

# Global Energy Management System Implementation: Case Study

Latvia

## City of Daugavpils

*First ISO 50001 certified city with broad energy management system boundaries.*



### Business Case for Energy Management

City of Daugavpils is the second largest city in Latvia with population of over 94,500. It is located in the southeast close to borders with Lithuania and Belarus.

Municipality employs in total 5910 persons from those 218 are directly involved in the operation of the recently certified energy management system. On 9 December 2016 city of Daugavpils received ISO 50001. Certificate proves the existence of an EnMS in three main public sectors (boundaries) in the city:

- Public buildings (includes 100 buildings with the total heated area of 233 739 m<sup>2</sup>);
- Public street lighting system (with 9183 luminaires; total length of the system - 351 km);
- Public transport (over 90 vehicles for 32 bus and 3 tram routes).

Annual total consumption of electricity, heat energy and diesel fuel of these sectors are around 223 TJ (based on the average consumption of 2014 and 2015). This represents about 4.3 million USD of municipality yearly budget spent on energy in public buildings.

### Case Study Snapshot

|   |                    |
|---|--------------------|
| Industry  | Public authority   |
| Product/Service   | Municipality       |
| Location  | Daugavpils, Latvia |
| Energy Management System  | ISO 50001          |
| Energy Performance Improvement Period   | 1 year             |
| Energy Performance Improvement (%) over improvement period (expected)                 | 1.95               |
| Total energy cost savings over improvement period (expected)                          | 86,920 \$USD       |
| Cost to implement EnMS  | 13,474 \$USD       |
| Payback period on EnMS implementation (including costs for operation of EnMS in 2017) | 11 months          |
| Total Energy Savings over improvement period (expected)                               | 4359.6 GJ          |
| Total CO <sub>2</sub> -e emission reduction over improvement period (expected)        | 311.2 metric tons  |

**Drivers and history of energy reduction:** Before the EnMS was designed, selection and implementation of the energy efficiency activities in the city was chaotic. E.g. decisions for renovation of buildings were based more on available programmes and their requirements and less based on the energy performance.

However, due to the European and also national energy policy trends towards energy efficiency, energy efficiency was set as one of the priorities also at the city level in Daugavpils city Development Plan 2014-2020. To accelerate the changes in the city, Daugavpils joined an EU funded project “50000&1SEAPs” in 2014. The

idea of the project was to test a coherent approach – integration of EnMS with Sustainable Energy Action Plans (SEAPs) in different municipalities. In the framework of the project, city of Daugavpils received crucial support for development and implementation of the EnMS, including methodology; procedures; training etc.

Meanwhile in early 2016, a new national Energy Efficiency Law was approved in Latvia. The Law foresees that nine Latvian cities, including Daugavpils, are obliged to implement a certified EnMS until April 2017. As Daugavpils had already started designing EnMS, the new requirements just accelerated the whole process in Daugavpils.

As a signatory of the Convent of Mayors<sup>1</sup>, municipality has voluntarily committed to reduce GHG emissions in the whole territory of the city until 2030 by 40% compared to 2010. Therefore, implementation of the EnMS is only one of the first activities that municipality has selected and included in the SEAP to achieve ambitious CO<sub>2</sub> emission target of the city.

*“Implementation of ISO 50001 in our municipality is a message to our inhabitants that the local government cares about their well-being and the environment. It also gives a positive example to others to make an efficient use of energy integral part of their daily life.”*

—Jānis Lāčplēsis, Mayor of the city of Daugavpils

Besides targets and legal regulations, the implementation of EnMS has been driven by the interest to use public resources more efficient, including public money spent on energy. Before the whole process, hardly any person in the city administration was aware of the real energy costs and their potential to reduce them.

Finally, EnMS allowed improving the image of the municipality. As a public authority it can act, inform and show good example to the citizens how to improve

energy use, impact on environment and climate and efficient use of public funds.

In the same time, Daugavpils gives a positive example to other municipalities, businesses and individuals to make an efficient use of energy integral part of their work and daily life.

### Business Benefits Achieved

City administration has made a big step towards sustainable and climate friendly governance by implementing the EnMS and setting ambitious targets.

As the EnMS is implemented recently, the quantitative results will be available only at the end of 2017. However, already during the establishment and development of the EnMS, major improvements were achieved. Firstly, responsibilities and communication was established among different key players, especially regarding collection, storage and analysis of the monthly energy data. It was crucial as historically nobody was responsible for centralized energy consumption data collection and analysis. Therefore also energy efficiency measures were not implemented on regular basis.



Vice-Mayor receives ISO 50001 certificate

*“EnMS for us is a green thinking tool that helps targeted CO<sub>2</sub> reduction”*

—Pēteris Dzalbe, Vice-Mayor of Daugavpils

Forecasted energy savings due to implementation and operation of the EnMS in 2017 are 4.3 TJ. This leads to the energy cost savings of 86,920 USD, and a simple payback time of 11 month. The total CO<sub>2</sub> emission savings are expected to reach 311 metric tons.

<sup>1</sup> EU co-operation movement involving local and regional authorities to implement EU climate and energy objectives in their territory

## EnMS Development and Implementation

The EnMS in Daugavpils was certified in December 2016. Though several energy efficiency measures were already implemented, e.g. in public buildings, no clear management system was in place.

### Organization and resources

The first step in the EnMS process was the formation of a functional, well-organized and structured EnMS team and assigning of the responsibilities. Currently the team consists of 10 representatives from six different departments (Development, Real Estate, Public Utility, Transportation, Education, and Procurement). The main task of the team is to supervise operation of the EnMS and act. The chair of the EnMS team as well as the representative of the top management is the vice-mayor.

The next step was creation of a new job position of an Energy Manager. The responsibilities of the Energy Manager (EM) were to assist and ensure EnMS development process, as well as the implementation. Currently the EM is the core of the EnMS team and the key player of a successful ongoing EnMS in Daugavpils.

*“Initially it was a tough explanatory work with employees. But I couldn’t be happier that afterwards I got tips from them for further improvements of EnMS.”*

—Helena Trošimova, Energy Manager at Daugavpils

All the ISO 50001 standard requirements including different procedures are documented in the EnMS manual. Though some of the instructions existed before the EnMS, they were not fully respected and operational. Moreover, energy saving improvements were not ensured systematically and hardly ever reported. Current EnMS ensures systematic approach and optimized human resources. Additional resources for the implementation of EnMS were not needed.

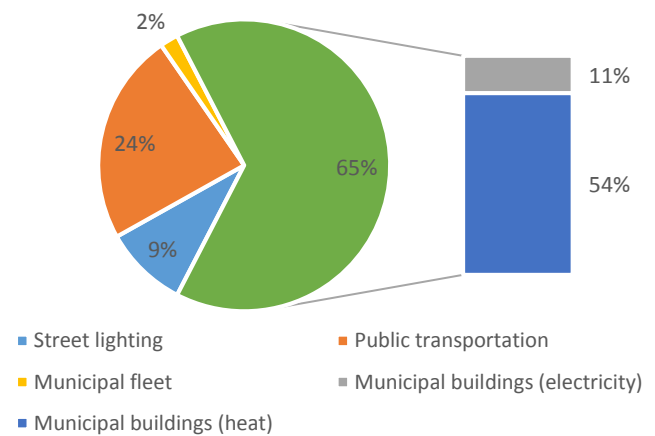
### Energy review and planning

The work on energy review started with the development of Sustainable Energy Action Plan for the

city of Daugavpils in 2015. It included annual energy data gathering not only for municipal sector, but also for residential, tertiary and industrial energy users in the city. Establishment of a detailed energy review for EnMS boundaries started in early 2016.

Collection of historical energy consumption data for 100 buildings, 140 lighting lines and public transportation units and municipal fleet took around six month.

For the EnMS historical monthly energy consumption data were collected for 2012-2015. The total yearly final energy consumption in Daugavpils is 223.2 TJ. The energy consumption distribution between different EnMS sectors is shown in the graph below. 65% of the total energy consumption is used in public buildings mainly for heating purposes.



The EnMS boundaries were defined based on the energy distribution. The EnMS baselines for different sectors were selected based on the historical data for time period of the last three years, and with the most representative data and situation. To evaluate the changes following main energy performance indicators were selected:

- ✓ for buildings: monthly energy consumption, specific heat consumption with climate correction kWh/m<sup>2</sup> year; specific electricity consumption kWh/m<sup>2</sup> year;
- ✓ for public lighting: monthly electricity consumption, specific electricity consumption kWh/dark hours/real operation time per month;
- ✓ for transport: monthly fuel consumption by type, specific fuel consumption l/100 km; energy per passenger-km.

Despite the fact that the EnMS has been implemented recently, Daugavpils has set solid and quite ambitious targets for 2017:

1. To reduce the energy consumption by 3% (3.8 TJ) in 10 municipal buildings with the highest energy consumption;
2. To reduce the electricity consumption by 1% (0.2 TJ) in 10 public lighting lines;
3. To reduce consumption of diesel fuel by 1% (0.4 TJ) in the public transportation.

In order to fulfil these targets, Daugavpils has developed a yearly action plan for 2017 with the most urgent and systematic measures.

One of the main tasks is to continue with improvement and elaboration of the EnMS procedures and documentation, especially regarding the energy data collection and analysis. Another task is development and implementation of specific Action Plans (inventories) for each of the 10 municipal buildings, public lighting lines, and public transportation. Such action plans will ensure concrete and direct approach with the most significant energy users to identify and prioritise potential energy efficiency measures. Moreover, Energy Manager will be able to test different communication approaches and skills.

#### Cost-benefit analysis

The work on EnMS development started early in 2016, and at the end of the year Daugavpils was certified. The total implementation costs were 13,474 USD. The cost distribution by different categories is presented in the Table below.

| Cost category                          | Costs, USD |
|--|------------|
| Internal staff time for development    | 3357       |
| Internal staff time for external audit | 1672       |
| Online energy monitoring platform      | 1762       |
| Third party audit costs                | 3242       |
| Technical assistance                   | 3441       |

Almost half of the costs were allocated for the establishment, and 10% for the implementation of the EnMS. The whole development process of the EnMS required three persons work for six month in close collaboration with the external experts. For the EnMS monitoring and evaluation purposes Daugavpils is using an Online Energy Monitoring Platform (OEMP). The costs of the OEMP include energy data storage and subscription for 12 months, historical data entry as well as the trainings and consultations for all users.

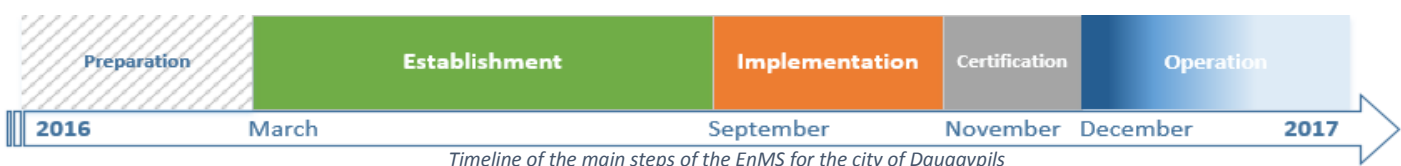
The council of Daugavpils has allocated 67.5 thousand USD in 2017 for EnMS actions showing a strong commitment to maintain the EnMS. Therefore total investments in EnMS since the creation of EnMS until 2017 reach 81,014 USD.

The expected energy saving of EnMS implementation in 2017 are 4.3 TJ. This leads to a simple payback time of 11 months.

#### Improvements in energy performance & result validation

The OEMP is used to determine the energy savings within EnMS. It identifies the changes in specific energy consumption by normalizing heat consumption data to the weather conditions. It is especially important in the countries with colder climate like Latvia. For the assessment and comparison of the buildings, specific energy consumption is estimated and used – kWh/m<sup>2</sup> year. Energy manager uses 12 month period to calculate energy savings. In 2017 only total energy savings of public lighting sector and public transportation will be calculated due to the limited availability of the specific data for calculation of energy performance indicators.

According to the Energy Efficiency Law, Daugavpils annually will submit the EnMS evaluation report to the Ministry of Economics. Municipality has to report the information regarding implemented energy efficiency measures and the actual energy savings (MWh) within

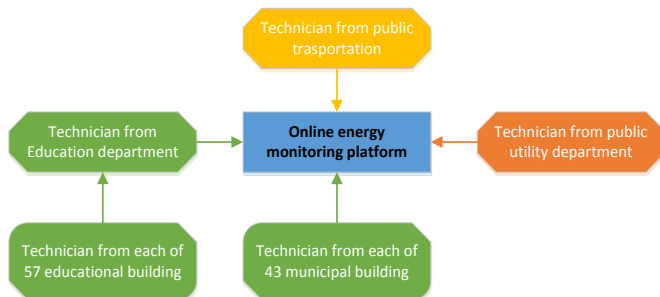




EnMS.

### Operational control & energy performance sustainability

The core of the operational control is ensured through the Online Energy Monitoring Platform. Technical managers of all public buildings as well operator of the street lighting and of the public transport utility have been assigned the responsibility to insert monthly energy consumption data. Specific local ordinance was issued with instructions when and how the energy data should be entered into the OEMP. Each of the responsible technical manager was trained how to enter and analyze the monthly energy data.



Also, for each of the EnMS sector a deviation from energy baseline is set. Energy Manager has the overall access to the account of the municipality in the OEMP and monitors the deviations in energy consumption. If the deviation of monthly energy consumption is above/below threshold, Energy Manager takes further action according to the respective procedure.

### Development & communications

Daugavpils has put a large effort in training and motivation of the internal staff, as well as in communication with the public and sharing experiences with other stakeholders using inner expertise as well as external consultants.

**Employee engagement:** Since the initial stages of the development of the EnMS, employees have been involved and informed, e.g. about the energy policy and goals. Energy Manager provided Energy Tips to show how employees can reduce their energy consumption at work. All the employees directly involved in the energy

management system, received also specific training in using Online Energy Monitoring Platform.

Moreover, Energy Manager together with other experts has also ensured specific trainings for the technical staff of the public buildings during Energy day and Energy forum.

**Professional expertise:** Daugavpils has collaborated with the experts from a private consulting company Ekodoma. Ekodoma as the country coordinator of the EU project "50000 & 1 SEAPs" (2014-2017) provided assistance to the city of Daugavpils throughout all development and implementation process of the EnMS, including trainings of employees. Moreover, Ekodoma provides and ensures access to the Online Energy Monitoring Platform.

**Communication with the public and other municipalities in Latvia and abroad:** All stakeholders including residents are invited to participate in the events organised by the council, e.g. Energy forums, Energy days etc.

Information about the EnMS is published on the website of the municipality. Wider society is also informed through the local online news and local TV.

The experience in implementing and certifying EnMS is has already widely shared with other Latvian municipalities in different workshops and forums at local and national level as well internationally.

Exchange of experience is also planned with delegations from abroad and the first meeting with the representatives of the City of Tartu (Estonia) is planned soon.

**PADOMI ELEKTROENERĢIJAS TAUPĪŠANAI**

- Izvēlieties gaisma, kad tā nav vajadzīga.
- Taisiet logus un durvis cieši, kad iesildāties kondicionierī.
- Sadedzinot laukstienī ierīcēm, izvēlieties un uzstādiet tīkai nepieciešamo uguns daudzumu.
- **Neaizmirstiet iekārtas "gaidīšanas režīmā".** Gaidīšanas režīms (Stand by) samazina enerģijas patēriņu, taču ne ekonomiski visādevīgākajiem pasākumiem, jo tas nepasargā augstas investīcijas, bet spēj samazināt vadoji 10% no kopējā elektroenerģijas patēriņa.
- **Neaizmirstiet elektroierīces ieslēgtas kontaktligzdā.** No stāvas ierīcēm ir iespējams izslēgt enerģijas patēriņu, turpinot enerģijas patēriņu. Lai gan televizoru izslēdzot ar pults, tas tik un tā patērē enerģiju. Enerģijas patēriņš centra aprīkē ierīcēs, kā piemēram televizoru darbināšanai nepieciešams 500 W (gaidīšanas režīmā 50 W), 32 collu LCD televizoram attiecīgi 200 W (gaidīšanas režīmā 20 W), LED televizoram – 29 W (gaidīšanas režīmā režīmā patērēti nelieli). Naudas izdevumi, piemēram, atbilstošas visu diennakti gaidīšanas režīmā, mēneši izmaksā aptuveni 6 eiro. Samēdziet vairākas elektroierīces vienā daudzā rozes sadalījā, lai tos atkārt izslēgtu.
- **Neaizmirstiet logus un nāvēt lampas.** Tīri logi uztur labāku gaisma replādi un tīri gaisma ierīcēm pasargā no darbības efektivitāti.
- **Izvēlieties jaunu elektroierīci,** pievienot uzmanību energomarkējumam. Iegādājieties jaunus elektroierīci ar augstu energoefektivitātes klasi.
- Kontrolējiet elektriskā bojāna darbību, samaziniet bojāna uguns temperatūru un izmantojiet ekonomisku uguns sildīšanas programmu. Mazāk lietojiet karsto ūdeni. Nākamais solis būtu apsvērt enerģijas pāreju uz citiem karstā ūdens sildīšanas veidiem, piemēram, saules kolektoriem.
- **Enerģiju taupīšanas spēlētāji ir ekonomiski izdevīgi.** Uzstādot energoefektīvu gaisma ierīci, kompānijas kumērodotas spēlētāji 80.5% vai LED.
- **Leduskausis un saldētava** jānovieto pēc iespējas tālāk no dzīvības siltuma avotiem. It īpaši jāņem vērā apstākļi, kas ietekmē leduskausis, piemēram, lai vecāku siltuma izdevumi un pasargātu leduskausis energoefektīvi. Putekļu siltuma var patērēt par 30% vairāk elektroenerģijas.
- **Uzstādot atbilstošu sildīšanas temperatūru (+18°C).** Ar katru pazemināto grādu enerģijas patēriņš pieaug par – 5%. Regulāri jāatkausa leduskausis un saldētava, kam nav automātiskā atkausēšanas režīma, ja ledus slānis biezums ir 3-5 mm.

*Energy Tips about saving energy at work for the employees*

## Tools & resources

In order to address and ensure continuous energy data availability, Energy Manager and involved technical staff uses Online Energy Monitoring Platform (OEMP). The OEMP is designed specifically for local authorities and includes main energy consumption sectors: public buildings, street lighting, public and municipal fleet. The objective of this tool is to support municipalities to set up their own database of the main sectors addressed by EnMS and monitor their monthly energy consumption and estimate savings within EnMS. Currently the Platform is available in Latvian and English and includes database of different fuels, input values, different user categories, web based illustrations of the performance indicators, as well as options like to export data to Excel and reporting.



Example of analysis about a municipal building provided in the Online Energy Monitoring Platform

The platform can be used as database but it also allows easily view and analyse inserted data. For example, each user can monitor their building monthly and yearly

electricity and heating consumption trends and compare it to the baseline as well as to other buildings in the municipality. Consumption is also analysed against the outdoor temperature, a very important factor influencing energy consumption in the heating season as the temperatures in the winter can fall below -25°C in the municipality.

## Lessons Learned

### Keys to Success

- Interest and involvement of the top management in creation of EnMS since the beginning of the process;
- Assignment of a young and motivated energy manager;
- New mandatory rules for certification of energy management systems in the nine cities in Latvia;
- Involvement of experienced consultants.

### Further steps for expand boundaries

- Even if the current boundaries are large, municipality will expand them and include also municipal capital companies, like hospitals etc.

### Tips

- Find an interested representative in the top management to have support;
- Consider EnMS as an opportunity and not as a burden;
- Appoint the right person as energy manager, i.e. open, communicative and;
- Find sites/municipalities where EnMS has been introduced to get first impressions.

Through the Energy Management Working Group (EMWG), government officials worldwide share best practices and leverage their collective knowledge and experience to create high-impact national programs that accelerate the use of energy management systems in industry and commercial buildings. The EMWG was launched in 2010 by the Clean Energy Ministerial (CEM) and International Partnership for Energy Efficiency Cooperation (IPEEC).

For more information, please visit [www.cleanenergyministerial.org/energymanagement](http://www.cleanenergyministerial.org/energymanagement).