Global Energy Management System Implementation: Case Study

Italy

City of Montecchio Maggiore

Montecchio Maggiore Municipality improves Energy Performance by 1.11% due to the implementation of EnMS in the first six months!

—City of Montecchio Maggiore

Business Case for Energy Management

City of Montecchio Maggiore is a Municipality with a population over 23,000 located in Southwest of Vicenza province in Veneto Region, and it covers an area of 30.7 km^2 at 72m above sea level. In 2013 the Municipality joined the EU funded project 50000and1SEAPs focused on the development and implementation of ISO 50001 and SEAPs (Sustainable Energy Action Plans). The project supports more than 40 municipalities in 7 EU Countries to develop, implement and certify their Energy Management Systems and SEAPs using a coherent approach integrating Energy Management Systems and SEAPs. Montecchio Maggiore Municipality approved its SEAP on July 11th 2016 and on October 17th received the ISO 50001 certificate from DASA Rägister.
13 are the Municipal officers directly involved in the SEAP+EnMS action, representing the 4 areas of the Municipality management services:

- General Secretariat & Human Resources Sector;
- Finance and Tax Sector;
- Public Works and Urban Planning Sector;
- Services to the Population Sector.

The ISO 50001 certificate proves the implementation of the Energy Management System in three main public sectors (boundaries of the system):

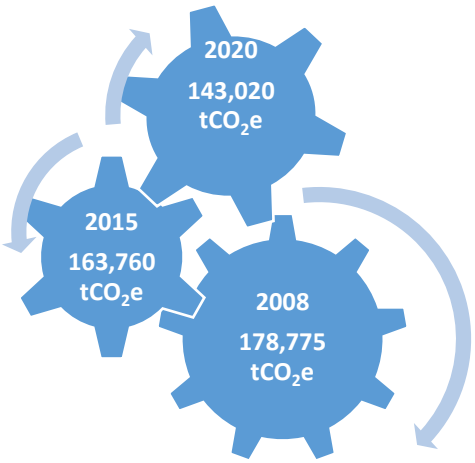
- Public buildings (includes 36 buildings and facilities with a total surface of 24,037 m^2)
- Public street lighting (includes 5,239 luminaires);
- LG vehicle fleet (includes 41 vehicles)

Annual total consumption of electricity, natural gas and fuels of the sector mentioned is about 38,087 GJ in 2016.

Case Study Snapshot	
Tertiary	Local Government
Product/Service	Public Authority
Location	Montecchio Maggiore, Italy
Energy Management System	ISO 50001
Energy Performance Improvement Period	6 months
Energy Performance Improvement (%) over improvement period	1.11%
Total energy cost savings over improvement period (6 months)	12,609 $USD
Cost to implement EnMS	19,014 $USD
Payback period on EnMS implementation (years)	0.75
Total Energy Savings over improvement period	423 GJ
Total CO_2-e emission reduction over improvement period	21,233 Metric tons

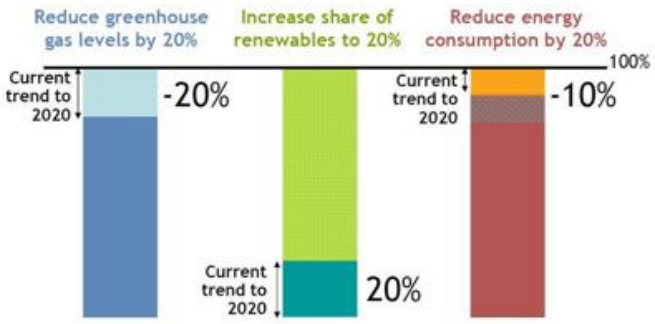
On July 2014, a new Energy Efficiency Law was approved in Italy transposing the EU Directive 27/2014: the Legislative Decree n. 102/2014. The law establishes a framework of measures for the promotion and improvement of energy efficiency that contributes to national energy saving targets. However the Law does not includes the Local Governments in the energy efficiency targets so in Italy there is no specific national regulatory framework on energy efficiency. The ISO 50001 certification and the Covenant of Mayors initiative are both voluntary schemes for the LGs who want to improve energy efficiency performance and reduce the environmental impact arising from energy consumption.

Going beyond national targets and regulatory framework, the Municipality signed the Covenant of Mayors and joined 50000and1SEAPs project voluntarily committing to reduce GHG emission in the whole territory of the city by 20% until 2020 (-38,044 tCO_2e by 2020) compared with 2008 through the SEAP measures implementation.



—Figure 1 tCO_2 reduction target of Montecchio Maggiore through SEAP measures implementation

The commitment signed by the City of Montecchio Maggiore is aimed to support European policies for the fight against climate change and focused on achieving the EU targets for 2020, that is:



—Figure 2 20-20-20 target of the Covenant of Mayors initiative

- 20% of CO_2e reduction by 2020;
- 20% of energy efficiency improvement by 2020;
- 20% of RES use by 2020.

The EnMS implementation has been driven by the interest to use public resources more efficiently in order to reduce the impact of energy costs on the Municipal budget and to be able to improve the quality of public service to the citizens. Moreover, EnMS allowed improving the image of the Municipality.

"Through ISO 50001+SEAP implementation Montecchio Maggiore Municipality wants to improve its own and the territory's energy performance by focusing on quality and efficiency."

—Milena Cecchetto, Mayor of the City of Montecchio Maggiore

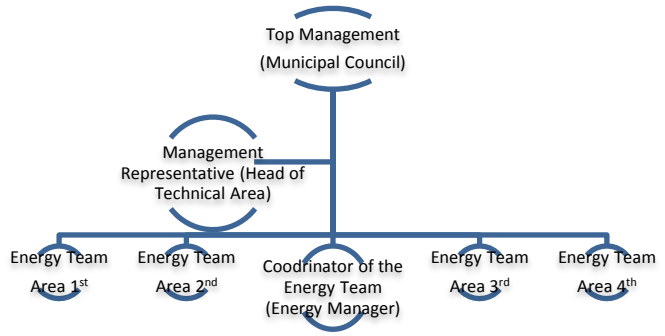
As a public authority it can act, inform and show good examples to citizens and stakeholders on how to improve energy use reducing environmental and climate impact and involving private actors of the territory in the energy management and planning. At the same time, Montecchio Maggiore Municipality gives a positive example to other municipalities and business companies of the tertiary and industrial sectors on results reached through an efficient use of energy sources integrated in the daily life of the organization.

Business Benefits Achieved

The City administration has defined internal rules and responsibilities in order to develop and implement ISO 50001 integrating its energy policy in the activities of the Public Administration. Continual energy improvement and CO_2e reduction has become a fundamental criterion reflecting the energy policy of the Municipality. Internal and external responsibilities and communication were established. The 4 Municipality sectors who manage energy issues (purchase of goods and Energy Services, data analysis, energy billing, energy planning, design, operational control and monitoring have been involved in the Energy Team coordinated the Energy Manager, Eng. Sabino Petrillo. SEAP development and implementation activities have been focused on involving in the process several key actors of the territory (residential, tertiary, mobility) in order to communicate the ISO 50001 achievements and stimulate energy efficiency measures, coordinated by the Municipality, in the private sectors who represent significant energy use in the territory.

EnMS Development and Implementation

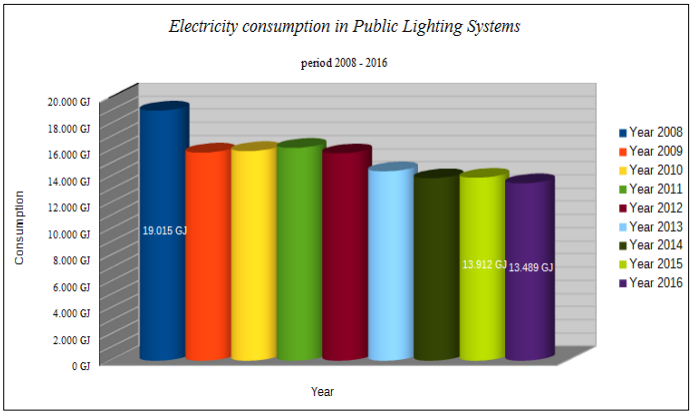
ISO 50001 implementation represented a fundamental step for proper application of the Legal requirements improving the operational control and contributing to reduce energy costs related to energy consumption. As the EnMS has been only recently implemented (2016), complete data on the results achieved will be available at the end of 2017. However, already during the establishment and development of ISO 50001 activities significant results were achieved. Forecasted energy savings related to the implementation and operation of the EnMS between July 2016 and December 2016 (last data available) represent 423 GJ, mostly reached through to energy efficiency measures on the public lighting systems.



—Figure 3 Energy Management System internal organization in Montecchio Maggiore Municipality

Area	Services
Area 1st General Secretariat and Staff Services Sector	Contracts and public tenders
Area 2nd – Finance and Taxes Sector	Public Procurement
	Accountancy
Area 3rd – Public Works and Urban Planning Sector	Technical office
	Environment
	Urban Planning
	Energy and Energy Manager
	Public Works
	Public Building maintenance
	Public Lighting maintenance
	Data analysis
Area 4th – Population services Sector	Schools and transport service for students

—Table 1 Scope of the Energy Management System of Montecchio Maggiore



—Figure 4 Energy efficiency results in Public Lighting System through ISO 50001 implementation

Montecchio Maggiore Municipality is already certified according to ISO 9001 (Quality Management System) and ISO 14001 (Environment Management System). Thanks to these other ISO certifications, the Municipality maintains high quality process and monitoring procedures on internal services and environmental impact of the Local Governments activities. The three Management Systems in place are not formally integrated, but from in practice the procedures of Quality, Environment and Energy Management Systems are implemented and monitored in all the 4 sectors of the Local Government activities. The competences, training and awareness of the persons who works for or on behalf of the Municipality are based on a significant experience on Management System development and implementation.

—Figure 5 Management System certifications of Montecchio Maggiore Municipality

Energy review and planning

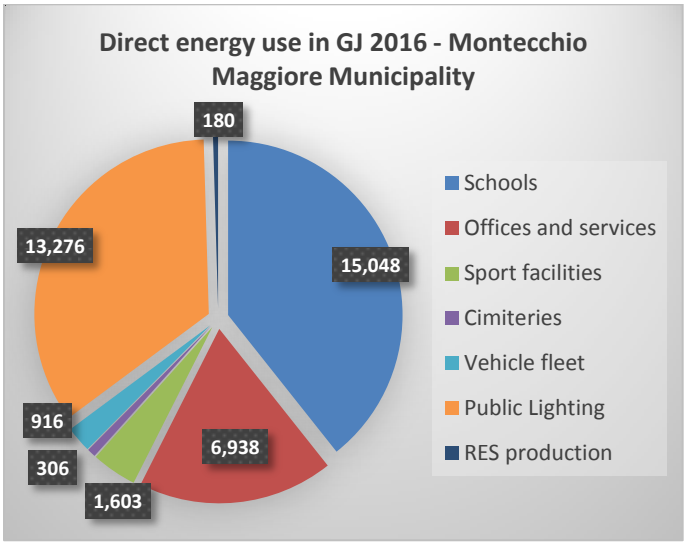
The work on the energy review started with the development of the Sustainable Energy Action Plan of Montecchio Maggiore Municipality approved by the Joint Research Centre (DG Energy – EU Commission) on November 30th 2016. The plan, as well as the Energy Analysis and the Energy baseline, includes annual energy performance collected using a bottom-up approach in the following sectors:

Energy use in Local Governments (data collection 2008-2016):

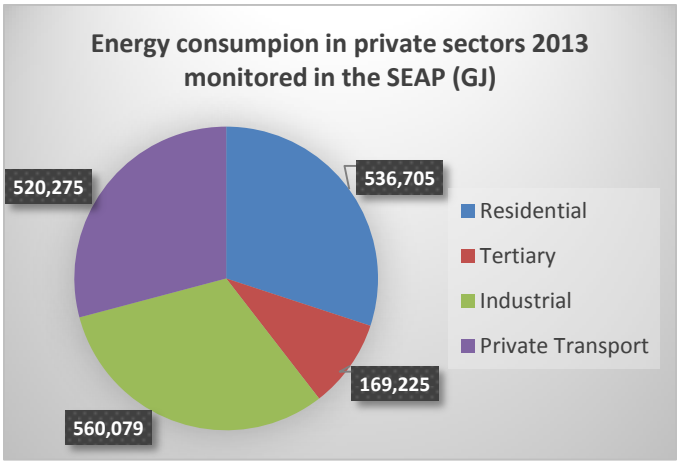
- Buildings, facilities and infrastructures (electricity and natural gas);
- Public Lighting Systems (electricity);
- Vehicle fleet of the Municipality (gasoline, diesel, methane, liquid gas)

Energy use in the territory (data collection 2008-2013[1]):

- Residential (electricity, natural gas, diesel);
- Tertiary (electricity, natural gas);
- Industrial and Agriculture (electricity, natural gas);
- Mobility (gasoline, diesel, liquid gas, methane)



—Figure 6 Direct energy use in the Local Government



—Figure 7 Energy use in private sector 2013 – 1,786,284 GJ

[1] Last year available at the moment for energy consumption in private sectors

Energy performance indicators, measurement and monitoring

The EnMS boundaries have been identified and based on the energy consumption. According with specific EnPI all the direct energy uses have been evaluated following the criteria below:

- ✓ Percentage of the specific energy consumption on the total energy consumption;
- ✓ Potential reduction of the energy consumption based on the improvement opportunities;
- ✓ Investment payback period based on the improvement opportunities;

According with the criteria mentioned above, the Municipality established its energy objectives, energy targets and the energy management action plan:

Target	Energy Efficiency measure	EnPI	EnPI Baseline	EnPI expected	Time frames
Improvement of the EnPI in thermal use Public Buildings (Schools)	Primary School "Don Milani" (windows replacement heating plant revamping)	kWh*Degree Day/m^2	190 kWh/m^2 *DD rif	172 kWh/m^2 DD rif	2017
	Secondary School "Marco Polo" (windows replacement and climatic heating plant regulation)	kWh*Degree Day/m^2	144 kWh/m^2 DD rif	138 kWh/m^2 DD rif	2017
	Primary School "Andersen" (roof insulation)	kWh*Degree Day/m^2	140 kWh/m^2 DD rif	133 kWh/m^2 DD rif	2017
	Primary School "J. Piaget" - (roof insulation)	kWh*Degree Day/m^2	143 kWh/m^2 DD rif	136 kWh/m^2 DD rif	2017
	Primary School "Zanella" - (roof insulation)	kWh*Degree Day/m^2	99 kWh/m^2 DD rif	94 kWh/m^2 DD rif	2017
Improvement of the EnPI in Public Lighting System	Lamp replacement in Pub.Light.	kWh/lamp	334 kWh/lamp	183 kWh/lamp	2020

—Figure 8 Energy Management Action Plan of Montecchio Maggiore Municipality

The energy performance target in buildings (Schools) included in the action plan is to reduce the thermal energy consumption by 361,08 GJ in 2017. The energy performance target in Public Lighting Systems is to reduce the electricity consumption by 2,709.72 GJ for 2020 through the gradual replacement of 4,047 lamps.
In order to fulfil these targets, the Municipality has developed internal Monitoring procedures supported by an internal online software focused on the monitoring, measurement and analysis establishing an operational control on the energy performance.

Direct Energy use	EnPI
Electricity in buildings, facilities and infrastructures	kWh/m^2 monthly
Electricity in Public Lighting Systems	kWh/light lamp monthly
Natural Gas in buildings, facilities and infrastructures	$kWht_h$*degree days/m^2 monthly
Fuel in vehicle fleet	Km/L monthly

—Table 2 EnPI defined for direct energy use

EnPI in the territory monitored by the SEAP activities (Energy Balance and measures)	
Total consumption of electricity	kWh/inh. per year
Electricity consumption by sector (residential, industrial, agriculture, tertiary)	kWh per year
Total consumption of natural gas	SCM per year
Natural gas consumption by sector (residential, industrial, agriculture, tertiary)	SCM per year
Fuel sales in private transport	Tons per year
Electricity RES production by sector (residential, industrial, agriculture, tertiary)	kWh per year; kWh/kWp
Thermal energy production by sector (residential, industrial, agriculture, tertiary)	kWh per year; kWh/m^2
Total energy consumption per capita	MWh/inh.
Total energy consumption in residential sector	MWh/inh.
Total energy consumption in industrial sector	MWh/company
Relationship between energy production from renewable sources (electricity and heat) and territorial gross final consumption	%
Relationship between buildings in class A in the municipal area and the total number of buildings	%
Energy efficiency measures on private buildings in residential sector	Number of energy efficiency measures; MWh saved/year

—Table 3 EnPI defined in the territory by SEAPs activities (Energy Balance, measures monitoring)

SEAP monitoring procedures have been developed according with the SEAP Monitoring and Reporting Guidelines established by the Covenant of Mayors initiative. The Municipality shall monitor the SEAP continuously and report the monitoring results to the Covenant of Mayors Office every two years starting from the formal approval of the SEAP by the City Council. In the first biennial monitoring report, the Municipality shall report the effectiveness of the SEAP measures planned. In the second biennial monitoring report the Municipality shall report the effectiveness of the SEAP measures planned and define a new energy

and emissions balance including energy consumption and emissions in LG and private sectors.

1.5 Internal and external communication

Montecchio Maggiore Municipality has made a great effort on internal and external communication of the EnMS+SEAP activities. Since the initial stages of the process, employees have been involved, trained and informed about energy policy and goals. At the same time, the Municipality established permanent roundtable with stakeholders of the territory in order to communicate externally EnMS+SEAP activities, results and goals achieved. The Municipality created a visual identity referred to the EnMS+SEAP and a specific webpage to communicate externally activities, targets and results.

Lessons learned

- The growth of awareness on energy issues in all the sectors involved by the EnMS is the most important achieved result;
- The direct relationship between operational control and monitoring phase gives to the Top Management the opportunity to take informed decisions based on specific performance indicators;
- Defining specific roles and responsibilities related to energy issues is the correct methodology to support the work coordinated by the Energy Manager
- The continuous monitoring of the energy performance of the LG and territory helps the Municipality to establish and share policies for a local sustainable development in partnership with local actors (citizens and stakeholders).

—Figure 9 The Covenant of Mayors step-by-step process

—Figure 10. Stage 1 of Certification of the Energy Management System in Montecchio Maggiore Municipality

—Municipality SEAP Logo	—50000and1SEAPs Project Logo

"Only the continuous monitoring of energy performance make possible to reduce energy waste and decide where, how and when act to improve energy efficiency."

—Eng. Sabino Petrillo, Energy Manager of Montecchio Maggiore Municipality