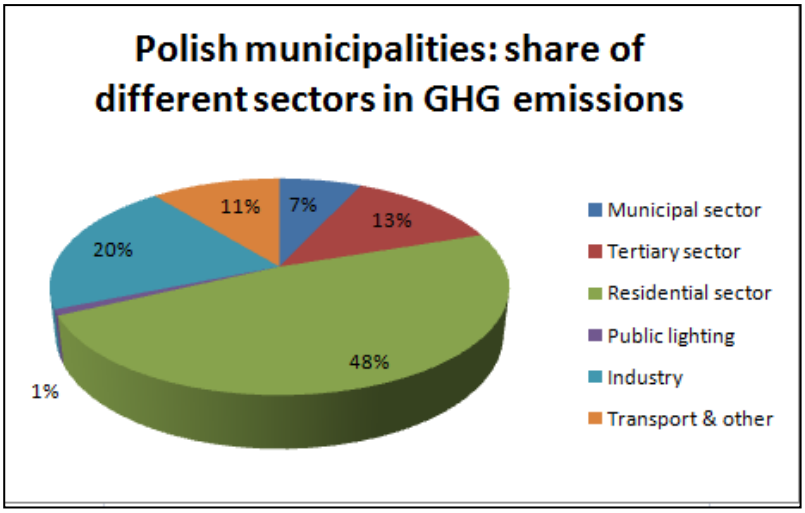
POLAND

In Poland there were 6 pilot municipalities implementing 50000&1 SEAPs approach: **Słupsk**, **Sztum**, **Grybów**, **Pilzno, Żyraków** and **Zarszyn**. Polish partner, PNEC, supported them in this process, including the development of Baseline Emission Inventory and Energy Review. Below there are some more details concerning the assessment of the initial energy situation of Polish municipalities.

Baseline Emission Inventory

The municipalities chose the baseline year, for which the calculations were made, depending on the availability of the data (ranging from 2008 to 2013). In each case standard emission factors were used to recalculate energy consumption into CO_2 emission. Regarding the data, PNEC made sure that they are as bottom-up as possible and well reflecting the situation of the municipalities. Various data sources were used, including energy invoices (for public buildings and lighting), electricity, heat and gas suppliers, transport companies (trains, buses), local strategy documents (e.g. plans for supplying the city with heat, electricity and gas fuels, local development strategies), surveys and expert estimates. Analysis of the baseline energy consumption and GHG emissions was complemented by the development of BAU scenario for the year 2020. Below there are the main results of the inventory for respective municipalities:

Municipality	GHG emissions TOTAL	GHG emissions Municipal sector	GHG emissions Tertiary sector	GHG emissions Residential sector	GHG emissions Public lighting	GHG emissions Industry	GHG emissions Transport and other
Słupsk	**489178,72**	38916,7	72977,03	208942,64	3932,12	137075,93	27334,3
Sztum	**53681,27**	4206,34	2241,37	30014,91	101,03		17117,62
Grybów	**19976,66**	405,11	3959,54	11839,84	410,15		3362,02
Pilzno	**44916,99**	1306,49	4298,72	28355,09	1087,22		9869,47
Żyraków	**34639,15**	1664,15	467,36	26352,69	359,46		5795,49
Zarszyn	**32733,35**	538,85	2911,78	18896,27	282,58		10103,87
TOTAL	**675126,14**	**47037,64**	**86855,8**	**324401,44**	**6172,56**	**137075,93**	**73582,77**



As it can be seen from the table above and the graph, the most GHG emissive sectors in Polish municipalities are residential sector and industry sector. This is where pilot LGs need to take action in the first place to improve their overall energy situation. Municipal building and facilities are responsible only for 7% of the total emissions, therefore development and implementation of a successful SEAP will require cooperation with citizens and local stakeholders.

Energy Review

Energy review goes beyond the traditional scope and includes both the municipal and the private sector. Below there are summarised the main elements and outcomes of conducted reviews:

- current energy sources used:
  Słupsk: electricity, natural gas, liquid gas, heating oil, coal, diesel, gasoline, CNG, RES (biomass/wood, biogas, solar energy, heat pumps)
  Sztum: electricity, natural gas, liquid gas, heating oil, coal, diesel, gasoline, RES: biomass (wood), wind energy
  Grybów: electricity, natural gas, liquid gas, heating oil, coal, diesel, gasoline, biomass (wood), solar energy
  Pilzno: electricity, natural gas, liquid gas, heating oil, coal, diesel, gasoline, biomass (wood), water energy, solar energy
  Żyraków: electricity, natural gas, liquid gas, heating oil, coal, diesel, gasoline, biomass (wood), solar energy
  Zarszyn: electricity, natural gas, coal, liquid gas, heating oil
- main variables/parameters influencing energy consumption in a municipality: Outside tempreture and weather conditions, buildings insulation/standard, prices of energy sources, access to public transport.
- main persons/groups of stakeholders influencing energy consumption: residential buildings owners; private transport users; public buildings owners and users
- sectors which consume most energy (starting from the most consuming one):
  Słupsk, Grybów, Pilzno, Zarszyn: residential buildings; transport; tertiary buildings
  Sztum, Żyraków: residential buildings; transport; public buildings
- main opportunities for improvement in the area of EE and RES use: thermal retrofitting of buildings, improving EE of installations, change of behaviours, subsidies for sustainable energy projects implemented in the private sector

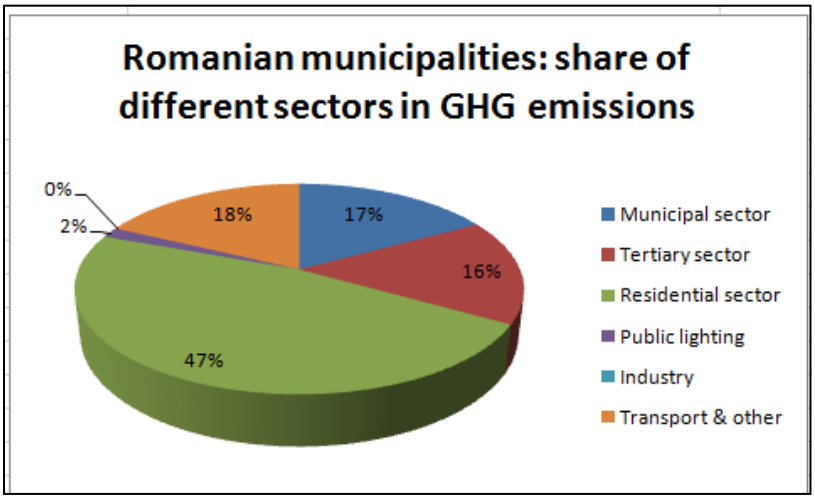
ROMANIA

In Romania there were 7 pilot municipalities implementing 50000&1 SEAPs approach: **Sannicolau Mare**, **Caransebes**, **Faget**, **Ineu**, **Otelu Rosu, Lugoj** and **Resita**. Romanian partners, AMET and DENKSTATT, supported them in this process, including the development of Baseline Emission Inventory and Energy Review. Below there are some more details concerning the assessment of the initial energy situation of Romanian municipalities.

Baseline Emission Inventory

The inventories were completed for all municipalities except for Caransebes. They all were prepared for the same baseline year - 2008 - and using standard emissions factors to recalculate energy consumption into CO_2 emission. Romanian partners designed special integrated data collection tool, based on the SEAP template, to help the municipalities in the data collection process. Main data sources were energy bills, databases of energy suppliers (ENEL, EON, etc.) and the database of urban collector for waste. Analysis of the baseline energy consumption and GHG emissions was complemented by the development of BAU scenario for the year 2020. Below there are the main results of the inventory for respective municipalities:

Municipality	GHG emissions TOTAL	GHG emissions Municipal sector	GHG emissions Tertiary sector	GHG emissions Residential sector	GHG emissions Public lighting	GHG emissions Industry	GHG emissions Transport and other
Sannicolau Mare	**33747,81**	2218,48	13794,00	12229,87	1375,33	0	4130,13
Caransebes							
Faget	**48606**	2421	10106	34654	805	0	622
Ineu	**13623,58**	270,67	682,75	9663,49	232,04	0	2774,63
Otelu Rosu	**1202,41**	66,62	42,85	99,94	322	0	671
Lugoj	**92176**	8141	22730	45075	1817	0	14413
Resita	**216781**	55786	18551	90725	1910	0	49809
TOTAL	**406136,8**	**68903,77**	**65906,6**	**192447,3**	**6461,37**	**0**	**72419,76**



As it can be seen from the table above and the graph, the most GHG emissive sectors in Romanian municipalities are residential sector and "Transport & other sources of emission" sector. This is where pilot LGs need to take action in the first place to improve their overall energy situation. Municipal building and facilities are responsible only for 17% of the total emissions, therefore development and implementation of a successful SEAP will require cooperation with citizens and local stakeholders. Still, in this case, share of "municipal" GHG emissions in the total GHG emissions is much higher than in case of other countries.

Energy Review

Energy review goes beyond the traditional scope and includes both the municipal and the private sector. Below there are summarised the main elements and outcomes of conducted reviews:

- current energy sources used:
  Sannicolau Mare, **Caransebes, Otelu Rosu**: electricity, natural gas, DH, diesel, gasoline
  Faget: electricity, diesel, gasoline
  Ineu and Resita: electricity, natural gas, DH, biomass, diesel, gasoline
  Lugoj: electricity, natural gas, diesel
- main variables/parameters influencing energy consumption in a municipality:
  Sannicolau Mare, **Caransebes, Ineu, Lugoj and Resita:** hours of lighting, weather conditions, behavioral aspects, insulation and retrofitting of buildings; windows characteristics
  Faget and Otelu Rosu: weather conditions, use of devices and appliances, behavioral aspects, insulation and retrofitting of buildings, windows characteristics

- main persons/groups of stakeholders influencing energy consumption: citizens (residential sector); industrial enterprises; municipal services, private transport users
- sectors which consume most energy (starting from the most consuming one):

  Sannicolau Mare: residential buildings, municipality's buildings, private sector (industry), with the 3 biggest consumers being Zoppas Industry Romania, Delphi Packard and Water Company

  Caransebes, Faget, Otelu Rosu: residential buildings, municipality's buildings and public lighting, private sector (industry)

  Ineu, Lugoj: residential buildings, municipality's buildings, private sector (industry)

  Resita: residential buildings, municipality's buildings, private sector (industry), transport
- main opportunities for improvement in the area of EE and RES use:

  Sannicolau Mare, Lugoj: using solar panels for warm water preparation in residential and municipal buildings, rehabilitation of public buildings (insulation, windows replacement, lighting systems modernisation)

  Faget: addition of a central-heating system fueled by biomass, rehabilitation of public buildings (insulation, windows replacement, lighting systems modernisation)

  Ineu: using biomass from sustainable sources for heating purposes, rehabilitation of public buildings (insulation, windows replacement, lighting systems modernisation)

  Otelu Rosu: modernisation of natural gas distribution network; rehabilitation of public buildings (insulation, windows replacement, lighting systems modernisation)

  Resita: using solar panels for warm water preparation in residential and municipal buildings, rehabilitation of public buildings (insulation, windows replacement, lighting systems modernisation), planning sustainable mobility

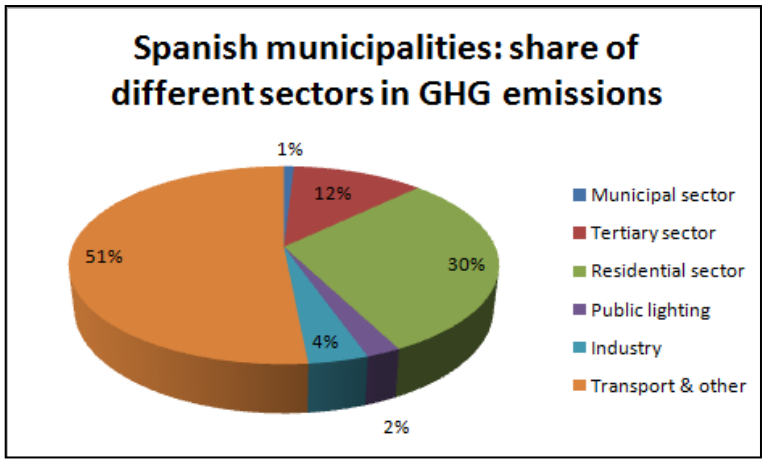
SPAIN

In Spain there were 5 pilot municipalities implementing 50000&1 SEAPs approach: **Carballiño**, **Barco de Valdeorras, Xinzo de Limia, Celanova** and **Cartelle**. Spanish partners, OURENSE and ALBEA, supported them in this process, including the development of Baseline Emission Inventory and Energy Review. Below there are some more details concerning the assessment of the initial energy situation of Spanish municipalities.

Baseline Emission Inventory

All inventories have been prepared for the same baseline year - 2007 - and using standard emissions factors to recalculate energy consumption into CO_2 emission. Spanish partners designed their own excel file adapted from the SEAP guidebook to help the municipalities in the process. Various data sources were used including energy invoices (for public buildings and lighting), databases of electricity, heat and gas suppliers, public and private transport companies, local strategy documents, surveys and expert estimates. In each case the analysis was completed with the prognosis of energy consumption and GHG emissions in case the municipality didn't undertake any mitigation measures. Below, there are summarized results of conducted analysis:

Municipality	GHG emissions TOTAL	GHG emissions Municipal sector	GHG emissions Tertiary sector	GHG emissions Residential sector	GHG emissions Public lighting	GHG emissions Industry	GHG emissions Transport and other
Carballiño	**54662,592**	428,364	4912,621	15182,103	989,686	6220,377	26929,44
Barco de Valdeorras	**48132,801**	224,606	5817,307	16796,63	866,38	0	24427,878
Xinzo de Limia	**31294,62**	436,177	6105,615	8763,514	924,485	0	15064,829
Celanova	**21744,275**	222,608	1924,744	5900,218	540,714	0	13155,991
Cartelle	**8320,235**	152,503	553,985	2310,196	333,1	0	4970,451
TOTAL	**164154,523**	**1464,258**	**19314,272**	**48952,661**	**3654,365**	**6220,377**	**84548,589**



As it can be seen from the table above and the graph, the most GHG emissive sectors in Spanish municipalities are "Transport & other sources of emission" sector and residential. This is where pilot LGs need to take action in the first place to improve their overall energy situation. Municipal building and facilities are responsible only for 1% of the total emissions, therefore development and implementation of a successful SEAP will require cooperation with citizens and local stakeholders.

Energy Review

Energy review goes beyond the traditional scope and includes both the municipal and the private sector. Below there are summarised the main elements and outcomes of conducted reviews:

- current energy sources used: all municipalities are using non-renewable energy sources.
- main persons/groups of stakeholders influencing energy consumption: citizens (residential sector); private transport users
- sectors which consume most energy: in each case the biggest consumers are public lighting, private transport and heating of buildings.
- main opportunities for improvement of the energy situation: renewal of public lighting installatio, renovation of municipal vehicle fleet renovation, applying criteria of low carbon footprint, implementation of EE and RES projects in public administratin, organisation of trainings for public and private workers on good energy practices in buildings and facilities.

More details on the progress made and results achieved in each of the project countries may be found in the **WP3 monitoring tool** which is attached to this report.

4. Lessons learnt and conclusions

Analysis of the baseline situation, both in the CoM and ISO 50001 context, is the most challenging and time consuming part of the development of integrated SEAP and EnMS. It is also the most important part that affects all future steps and the efficiency of the monitoring of undertaken actions. Therefore the partners put great attention to the identification of the most reliable data sources, data collection and analysis. As a result, it was possible not only to well understand initial energy situation of respective municipalities, but also to identify the most significant energy uses, prioritize areas of intervention and pre-define necessary measures that could be potentially included in a SEAP.

Integration of SEAP with an EnMS proved to be very beneficial. ISO 50001 gave pilot municipalities additional tools for assessing their initial situation beyond the scope of CoM

requirements. In some cases ISO methodology was applied also to the assessment of the energy performance in the private sector.

CONSORTIUM:

SOGESCA (Coordinator) - www.sogesca.it
CRES - www.cres.gr
PNEC - www.pnec.org.pl
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ECQ - www.ecq-bg.com
AMET - www.amet.ro
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