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Round table

EE in public buildings – from inventory to implementation of measures

Bishkek, 16 July 2024

Energy management systems for municipalities – legal and technical aspects

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Expert in EMS, SECCA

Stantec | intec | ACTED | European University Institute | Robert Schuman Centre for Advanced Studies | FSR Energy | Florence School of Regulation

Content

1. What is energy management
2. International standard MN ISO 50001:2019: main requirements
3. Practical examples: energy management in municipalities

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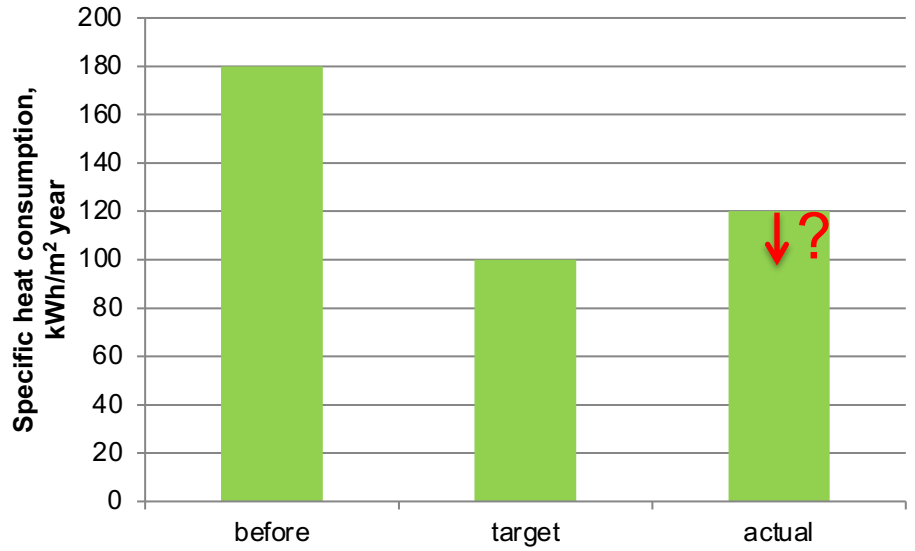
What was and still is the Starting point (motivation) towards energy management in different municipalities?

One of the reasons: Failure to reach targeted heat consumption

Grant for renovation of a public building - target values are set (kWh/m^2 year)

1 year later



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What was and still is the Starting point (motivation) towards energy management in different municipalities?

HOW TO ACHIEVE THE TARGET: WHAT ARE THE OPTIONS?

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Every municipality should have an energy management system in place

1. Energy management system ensures rational use of energy and reduction of energy costs
2. Energy management system defines clear roles and responsibilities
3. Certified energy management system ensures continuity

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1. **Energy management system ensures rational use of energy and reduction of energy costs (and leads to improved to air quality)**

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Municipality with one public building

City council

- 2 story building built from white bricks
- Consumes heat and electricity
- Has different equipment, e.g. ventilation, printers, lighting etc.
- Has its own history
- Has its “guardian” – technical person

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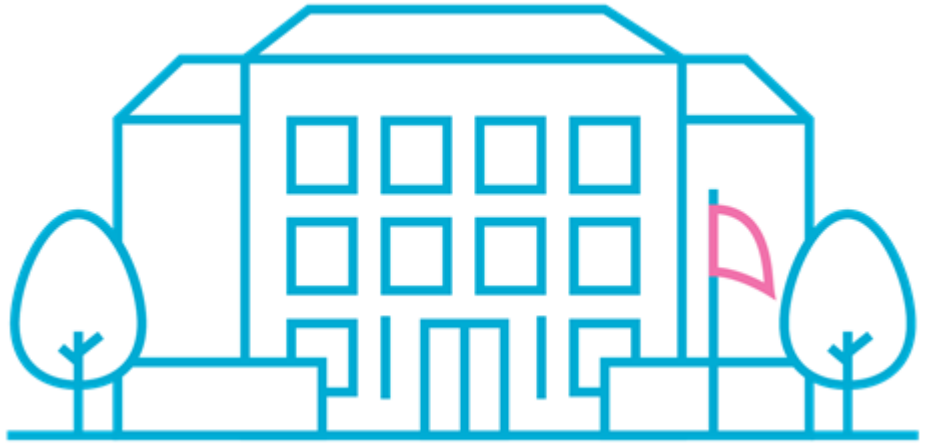
Municipality with two public buildings

City council

- 2 story building built from white bricks
- Consumes heat and electricity
- Has different equipment, e.g. ventilation, printers, lighting etc.
- Has its own history
- Has its "guardian" – technical person



School

- 3 story building built from red bricks
- Consumes heat and electricity
- Has different equipment, e.g. coal boiler, electrical boilers, lighting, sport hall etc.
- Has its own history
- Has its "guardian" – technical person

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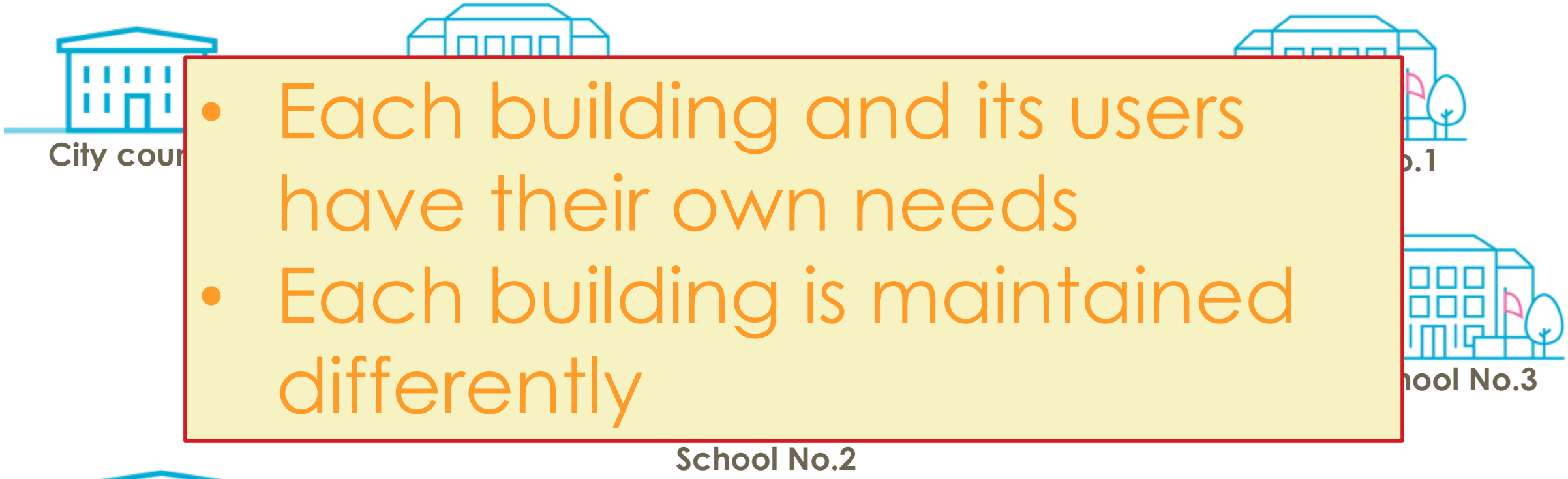
Municipality with a lot of public buildings



- Each building and its users have their own needs
- Each building is maintained differently

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The challenges

At the building level:

- Is the building maintained as well as possible?
- Is heat consumption known? We consume a lot or average?
- Is electricity consumption known?
- Is air quality good?
- Are rooms well ventilated?
- Is lighting appropriate?
- Is system regulated so that there is less heating ensured during the weekends (if building is not used)?

Etc.

At the municipal level:

- Are all buildings maintained as well as possible?
- Do we know heat consumption in each building and how it changes?
- Is electricity consumption known for each building?
- Do we know how much we pay monthly/annually for energy?
- Is air quality good in all schools and kindergartens? Are rooms well ventilated?
- Is lighting appropriate?
- Is system regulated so that there is less heating ensured during the weekends (if building is not used)?
- Etc.

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What often happens at the building level…

- Kindergarten built in 1970-ies
- Renovated in 2015
- 120 children
- 1566 m^2
- Heat consumption before renovation – 206 kWh/m^2 year
- Heat consumption after renovation (from energy audit) – 99 kWh/m^2 year
- Real consumption 4 years after renovation – 180 kWh/m^2 year
- Building is overheated and ventilation is ensured through open windows
- Automatisation of the heating system was not connected
- Annually lost around 5000 EUR

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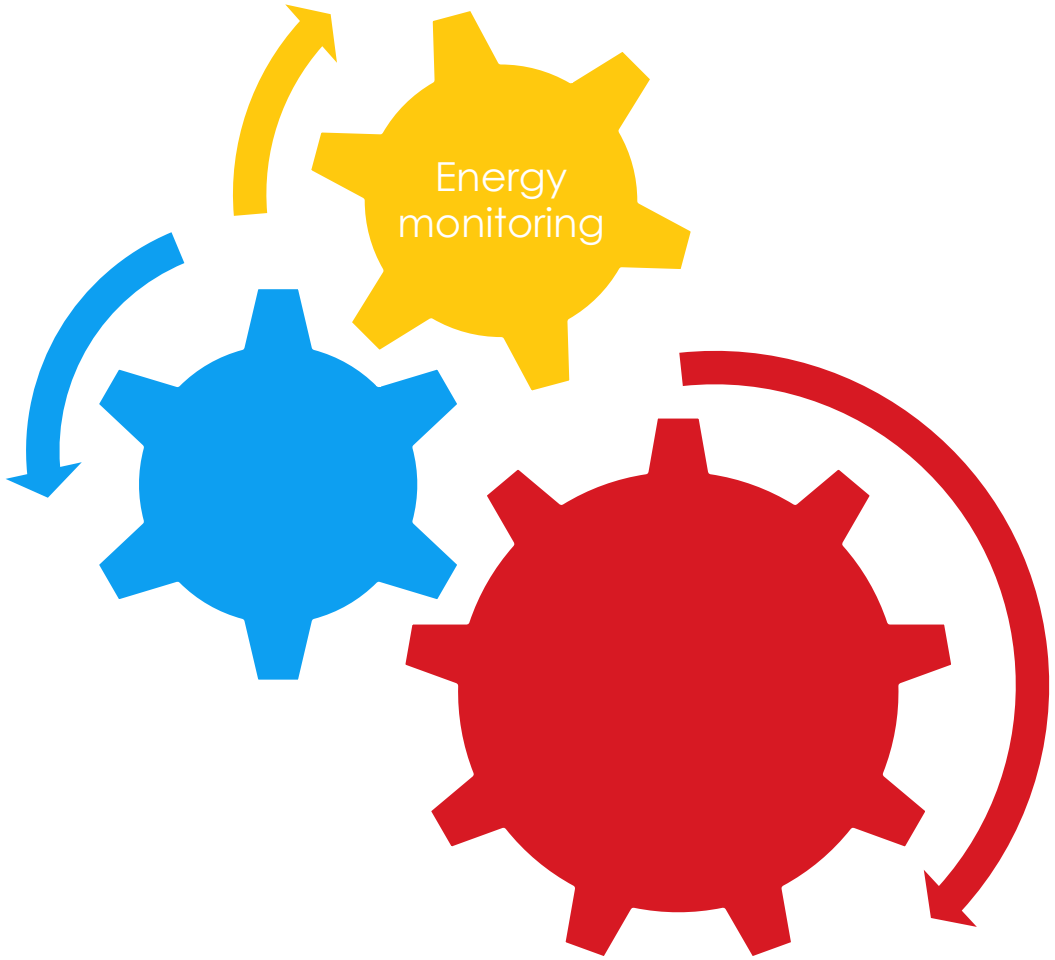
What can help?



Energy monitoring is crucial as you can influence only that what you measure

But it is not enough…

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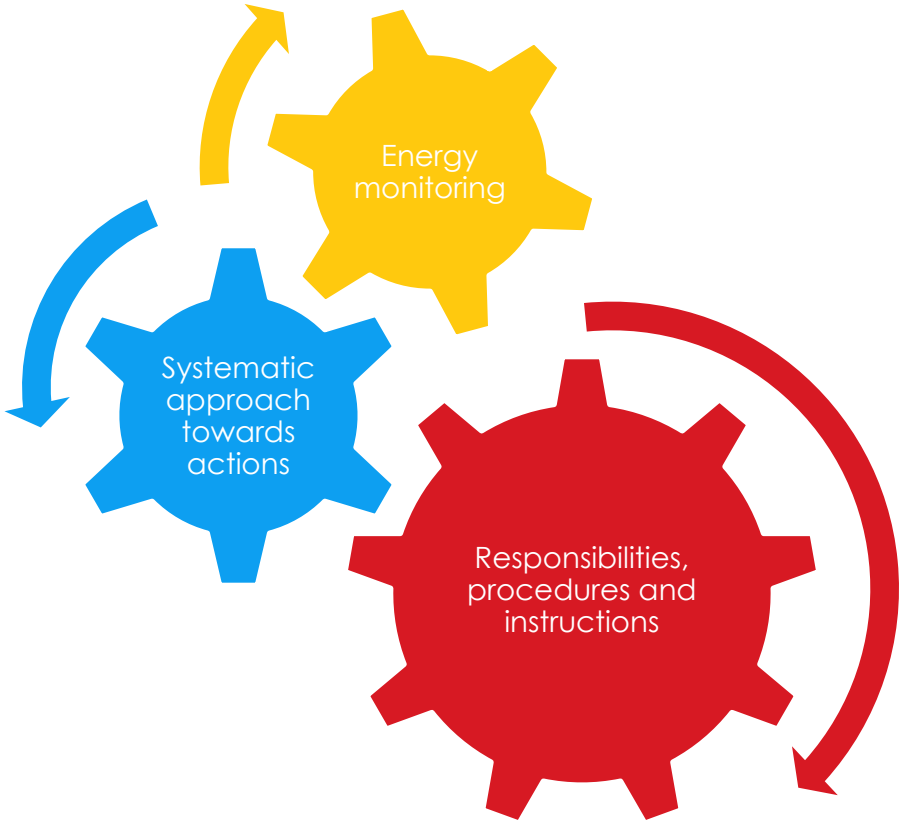
What can help in this case?



1. Rational use of energy - targets
2. Efficient and effective actions
3. Use of available resources

Introduction and implementation of Energy Management System

Energy Management System will address challenges like:

1. How many public buildings there are?
2. What is their heat consumption? Do we use it rationally?
3. What is their electricity consumption?
4. How much do we pay for energy in public buildings?
5. What is the air quality in these buildings?
6. Which buildings should be renovated?
7. How to ensure that these buildings are maintained as well as possible?

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What can we save with energy management?

- Until 3% per year?
- 3-8% per year?
- Until 10% per year?
- Around 15-20% per year?
- Above 50% per year?

The main point of Energy Management System (EnMS) is to introduce systematic approach towards rational use of energy with available resources, i.e. with small investments and behavior change. Once it is done, municipality can plan large investment projects based on real data and needs!

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2. Energy management system defines clear roles and responsibilities

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The role of International standard MN ISO 50001:2019: why it was made?

The ISO 50001 was designed to allow any organisation to pursue, following a systematic approach, the **continuous improvement of its own energy performance**, including:

- *More efficient energy use and better use of the organisation's energy consuming assets;*
- *Energy efficiency;*
- *Reduction of energy costs.*

- Based on the core concept of continuously improving energy performance, the **ISO 50001 standard defines and addresses the most important requirements towards energy use and consumption**, including
  - measurement
  - procurement
  - documentation
  - design
  - equipment
  - processes and personnel
- All these issues can affect the energy performance of any organisation

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Plan-Do-Check-Act (PDCA) approach

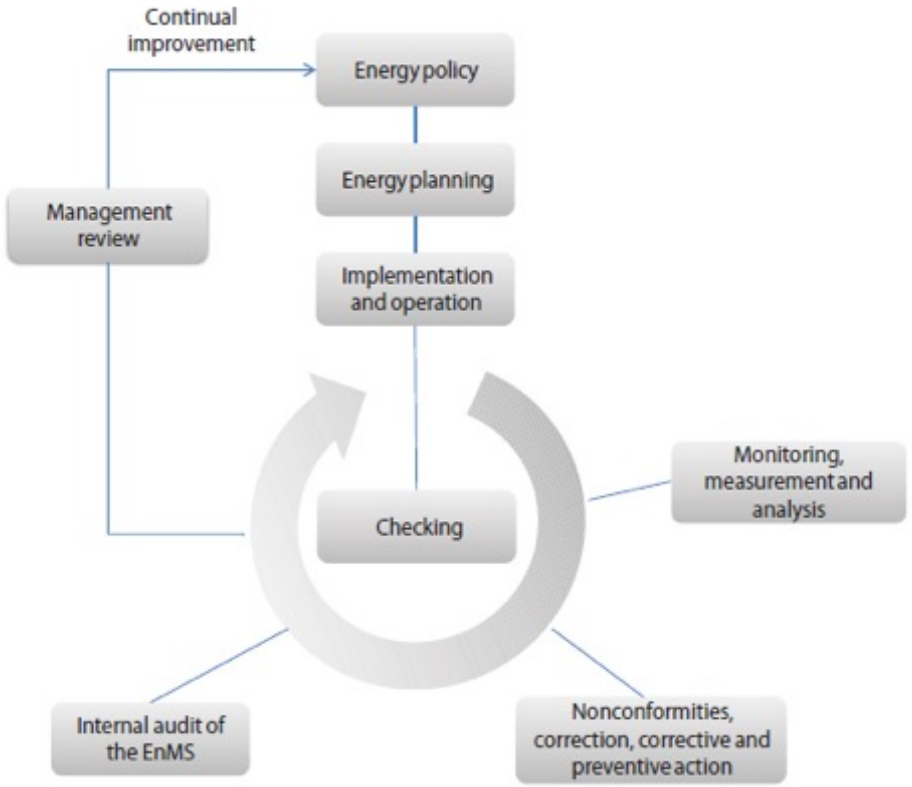
The ISO 50001 standard is structured according to the general Plan-Do-Check-Act (PDCA) approach

Plan: establish energy balances of the LA's assets, as well as define necessary objectives, targets and action plans that will improve energy performance

Do: implement an effective energy management action plan

Check: provide a methodological and operational approach for monitoring and analysing the energy performance of the LA

Act: continually improve the LA's energy performance with the aim that the EnMS becomes not just a niche tool, but rather actually an integral part of the administration's Energy Policy and day-to-day operations



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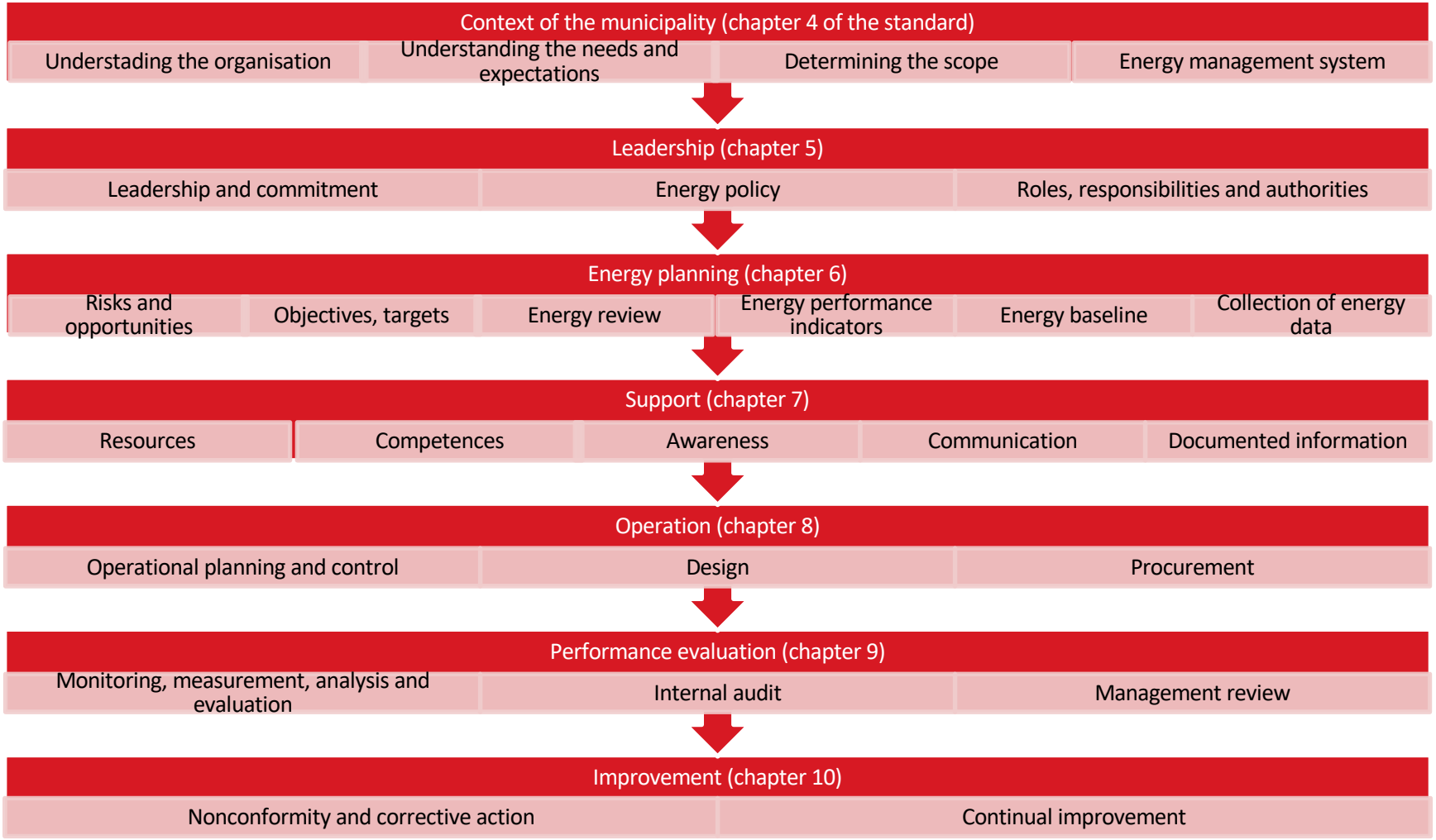
The main elements of MN ISO 50001:2019



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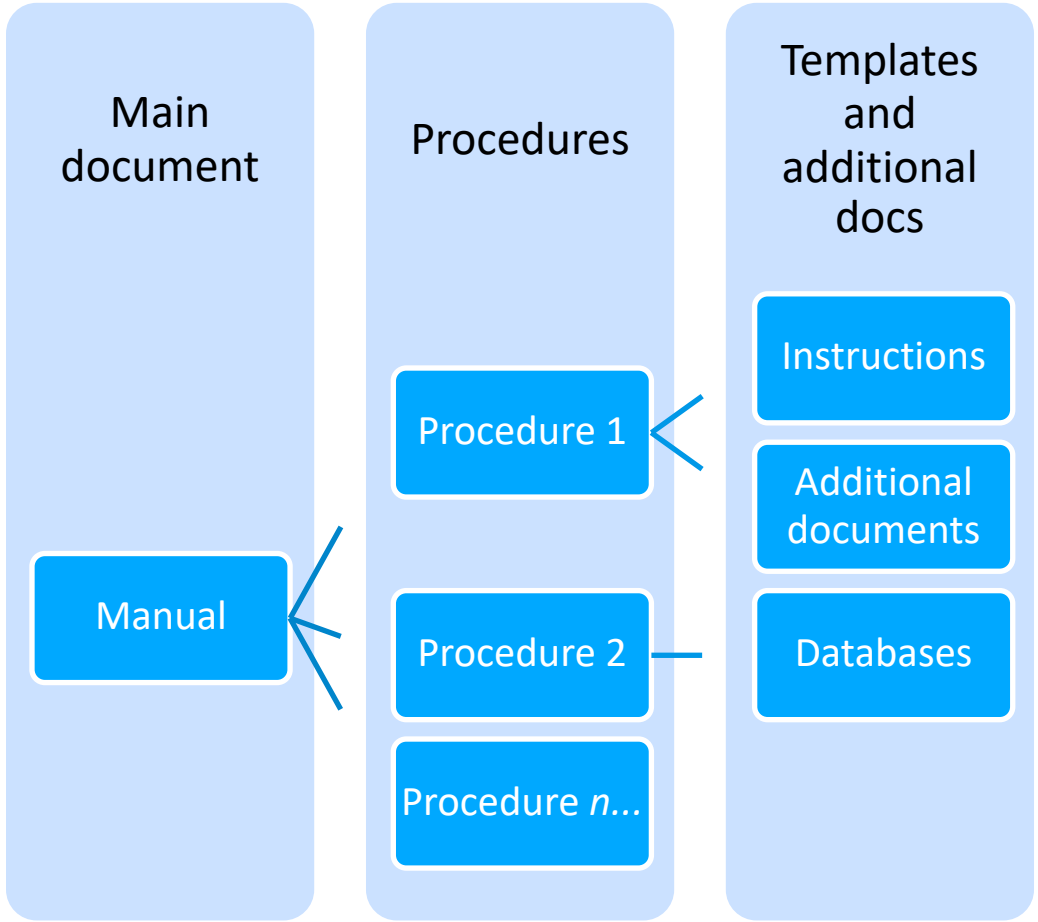
What does the EnMS look like?



Documentation of an EnMS

- Common elements found in many other ISO management system standards
- Organisation is given some degree of flexibility in how it actually implements the EnMS
- This flexibility helps make EnMS to be a so-called “organic system” made up of documents, processes, people, physical and organisational boundaries, energy objectives and targets

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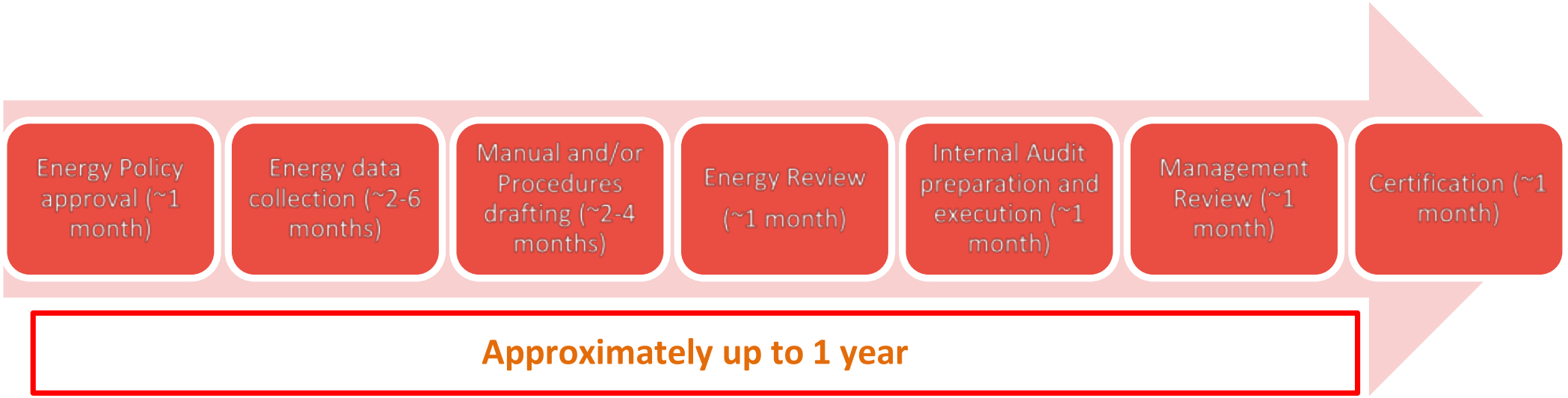
From decision to Certification



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3. Certified energy management system ensures continuity

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An example from a municipality with certified ISO 50001

Case Study Snapshot	
Industry	Public authority
Product/Service	Municipality
Location	Daugavpils, Latvia
Energy Management System	ISO 50001
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_2-e emission reduction over improvement period (expected)	311.2 metric tons

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Business case for Energy Management

- 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^2);
- 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).

"Implementation of ISO 500001 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

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Business benefits achieved

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

A simple payback time of 11 month

The total CO_2 emission savings are expected to reach 311 metric tons

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

Vice-Mayor receives ISO 50001 certificate

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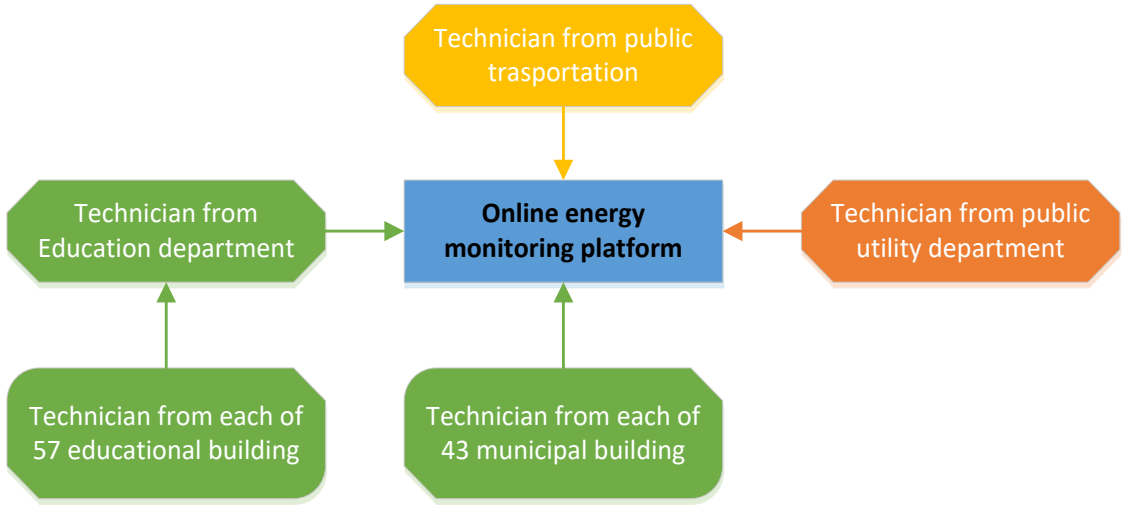
How to operate energy management system?

- **Operational control & energy performance sustainability**
- The core of the operational control is ensured through the 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 energy monitoring platform
- Each of the responsible technical manager was trained how to enter and analyze the monthly energy data



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Continuity in Daugavpils

Establishment, implementation and certification

Operation, surveillance and continuous improvement

- Supervision audit in 2017
- Supervision audit in 2018
- Supervision audit in 2019
- Recertification in 2020

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