sec-bench

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Sustainable Energy Communities

Benchmarking of energy and climate performance indicators on the web

A guide to the process

Intelligent Energy Europe

Preface

This document is both a publishable brochure that describes the SEC-BENCH project and its objectives, working methodology and partners which should be widely disseminated to European municipalities, e.g. to the Covenant of Mayors signatories. The brochure is at the same time a technical guideline on the process of using indicators and benchmarking methodologies and tools for municipal buildings an integral part of the development of SEAPs.

Regular collection, analyses and benchmarking of bottom-up energy data from municipal buildings is probably the most Critical Success Factor (CSF) for a continuous realisation of the energy efficiency potential in municipal buildings, and thereby saving costs for the municipality. However, benchmarking of municipal buildings can also be useful in several other contexts, e.g. in the approach to the building energy labelling scheme, development of SEAPs, establishment of internal energy management systems etc.

During the SEC-BENCH project, the data collection routines have been tested in 23 pilot communities from 8 countries across Europe. Our experiences show that this data collection is a rather complex process to implement as a regular routine in the municipality, and there are three main barriers to this:

- Firstly there is a lack of meters that can give a reasonably correct picture of the system borders and energy flows for the various end-use types in the buildings. ***Most municipalities require technical assistance from external consultants for defining of system borders and mapping of the energy flows***. However, this is a one-off exercise which normally should be covered by a traditional energy audit.

- Secondly, there is the shortage of staff to physically collect all this energy data on a sufficiently frequent basis. In order to be able to stay hands-on with the energy performance of every building in a municipality at all times, such data should ideally be collected at least one per day!! ***Obviously, the only possible answer is to install smart meters and automated Energy Monitoring Systems (EMS).***

- Thirdly, there is a lack of in-house knowledge in the municipalities to interpret the collected data and to present them is a way that makes sense to different technical and administrative levels in the municipality, which of course is a precondition for taking necessary, corrective actions. The ***SEC-BENCH benchmarking system presents a number of useful and easy to understand indicators which can help decision-makers understand and act.***

In order to stimulate a large scale, dynamic and constant improvement of energy performance in municipal buildings in Europe, all these barriers needs to be removed***. A useful start would be to make it mandatory for all European municipalities to introduce Energy Management in accordance with EN-16001***. A crucial part in such a system will be the availability and – quality of bottom-up energy data.

Although state-of-the-art EMS pay-back times are short as they are (2-5 yrs), the extra added value that could trigger a large scale implementation would be significant if such EMS systems were linked to a Europe-wide benchmarking system. The EMS technologies are in place! So is the SEC-BENCH benchmark system which is prepared for a large scale roll-out!

*Our company's vision "**Energy Management – Powered by NEPAS"** reflects our ambition to make a difference, and together with our SEC-BENCH partners we believe that this project have brought us at least a small step further towards achieving this.*

Hans Jacob Mydske
SEC-BENCH Coordinator and
Managing director, NEPAS

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The SEC-BENCH project

The SEC-BENCH project started in November 2007. Its duration is 30 months with a total budget of €838.669. The project is co-financed at a rate of 50% by the Intelligent Energy - Europe programme of the European Commission. The full title of the project is: “Sustainable Energy Communities – Benchmarking of energy and climate performance indicators on the web”.

Local communities have a significant potential in terms of saving energy and converting to more sustainable energy sources, especially in their own buildings and technical installations. SEC-BENCH will to develop a web-based benchmark solution to help local communities to identify, plan and realise this potential.

Objectives

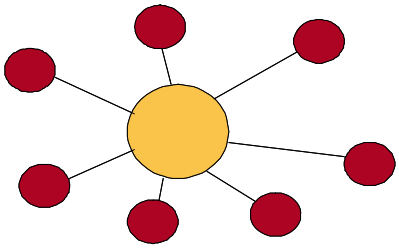
The main objective of the SEC-BENCH project has been to develop a web-based tool that will help municipalities to realise their potential in terms of energy savings and conversion to renewable energy sources in their own buildings and technical installations.

Main Steps

The project has followed the following main steps in order to achieve its objective:

- Establishment and/or operation of energy networks between municipalities
- Carry out pilot energy and climate plans, with a main focus on municipal buildings
- Development of energy performance indicators
- Development of a web-based benchmarking scheme
- A series of dissemination activities to involve all relevant stakeholders at local, regional, national and international level.

Achieved Results

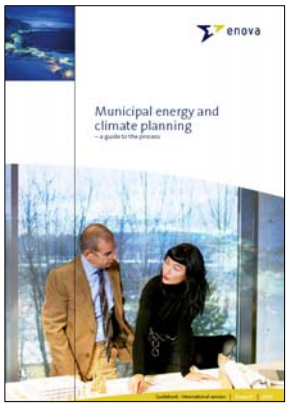


Networks

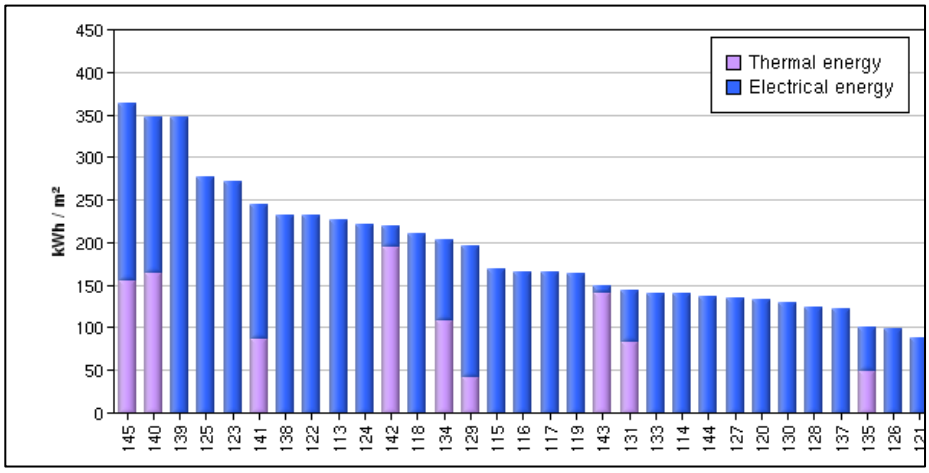
Benchmarking requires a critical mass of involved objects to make sense, and working together through networks is a good approach. The SEC-BENCH project has covered the establishment and/or operation of national energy networks in 7 partner countries. Our aim has bee to involve a significant number of municipalities and their local stakeholders in every national network.

Energy Planning – Development of SEAPs

The SEC-BENCH project has reviewed existing planning models and recommends to make use of the practical guide on local energy planning that was prepared as part of the completed 3-NITY project. This guide can be downloaded from www.nepas.no

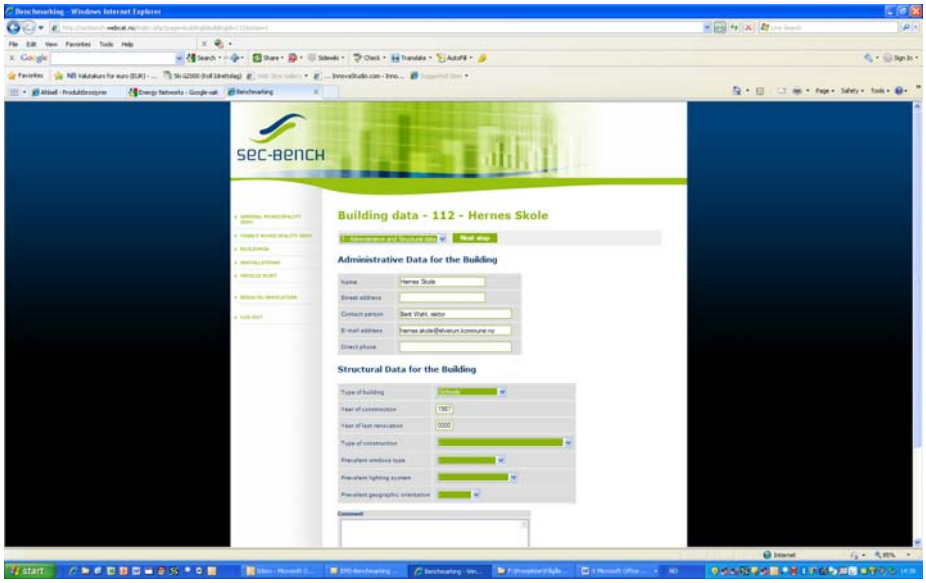


The SEC-BENCH project is about energy performance of municipal buildings, which is an important element of a SEAP. The SEAPs developed by the SEC-BENCH pilot communities have primarily been focusing on this element as well.



Indicators
The SEC-BENCH project has assessed existing indicators as well as any available long term data-series for the partner communities. Moreover, it has prepared a proposal for data collection routines, data processing as well as presentation of relevant indicators.

Web-Benchmarking
The SEC-BENCH project investigated existing benchmark solutions for municipal buildings, but could not identify a system with the bottom-up approach we believed was necessary to be successful. We therefore decided to develop a new web-based benchmark tool for municipal energy- and climate indicators from scratch.

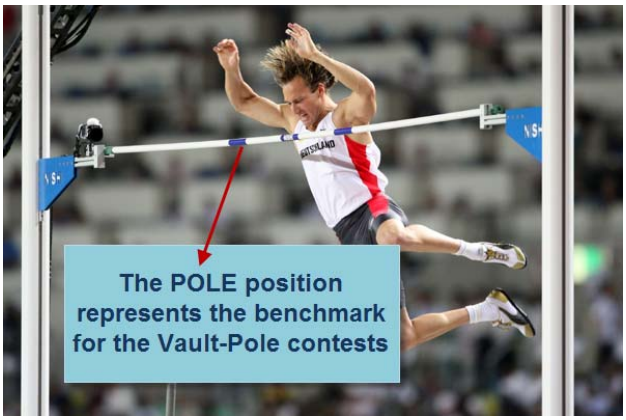


Main lesson learned

Benchmarking the energy performance of municipal buildings is indeed interesting and very useful for the municipalities, and can contribute to realising a huge energy and cost saving potential. The benchmarking must be based on real, bottom-up, energy data which is difficult to collect because the municipalities have severe difficulties to find the time and staff to actually do this important job. However, there are ways to deal with these challenges, and the next step should be to make better use of improved, low-cost technologies in the framework of the new Energy Management standard EN-16001.

Benchmarking as a tool in developing SEAPs

What is a benchmark?



Litterally a benchmark is a mark on a stone post or other permanent feature, at a point whose exact elevation and position is known.

So, more in general a benchmark is a criterion by which to measure something; a standard; a reference point.

Benchmarking Practice

Benchmarking is widely used in the business – marketing sectors, and is the process of comparing costs, cycle times, productivity, or quality to another that is widely considered to be an industry standard benchmark or best practice. Essentially, benchmarking provides a snapshot of the performance of your business and helps you understand where you are in relation to a particular standard.

The performance is measured by using specific indicators: energy or cost per unit of measure, productivity per unit of measure, defects per unit of measure resulting in a measure of performance that is then compared to others.

The "best practice benchmarking" is a process in which organizations evaluate various aspects of their processes (or real estates) in relation to best practice companies' processes/estates. This then allows organisations to develop plans on how to make improvements or adapt specific best practices, usually with the aim of increasing some aspect of performance.

Benchmarking may be a one-off event, but is often treated as a continuous process in which organizations continually seek to improve their practices. There are several types of benchmarking; most of them refer to the business-management ambit of activities and the most common benchmark types are external and internal.

- External, where the performance measures of one organisation are compared with external ones for the purpose of determining how good an organisation is as compared to others and identifying possible improvement
- Internal where comparisons are made between or within departments/divisions (real estates or processes) of the same organisation.

Steps to creating a Sustainable Energy Action Plan

All strategic plans, no matter who is writing them or what topic they are addressing, tend to have five major elements.

Simplistically, these can be characterised by the following five questions with corresponding explanatory comments:

1. Where are you coming from?	To identify all applicable legislation, regulation and requirements that influence and define your work environment
2. Where are you now?	To paint a picture of where you are in terms of energy consumption, costs…
3. Where do you want to be?	To identify potential projects, both at short term and longer term, and tTo set specific goals
4. How do you get there?	To plan resources, costs, timing; To assign responsibilities and roles…
5. How do you measure your progress toward the goals?	To set and apply an accounting and information system is an unavoidable step to control the rate of achievements of your objectives

Figure 1: Steps to creating a SEAP. A more comprehensive checklist with detailed questions and issues to cover, also issues which involves benchmarking is in Appendix 1.

Data requirements and challenges with data collections

The SEC-BENCH database has been established for the collection of the data required for the key project indicators calculation.

The data to be collected refer only to the buildings and installations managed by the municipalities and for which the municipalities themselves pay the corresponding energy bills

The database is an Excel file composed by several different sheets, namely:

1. General Municipal information
2. *Municipal Buildings*
3. *Installations data*
4. Vehicles fleet
5. Investment

A more comprehensive and detailed description of the technical content of the datasheets is in Appendix 1.

During the SEC-BENCH project, the data collection routines have been tested in 26 pilot communities from 8 countries across Europe. Our experiences show that this data collection is a rather complex process to implement as a regular routine in the municipality, and there are three main barriers to this:

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The SEC-BENCH tool and web-solution

The SEC-BENCH web-solution is designed to store bottom-up energy data for individual municipal buildings of different types, as well as to calculate and present useful indicators for comparison of the energy performance of these buildings. Comparison can be made between individual buildings, types of buildings as well as between municipalities in one or more countries.

Organisation and responsibilities

The web-system is organised with three main levels for data input. For presentation of results, there is also a "Guest" level, where external stakeholders can access the system and view results on an aggregated and anonymised level.

- One program administrator: Web-master with all access rights
- One administrator for each country: Responsible for approving the inputs from the municipalities
- One user for each municipality: Responsible for submitting general info about municipality, including total energy consumption and greenhouse gas emissions (top-down values). Also responsible for entering building data, or delegate to the persons responsible for the different buildings

The web-structure

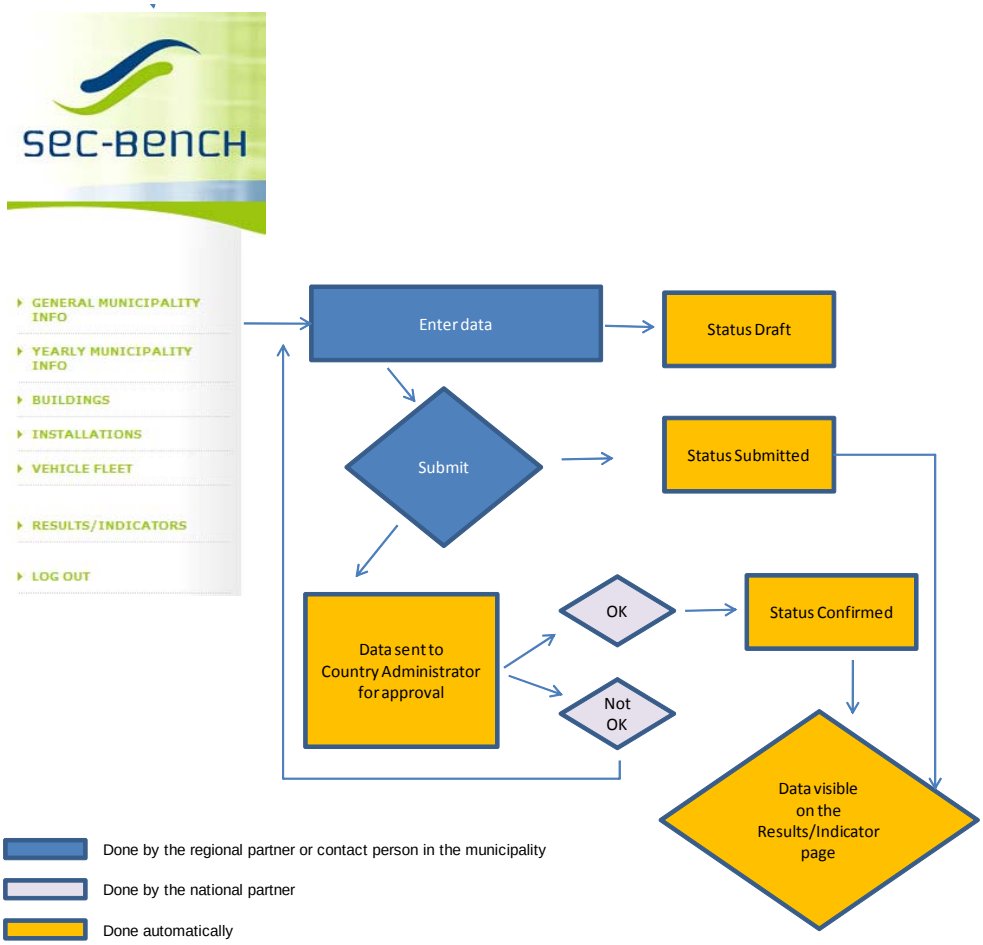


Figure 2: web-system structure

The data input module

Information about the municipality

The following input data are required for each municipality that is entered into the system:

- ❑ Total energy consumption in the municipality (kWh)
- ❑ Total GHG emissions in the municipality (tonne CO2)
- ❑ Total energy mix in all district heating systems in the municipality
- ❑ Total energy mix in all district cooling systems in the municipality
- ❑ Origin of gas delivery in the municipality
- ❑ GHG emission per kWh electricity (if not specified, EU-mix will be used)

Information about the individual buildings

The following input data are required for each individual building that is entered into the system:

- ❑ Administrative data (Building ID, building type, address, contact persons etc)
- ❑ Structural data (heated are, construction type, geographical orientation etc.)
- ❑ System information (systems for heating/cooling, water heating, lighting, ventilation etc.)
- ❑ Energy consumption and production (annual consumption by energy type and use)
- ❑ Management and investment costs (if available)
- ❑ Use and occupancy (to be discussed)

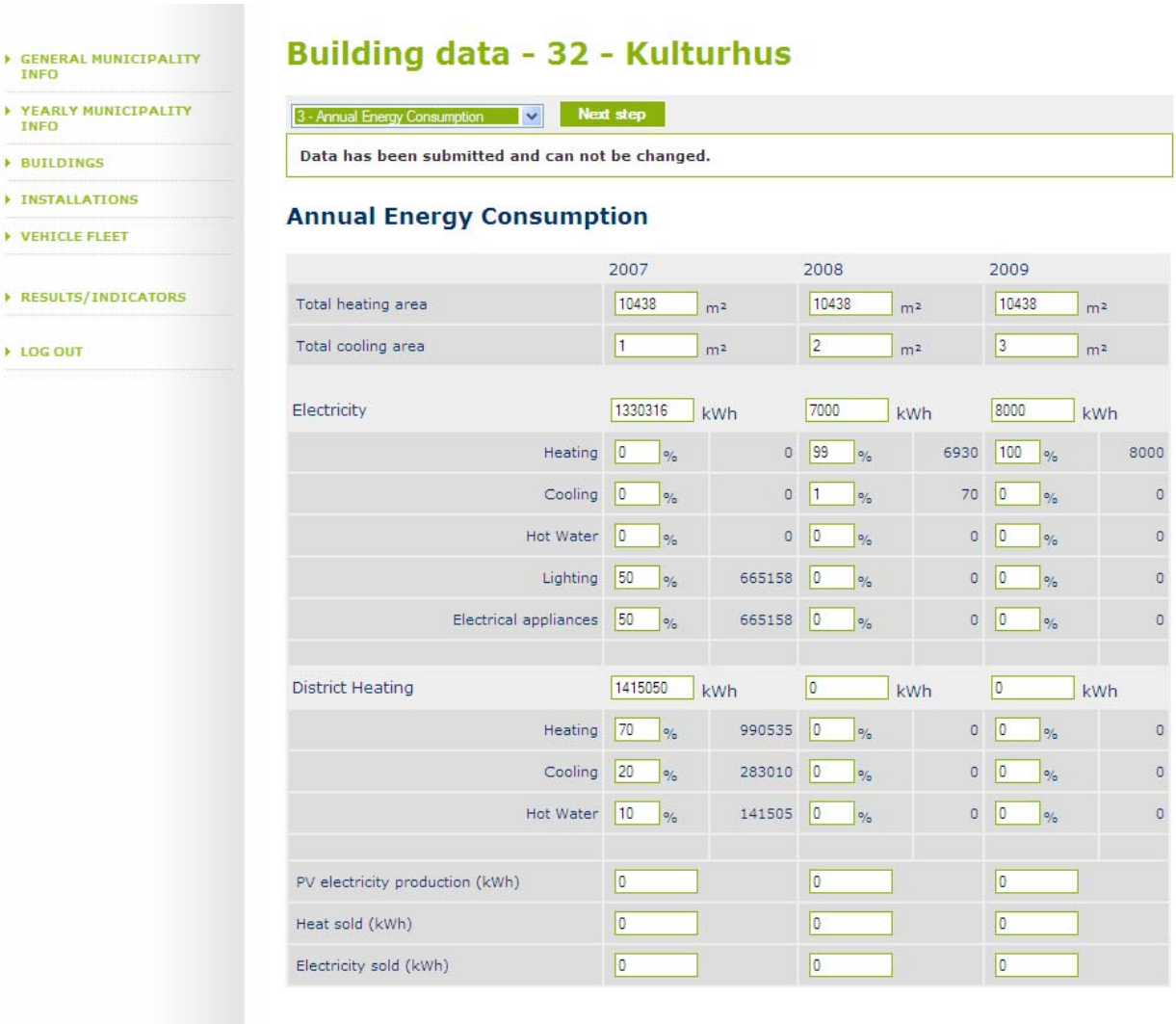


Figure 3: Example of data input screen, (heated/cooled area and annual energy consumption figures)

The presentation of results

The presentation of results has two main options:

- **Pre-defined indicators** where the municipality user is logged on and where the system displays a pre-defined set of indicators for the municipality's own buildings, the total benchmark figures per municipality or even for countries

  Municipal benchmarks
  The benchmarking at this level can be made between all individual buildings in the municipality or between types of buildings in the municipality.

  National benchmarks
  The benchmarking at this level produces indicators at an aggregated level. Comparison can be made between all the participating municipalities in a country.

  European benchmarks
  The benchmarking at this level produces indicators at an aggregated level. Comparison can be made between building types in up to three selected municipalities in Europe

- **Self-defined indicators** where almost any type of comparison can be made by choosing specific municipalities/countries or building types for comparison. This option requires more in-depth knowledge about the system and the algorithms calculating the indicators. Typical users for this kind of indicators and benchmarks are researchers and analysts.

Some examples of results from the pre-defined indicators are presented below.

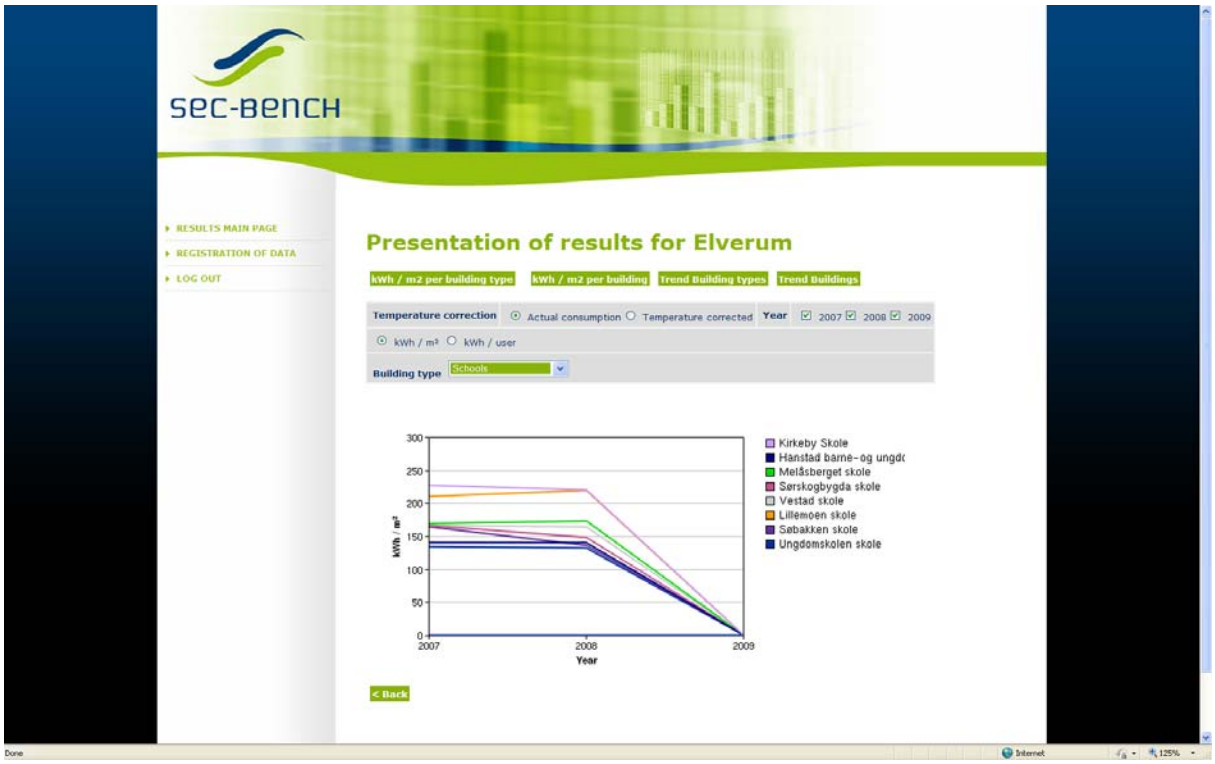


Figure 4: Pre-defined, municipal benchmarks. Trend of energy performance (kWh/m2) of all schools in the municipality of Elverum, Norway

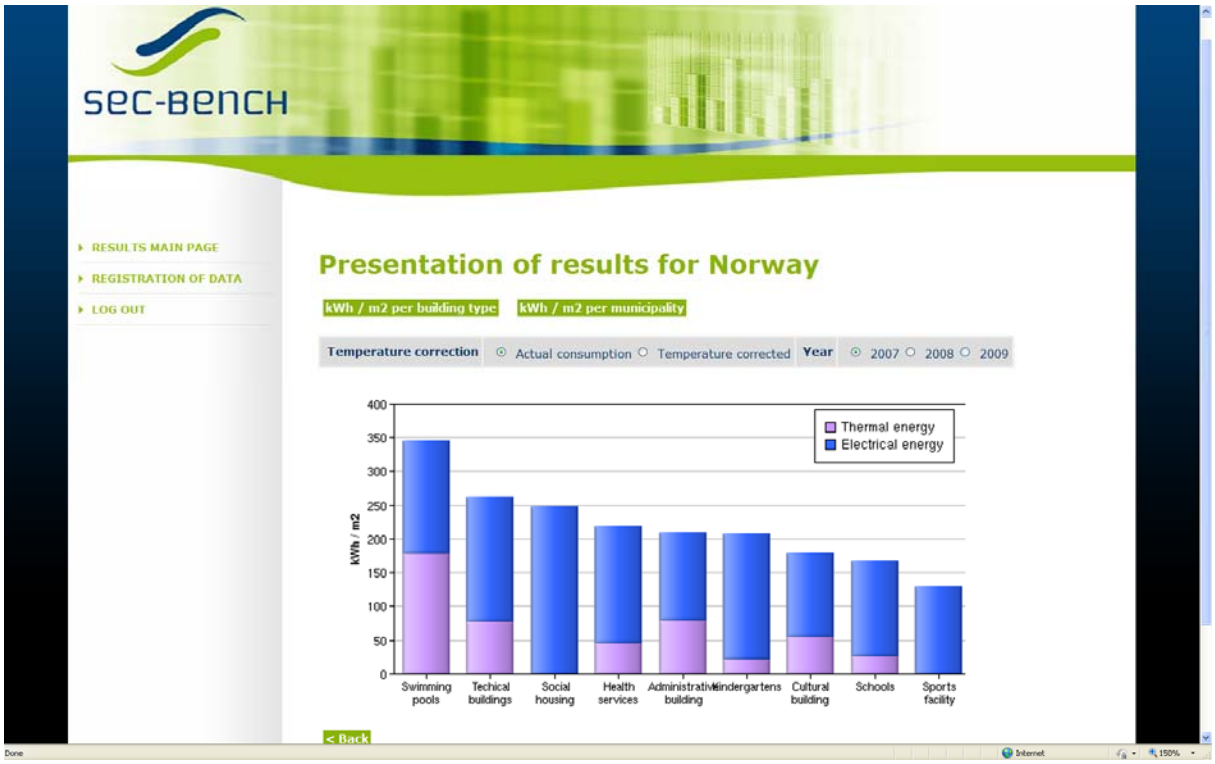


Figure 5: Pre-defined, national benchmarks. Energy performance(kWh/ms) per building type in Norwegian municipalities

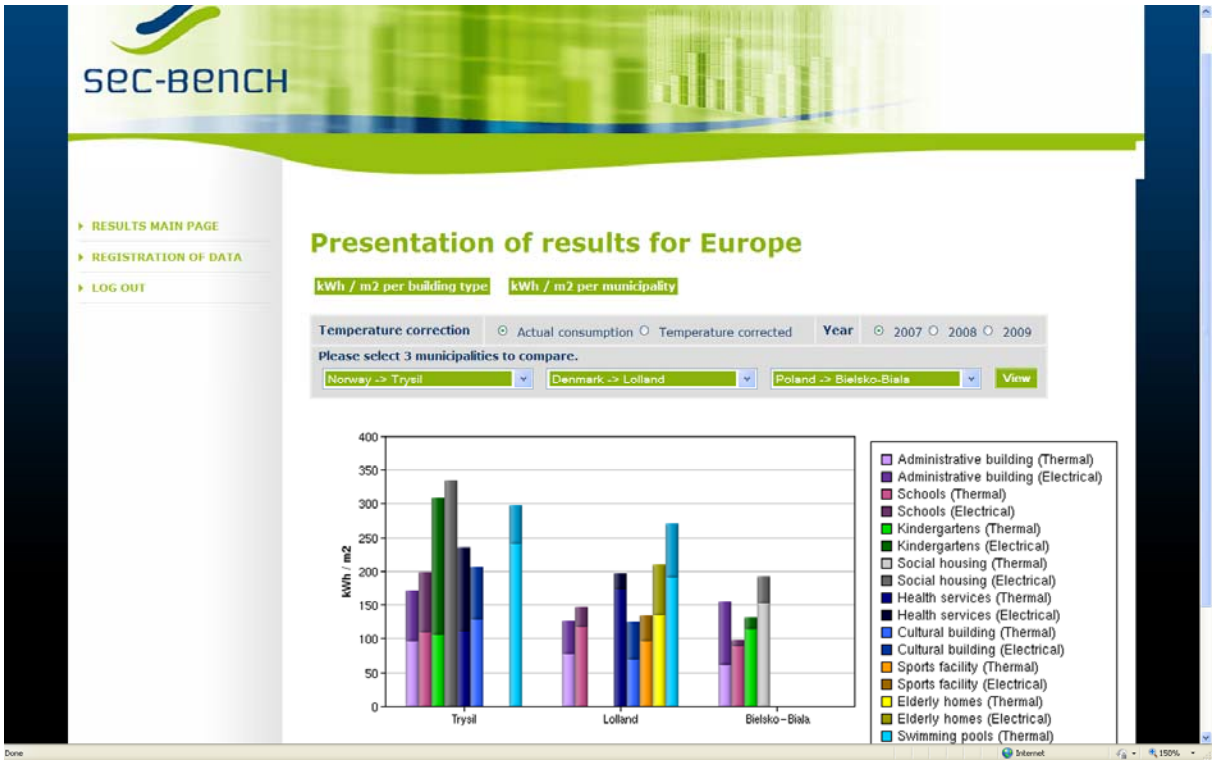


Figure 6: Pre-defined, European benchmarks. Energy performance (kWh/m2) per building type in 3 selected, European municipalities

Some examples of results from the selv-defined indicators are presented below.

Figure 7: Self defined indicators. Energy performance (kWh/m2) for all municipal buildings in some Danish and Norwegian municipalities, also with national indicators.

Figure 8: Self defined indicators. Energy performance (kWh/m2) in schools in selected municipalities in some countries, temperature corrected.

Analysing and using the benchmarks

As already indicated, the bottom-up indicators require data-collection from each individual building or installation, and are useful for the micro-level, i.e. direct monitoring of individual buildings' energy performance, the direct impact of specific energy efficiency measures. The indicator sets will be split into two levels; key-indicators and sub-indicators. The main features of these two levels are as follows:

- Key indicators compare only at municipal level (fair level of detail)
- Sub-indicators compare at building-type level (high level of detail)

In the following 2 examples from a total of 6 of indicator sets are described in terms of their relevance and their practical use. Indicators do not work by themselves, they need to be analysed and this requires experience ; indicators make possible to detect deviations or gaps, but then skilled people have to look for explanations to these deviations to draw the corresponding useful conclusions for planning actions.

Indicator: Annual energy consumption per area

The indicator "Total, specific energy consumption per area" will give an overall picture of a municipality's total building stock and provides e.g. the Chief Director with an indication of the general situation with respect to the energy consumption in the municipal building stock. The practical use of this indicator can be to extract trends for the long-term budgeting process.

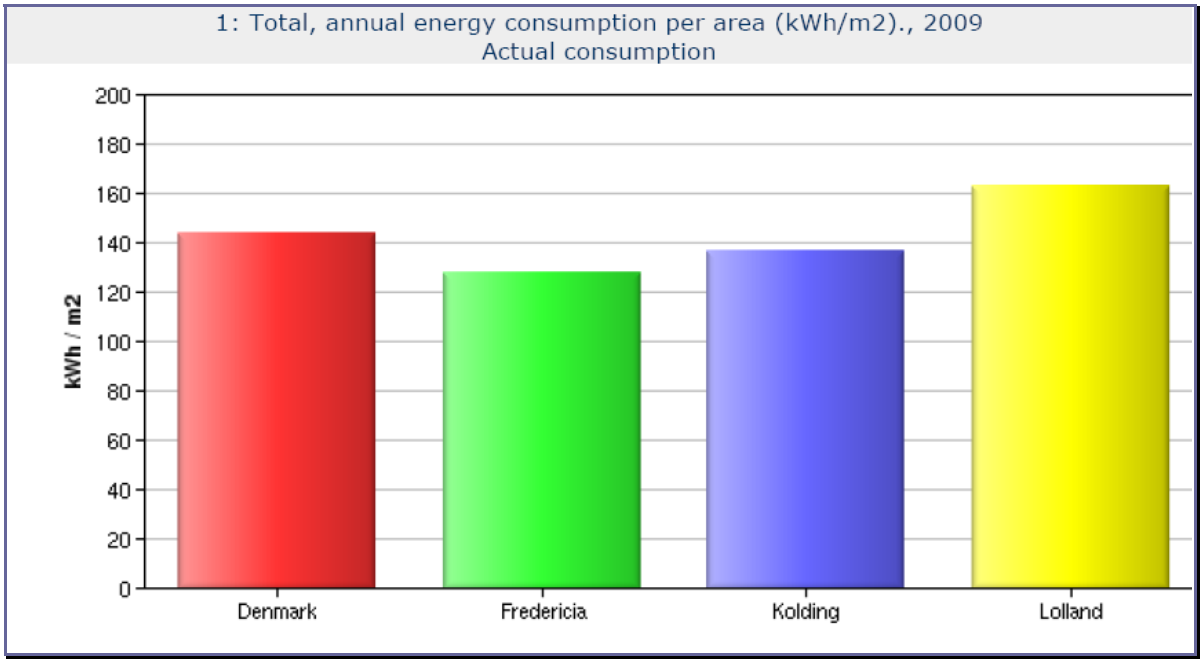


Figure 9: Key-indicator 1 - the average energy consumption per m2 of heated space in the three municipalities if Kolding, Fredericia and Lolland for the year 2009.

Indicator: Annual energy consumption per user

In this context, the term "users" will be different depending on the type of building, e.g. schools - pupils/student, social housing - resident, cultural building/cinema – visitor. This indicator-set gives relevant information on the area-efficiency, i.e. how well the total available area in the buildings are exploited, In practical terms, it will not make much sense to have good energy performance per area in a building if the building is half empty.

The key indicator "Total annual energy consumption per user" will give an overall picture of a municipality's exploitation and occupation of their total building stock and provides e.g. the Chief

Director with an indication of the eventual need to revise the user-patterns of the building stock. The practical use of this indicator can be to assess the need for a survey on the area-efficiency in the municipal building stock in order to identify areas of improvement, e.g if the offices in an administrative building should be rebuilt and made smaller to allow for more staff to work in that building. This is a good example of the need to assess the energy performance of a specific building by way of using several indicators. Provided that technical standards and regulations have to be followed, it is always necessary to strike a balance between more diffuse issues such as extra comfort requirements, the space needed for different types of commercial/administrative activities etc).

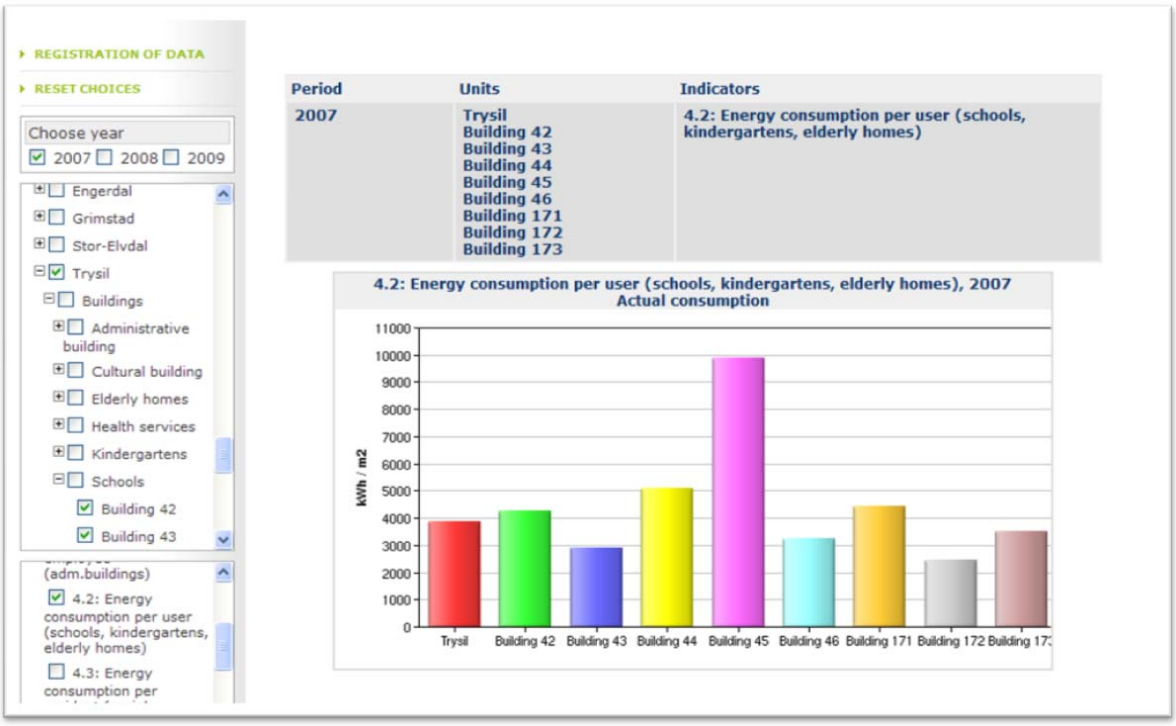


Figure 10: Specific energy consumption per user in municipal buildings

Conclusions

A consistent benchmark system can be based on bottom-up data collection, monitoring of action plan progress, visualisation of results to involve stakeholders, organisational performance and benchmarks of excellence. However, in order to make the benchmark-system attractive and useful at the municipal level, the information needs to relate directly to the municipalities' own building stock. Consequently, the data input needs to be bottom-up, and this bottom-up approach will take a significant effort in terms of data collection. The critical issue here, which needs to be understood and accepted by the municipalities, is that this extensive data collection is necessary to do anyway for municipalities aiming for significant improvements in terms of energy efficiency and renewable energy. It is obvious that an absolute minimum requirement is to know at least the state of its own building stock.

The SEC-BENCH pilot municipalities are currently collecting energy data from their own building stock, however not without problems. It seems clear, however, that it is a primarily a matter of putting sufficient priority to the issue. Those municipalities that are already engaged in local, sustainable development, either through local networks or other types of commitments, e.g. the "Covenant of Mayors" are quicker to identify and collect the relevant data.

Project Partners

NEPAS is the coordinator of the SEC-BENCH project. NEPAS was established in 2004 with Institute for Energy Technology (IFE) as the majority shareholder. NEPAS's vision *"Energy Management – Powered by NEPAS"* reflects the fact that services offered to customers in private industry and the public sector will focus on energy management. NEPAS will thereby assist them in achieving higher energy performance through implementation of technology and planning tools, building competence and behaviour and focus on decision-making processes.
Contact: Hans Jacob Mydske, mydske@nepas.no
http://www.nepas.no/

The 21 Municipalities of the N-E sector of the Prefecture of Athens, with over 1 million inhabitants, in 1999 created the Coalition for the promotion of the principles and aims of Sustainable Development. The Coalition is in effect an inter-municipal institution of development, technical know how, and scientific support of its members, which have adopted the basic axes for sustainable development, and are currently formulating in this direction political proposals for their area, incorporating thus the environmental, developmental, social, and financial issues, with democratic participatory design procedures. 21OTA has promoted the local Strategic Plans for Sustainable Development formulated by its members, and has established active linkage to large National and European Local Government networks (such as ICLEI, the International Council for Local Environmental Initiatives.
Contact: Pavlos Kamaras
21ota@ath.forthnet.gr

ApE was established in 1991 as a private company with the agreement and support of the Ministry for Energy of the Republic of Slovenia. ApE is an independent agency. ApE employs 6 highly qualified experts and uses up to 10 part-time experts depending on project execution requirements. ApE's main services to the costumers are analysis, consulting, feasibility studies and implementation/dissemination. ApE presents recommendations for actions, offers information to decision makers, and addresses the appropriate public audience. It is also active in developing long-term strategies for sustainable development mainly in the field of renewable energy sources (RES).
Contact: Matjaž Grmek matjaz.grmek@ape.si
www.ape.si

AREAC is a Portuguese regional energy agency created in June 2003, under the SAVE II Programme. AREAC is representing a group of counties of Portugal central region, namely Cantanhede, Castanheira de Pêra, Coimbra, Figueira da Foz, Figueiró dos Vinhos, Góis, Lousã, Miranda do Corvo, Montemor-o-Velho, Pedrogão Grande, Penela and Vila Nova de Poiares. The main objectives of AREAC are to improve the energy efficiency in the whole region, to disseminate the use of local renewable energy resources (RES), mainly solar, biomass and wind energy, to integrate energy efficiency and environmental concerns in the urban planning process and promoting the development of new activities and consequent creation of jobs.
Contact: Pedro Graça areac@mail.telepac.pt
www.areac.pt

Bass represents a public network of cities and regions throughout the Baltic Sea Region and is a non-profit project development and consulting organisation working in the field of regional development targeting sustainable energy and environmental projects. Our aim is to develop innovative approaches to sustainable development, which are based on local assets – human, natural, geographical, economic. Bass is a multinational and multilingual team, working with a **"glocal"** approach, offering flexibility and the promotion of best practices between local and global stakeholders.
Contact: Jesper Krogh Jensen jkj@bass.dk
www.bass.dk

CRES is the Greek national centre for Renewable Energy Sources (RES), Rational Use of Energy (RUE) and Energy Saving (ES) is a public entity, supervised by the Ministry of Development-General Secretariat of Research and Technology and has financial and administrative independence. Since 1992, CRES is located on its own premises, which include experimental outdoor installations, a wind energy park, specialized laboratories (biomass, photovoltaics, passive solar systems, fuel cells, wind energy, building cell and indoor climate), mechanical shop, conference rooms, a library and a strong computing infrastructure..
Contact: Evi Tzanakaki etzanak@cres.gr
www.cres.gr

DLAEM is an NGO and its main goal is to support sustainable development and effectiveness of Energy Management on the territory of Dobrich municipality. DLAEM's specific objectives are to contribute to the development of the Regional Action Plan for the "Reduction and Stabilization of the CO_2, SO_x, NO_x and other emissions". Moreover to contribute through energy efficiency improvement to the resolution of national tasks of the energy and environment policy. DLAEM's main activities focus on energy programming and planning at local and regional level; increasing the awareness and capacity of all community stakeholders with respect to efficient energy use, RES and energy management, as well as sectoral and horizontal initiatives for the promotion of rational energy use, energy saving technologies and renewable energy sources. DLAEM cooperates in joint activities with project partners from Bulgaria and abroad.
Contact: Binyo Dimitrov dlaem@abv.bg
http://www.dlaem.org/en/index.html

FEWE was established in 1990 as an independent, non-governmental not for profit organisation. Its mission is the promotion of sustainable energy management wherever energy is generated, distributed and used.
High work quality is guaranteed by highly skilled personnel and collaborators, all experienced in various work areas. Specific skills are supported by experience aquired from many international projects and partnership networks.

Contact: Szymon Liszka s.liszka@fewe.pl
www.fewe.pl

ISIS is a research and consulting outfit, active since 1971 and specialised in system analysis, design and building of information and decision support systems, mathematical modelling and operational research.
ISIS methodology and tools are applicable to the entire range of sectors and economic activities in which planning and policy design represent aspects of strategic importance. ISIS has acquired particular expertise in the areas of energy and environment, transport systems, urban policy issues, planning and quality control in the service sector. For the development of its activities, ISIS employs the professional contribution of about 20 full time partners and collaborators.
Contact: Stefano Faberi sfaberi@isis-it.com
www.isis-it.com

ISLENET is a network of European Island Authorities, which promotes sustainable and efficient energy and environmental management. It was created in 1993 and it now represents more than 30 islands from 14 European countries. It actively promotes the adoption of local energy management strategies, renewable energy projects and environmental policies. These policies have an important effect on local economic development and involve a well-balanced approach to sustainable development.
Contact: Panos Coroyannakis islenet@skynet.be
www.islenet.net

The mission of **Local Government Denmark (KL)** is to promote the joint interests of democratically elected and governed local authorities and to be a center for collection, development and dissemination of knowledge about local government in Denmark.
Danish local authorities experience the consequences of internationalisation. Firstly, local authorities increasingly witness the EU legislation directly on domains which traditionally belong to the administrative sphere of local authorities – e.g. the environment, the labour market, and public procurement. Secondly, local authorities show an icreasing interest in participating in EU-supported activities through EU programmes and funds, such as regional co-operation and town-twinning.
Contact: Grete Tarpgaard
www.kl.dk/lgdk

The Norwegian Association of Local and Regional Authorities (KS) is a national association of municipalities, counties and public enterprises under municipal or county ownership. All municipalities and counties are members. KS is an employer and central bargaining organisation, an advisory and consultative body, and acts as a spokesman and advocate vis-à-vis central government on behalf of its members.
Contact: Ole Jørgen Elstad Grann ole.grann@ks.no
www.ks.no

Nettkonsult AS

Nettkonsult is a 100% owned subsidiary in the Agder Energi group. Agder Energi AS is one of the largest energy groups in Norway in terms of hydropower production. The company is owned by the 30 municipalities in the region (54,5%) and by the state owned energy company Statkraft (45,5%). The consulting engineers in Nettkonsult are organized in three divisions; the Electricity Grid Division, the Safety Division, and the Energy Group.
Contact: Arild Olsbu Arild.Olsbu@ae.no
www.nettkonsult.no

Lazio Region - ITALY

Lazio is one of the 20 Italian regions.

The regional capital of Latium is Rome, which is also the capital city of the Italian Republic; Latium is divided into 5 provinces: Rome, Latina, Frosinone, Viterbo and Rieti, divided into a total of 378 local units called municipalities. The most important functions involve the health sector, social welfare, training, vocational education, town planning, public housing, economic development, tourism and cultural activities, agriculture, forestry, mining, regional public transport, public works, environment, and implementation of EU regulations and policies. Energy and environment represent an important challenge for our region that decided to invest over 70 million for the 2008-2013 period, through the Regional Operating Plan, to finance renewable energy and energy efficiency projects.
Contact: Alessandro Drago adrago@regione.lazio.it
http://www.lazioeuropa.it/home_eng.asp

Appendices

Appendix 1 : SEAP Cheklist with benchmark activities

The following is a very simple checklist of steps to take in the SEAP development. The specific steps where benchmarking and indicators are directly or indirectly involved in the process are marked red.

- ❑ The first step is to assemble stakeholders to develop a plan and form a *"Sustainable Energy Action Team"* that will continue to meet while developing and evaluating the plan.
- ❑ Stakeholders include:
  - o Management
  - o Facilities personnel
  - o Financial personnel
  - o Building Occupants/Employees
  - o Human Resources
  - o Utility providers
- ❑ Collect data from 1 to 3 years of utility bills, including electric, natural gas, and water. Compile data on energy spending and energy use in, i.e. spreadsheets. This could also include an inventory all buildings, equipment and other equipment that is plugged in (space heaters, appliances, etc.)
- ❑ Review purchasing policies, e.g are there requirements for Energy Star/Energy Labelling appliances? Evaluate the impact of current purchasing policies
- ❑ Collect information and data on any current programs or policies related to energy efficiency.
- ❑ Complete building assessments to find areas where energy can be saved.
- ❑ Building audit checklist (to be completed by someone with energy management expertise)
- ❑ Maintenance reports
- ❑ Capital Improvement projects
- ❑ Plug Loads: everything that is plugged in
- ❑ Collect sub-meter data. Meters on specific buildings or appliances will provide more detailed data as to where energy is being used. *Installing submeters may be part of your strategic energy plan*.
- ❑ Identify gaps in data. If gaps need to be filled before continuing, develop a strategy to collect this data and include it in the plan.
- ❑ Develop a method to continue recording both consumption and cost data
- ❑ Create prioritized list of Energy Conservation Measures (ECMs). Group ECMs as no cost, low cost, and high investment projects.
- ❑ Validate data accuracy
- ❑ Evaluate building performance based on data collected. Are there a large number or hot/cold calls related to the HVAC system? Can the plug load inventory be reduced?
- ❑ Establish Key Performance Indicators. Select the national/regional standards.
- ❑ Perform an internal and/or external (if available) benchmarking analysis
- ❑ Identify goals. Goals should be:
  - o **S** pecific
  - o **M** easurable
  - o **A** ction-Oriented
  - o **R** ealistic
  - o **T** ime-Dependent

- ❑ Develop Strategies: philosophies, plans, and policies supporting energy management goals
- ❑ Analyse requirements for supply side, demand side, and awareness and training
    - o **Supply side:** Activities that involve the source of energy. Examples: include finding alternate fuel sources (i.e renewables), minimizing rates and utilizing incentive programs.
    - o **Demand side:** Activities that lower demand for energy. Examples: include using more fuel efficient appliances, or installing more energy efficient lighting systems.
    - o **Awareness and training:** Activities that include training, behaviour modification and organizational communication.
- ❑ Develop Tactics: short term actions that support strategic energy management goals. These should be developed for each section outlined above (supply side, demand side, awareness and training…).
- ❑ Estimate the cost of each activity, the time frame and the savings.
- ❑ Develop a plan for equipment replacement. Critical equipment should be identified, and evaluated to determine which unit will be replacing it at the end its useful life. Vendors who can provide loaners and replacement units should be identified in case of equipment failure.
- ❑ Continue to identify gaps in the data, and develop means of filling these gaps.
- ❑ Evaluate any improvements from baseline data: reduced energy consumption, reduced costs, improved building performance.
- ❑ Evaluate participation of occupants and stakeholders through the number of meetings held, number of participants and the number of newsletters or memos issued.
- ❑ Indicate the actual costs, savings and jobs created for each completed activity
- ❑ Re-evaluate plan and make changes based on project success. Should activities be maintained, expanded or abandoned?
- ❑ Tracking Key Performance Indicators (internal benchmarking)
- ❑ Calculating energy savings
- ❑ Updating purchasing plans

Appendix 2 - Data collection sheet for the SEC-BENCH database:

The SEC-BENCH database has been established for the collection of the data required for the key project indicators calculation.

The data to be collected refer only to the buildings and installations managed by the municipalities and for which the municipalities themselves pay the corresponding energy bills

The database is an Excel file composed by several different sheets, namely:

6. General Municipal information
7. *Municipal Buildings*
8. *Installations data*
9. Vehicles fleet
10. Investment

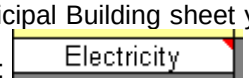
Important notes:

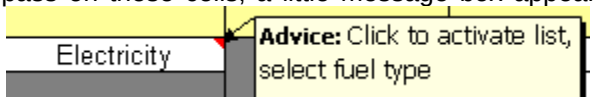
Note 1 : some of the requested data have to be referred to the year in which the activity (energy consumption, costs, …) took place. The reference years are: To= 2007, T1 = 2008, T3 = 2009. The 2009 data have to be provided by the municipalities by February/March 2010

Note 2:

- Each sheet concerning the *Municipal Buildings* and *Installation data* must refer to one building or to one installation.
- In this release of the database you will find 5 pre-set copies per each of these sheets, so:
  - If the buildings or installation are more than 5, add one or more new sheets.
  - If the buildings or installation are less than 5, simply don't fill the remaining empty sheets.

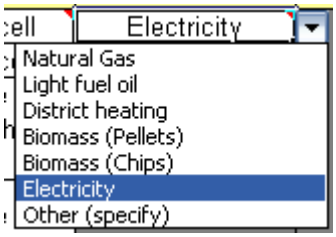
Note 3

- In most of the cells of the Municipal Building sheet you will find a little red triangle put on the right-upper side of the cell itself: 

- When the cursor pass on these cells, a little message box appears on the right side of the cells themselves: 

- This message may either inform on the type of data to be inserted or suggest to activate a button like this: 

- Pushing on this button a list of possible options pops out:
- At this point, select the appropriate choice from the option list and pass to the other cell



Contents of the datasheets

SHEET 1 : General Municipal Information

Name of Municipality	Name the city in which the building and /or installation is located
Resident Population	Number of resident in 2007, 2008 and April 2009
Area of Municipality	Square kilometers
Percentage of dense built area	What percentage if known or estimated
Population density (Resident Population/ Area of Municipality)	Calculate the variables mentioned above
Pro-Capita income (Euro/inhabitant)	Indicate if know or estimated (please provide the source)
Plans concerning energy	Has the municipality already implemented or will it implement a plan for energy (yes or no)?
If yes, insert reference	indicate the website, if any, where the plane is described
Plans concerning environment and climate	Has the municipality already implemented, or will it implement, a plan for environment and climate (yes or no)
If yes, insert reference	indicate the website where the plane is described
Energy management system	Has an energy management system been implemented in your municipality (yes or no)
If yes, please indicate the tool or the methodology adopted	EMAS, ISO, CAF…

SHEET (s) 2 : Municipal Buildings

ADMINISTRATIVE DATA FOR THE BUILDING

Unique ID	Reserved cell, don't insert nothing
Street address	Name the street in which the building is located
Contact person	Name of the person responsible for the data collection
E-mail address	E-mail address of the person responsible for the data collection
Direct phone	Direct phone of the person responsible for for the data collection

STRUCTURAL DATA FOR THE BUILDING

Type of building	Pop-up option list! Selectable options: 1. Administrative buildings 2. Technical buildings (fire dept, storehouse…) 3. Schools 4. Kindergartens 5. Social housing 6. Health services 7. Cultural buildings (cinemas, libraries..) 8. Sports facilities (swimming pools, gyms..) 9. Others (specificy) Insert additional comments if relevant
Total surface of the heated area in m2	Square meters of ***heated*** area
Year of construction	Year
Year of last major renovation	Year

STRUCTURAL DATA FOR THE BUILDING (continued)

Type of construction	Pop-up option list! Selectable options: 1. Self sustained walls (brick and stones) 2. Reinforced concrete - not insulated walls/roof 3. Reinforced concrete - insulated walls/roof (i.e. EE around 100 kWh/m2) 4. Reinforced concrete - low consumption building (i.e. EE around 40 - 50 kWh/m2) Insert additional comments if relevant
Prevalent windows type	Pop-up option list! Selectable options: 1. Self sustained walls (brick and stones) 2. Reinforced concrete - not insulated walls/roof 3. Reinforced concrete - insulated walls/roof (i.e. EE around 100 kWh/m2) Insert additional comments if relevant
Prevalent lighting system	Pop-up option list! Selectable options: 1. Low eff. fluorescent lamps 2. High eff. fluorescent tubes 3. High eff. Lamps 4. Other Insert additional comments if relevant
Prevalent geographic orientation	Pop-up option list! Selectable options: 1. North 2. North-West 3. North-East 4. South 5. South-East 6. South-West 7. East 8. West Insert additional comments if relevant

OPTION 1: DETAILED ENERGY CONSUMPTION BY END-USE (HEATING / COOLING / SHW / APPLIANCES)

HEATING SYSTEM	
Heating System	Indicate the prevalent type/s of the heating system
Heating Type	Pop-up option list! Selectable options: 1. Individual 2. Central 3. Collective
Fuel Type	Pop-up option list! Selectable options: 1. Natural Gas 2. Light fuel oil 3. District heating 4. Biomass (Pellets) 5. Biomass (Chips) 6. Electricity 7. Other.
Fuel Type - Specify If "Other"	Specify
Boiler Efficiency No Default Values!	Possibly insert reliable values (i.e. from the last maintenance check)
Age Class	Pop-up option list! Selectable options: 1. < 1980 2. 1981 - 1990 3. 1991 - 2000 4. > 2001
Type Of Maintenance	Pop-up option list! Selectable options: 1. YEARLY 2. ONLY WHEN REQUIRED
COOLING SYSTEMS	
Cooling System	Indicate prevalent type/s of the heating system
Cooling Type	Pop-up option list! Selectable options: 1. Individual 2. Central 3. Mixed (Individual+Cental)
EFFICIENCY CLASS (A,…,G): Specify the class of each cooling system	Only if Individual or mixed systems: put the EE class corresponding to the newest and the oldest individual cooling devices
Fuel Type	Pop-up option list! Selectable options: Here the selection should be only Electricity (already pre-set)
Age Class	Pop-up option list! Selectable options: 1. < 1980 2. 1981 - 1990 3. 1991 - 2000 4. > 2001
Type Of Maintenance	Pop-up option list! Selectable options: 1. YEARLY 2. ONLY WHEN REQUIRED
SANITARY HOT WATER	
Sanitary Hot Water System	Select the prevalent type/s of the SHW system (max two)
Sanitary Hot Water Type	Select the prevalent system for the Hot Sanitary Water system: 1. Combined System (same boiler for heating and SHW) 2. Dedicated Boiler 3. Electric Storage 4. Electric Instantaneous 5. Solar 6. Heat pump.

OPTION 1: DETAILED ENERGY CONSUMPTION BY END-USE … *(continued)*

EFFICIENCY CLASS (A,…,G):	Specify the EE class of each SHW system if knonw
Fuel Type	Pop-up option list! Selectable options: 1. Natural Gas 2. Light fuel oil 3. District heating 4. Biomass (Pellets) 5. Biomass (Chips) 6. Electricity 7. Other.
BOILER EFFICIENCY, no default values!	Possibly insert reliable values (i.e. from the last maintenance check)
Age Class	Pop-up option list! Selectable options: 1. < 1980 2. 1981 - 1990 3. 1991 - 2000 4. > 2001
Type Of Maintenance	Pop-up option list! Selectable options: 1. YEARLY 2. ONLY WHEN REQUIRED
APPLIANCES : insert the number appliances per category ; Put 0 if no appliances	
REFRIGERATORS and REFRIGERATORS-FREEZERS	Small (up to 80-100 litres)
	Large (up to 300 litres)
	Very Large (over 300 litres)
FREEZERS	Small (up to 100 litres)
	Large (over 100 litres)
WASHING MACHINES	Small (5-7 kg)
	Large (over 7 kg)
DRYERS	Small (5-7 kg)
	Large (over 7 kg)
DISHWASHERS	Small (bar)
	Large (restourant)
OVENS	Small (household)
	Large (restourant/canteen type)
Ovens fuel	Pop-up option list! Selectable options: 1. Natural Gas 2. Light fuel oil 3. District heating 4. Biomass (Pellets) 5. Biomass (Chips) 6. Electricity 7. Other.
COOKERS - HOBS	Small (household type)
	Large (restourant/canteen type)
Cookers, hobs fuel	Pop-up option list! Selectable options: 1. Natural Gas 2. Light fuel oil 3. District heating 4. Biomass (Pellets) 5. Biomass (Chips) 6. Electricity 7. Other.

OPTION 2: OVERALL ENERGY CONSUMPTION BY MAIN USE (THERMAL / ELECTRIC).

Note: insert the data concerning the energy consumption break down per end use only if known. Please don't estimate these data!

Energy consumption data		
Main Use	**Thermal**: total thermal energy consumption calculated from the gas/oil/district heating, etc bill (for the years T0, T1 and T2). The data should be possibly inserted in energy unit (kWh) Put the metric values (i.e. m3 of gas) only if not easy to calculate the energy values	**Electricity:** total electricity consumption read from the electric consumption bill (for the years T0, T1 and T2). Data in kWh
Type (end uses)	Heating Sanitary hot water Cooling	Heating: Sanitary hot water Cooling: Electric appliances Lighting
Energy production from renewables **Total annual energy production in kWh**		
Main use	Thermal energy from solar panels for SWH	
	Thermal energy from biomass for heating	
	Electricity from Photovoltaic systems	

BUILDING MANAGEMENT COSTS

Total yearly costs	**Indicate the total yearly management costs (in EURO) and break them down by the following items:**
	Personnel
	Maintenance
	Energy costs
	Of which
	Fuel
	Electricity

PEOPLE - EMPLOYEES

Permanently living people	Number of people permanently living in the structure (in case of annual fluctuation, calculate an annual average indicating the calculation formula) .
Number of employees	Numbers of employees per reference working structure. Please scale to 12 month the part time or seasonal workers.
Average daily number of External public (users, students, visitors)	Estimated average number of visitors per building type
Average number of daily hours in which the building is open to external public	Please indicate the calculation formula .

SHEET(s) 3 : Installation Data

STRUCTURAL - ORGANIZATIONAL DATA FOR THE INSTALLATIONS

Type of the installation	Pop-up option list! Selectable options: 1. Water treatment plants 2. Sewage treatment plants 3. Waste treatment plants 4. Street lighting 5. Municipal car fleets 6. District heating systems
Year of construction	
Prevalent Technology in use	Describe shortly (few words) the prevalent technology used in the plant. If waste treatment specify if there are energy recovery plants (incinerators, biogas…) or compost plants

ENERGY DATA INSTALLATIONS

Energy source	Enter the yearly energy consumption figure (kWh/year), if possible split by :
	Electricity
	Fuel
Energy Production from wastes (please specify the technology used, i.e. gas turbine, incinerator,…)	Enter the yearly energy production figure (kWh/year), if possible split by:
	Electricity
	Thermal

SHEET 4 : Vehicle Fleet

STOCK, TRAVELLED DISTANCE AND ENERGY DATA FOR VEHICLE FLEET

Vehicle types	Gasoline cars , Diesel cars, Diesel minibuses (10-12 seats), Diesel buses (> 30 seats) , Diesel Vans , Diesel Trucks , Other (specify).
Number	#
Average yearly Travelled Distance	Km - year
Energy Consumption data	Litres

FLEET MANAGEMENT COSTS

Total yearly costs	**Indicate the total yearly fleet management costs (in EURO) and break them down by the following items:**
	Personnel
	Maintenance
	Total fuel costs

SHEET 5 : Investments

Please insert the year in which the equipment or the insulation intervention have started working and the corresponding total investment cost for the following items:

Investment costs for renewables
Solar Panels
Photovoltaics
Other (specify)
Investment Costs For Energy Efficiency
Heating
External walls and windows
Lighting
Other (specify)

Appendix 3: 17 pilot communities' SEAP Executive summaries

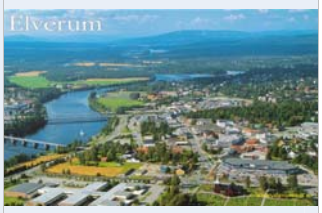
1 page by each of the pilot municipalities

Elverum (NO)
Trysil (NO)
Engerdal (NO)
Åmot (NO)
Stor-Elvdal (NO)
Arendal (NO) Joined the project as a pilot community on a voluntary basis
Kolding (DK)
Fredericia (DK)
Lolland (DK)
Katowice (PL)
Bielsko-Biała (PL)
Czestochowa (PL)
Amaroussion (GR)
Vrilissia (GR)
Halandri (GR)
Holargos (GR) Joined the project as a pilot community on a voluntary basis
Slovenske Konjice (SL)

Elverum, Norway
Sustainable Energy Action Plan
Executive summary

Municipality	Country	Population
Elverum	Norway	19.000

The municipality of Elverum is located 120 km north-east of Oslo in the western part of Hedmark County. The municipality has already carried out energy audits in all municipal buildings and implemented energy efficiency measures in some of these buildings with encouraging results. In 2009, Elverum was one of two pilot municipalities that took part in a national initiative promoting energy labelling of buildings.



The Sustainable Energy Action plan

Elverum Municipal Council adopted its energy and climate plan in December 2009. The plan identifies a whole range of potential follow-up projects related to energy efficiency and renewable energy. It aims at emission reductions of up to 3.850 tonnes in the agriculture sector, 13.000 tonnes in stationary consumption and 13.100 tonnes in the transport sector.

Part I - Facts and figures

- Total energy consumption: 630.000 GWh/year
- Total GHG emissions: 93 000 tonnes of CO_2
- By 2020, emissions will be reduced by 25.000 tonnes

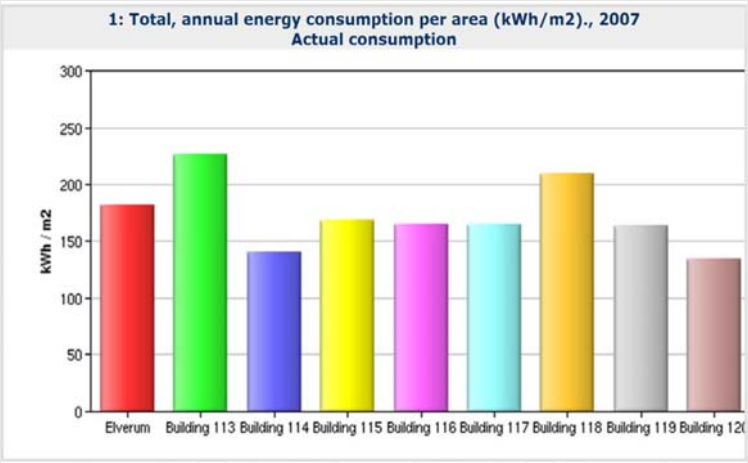
Part II - Measures and activities

- Energy efficiency measures in municipal buildings: 10% during the period 2010-2015 and another 10% by 2020.
- Private building owners will be encouraged to replace old woodstoves and oil-fired heating systems with clean-burning stoves, bioenergy and heat-pump systems.
- The existing district heating system in Elverum will be further expanded. In all these measures fossil fuels for heating purposes will be phased out by 2020. This will result in a GHG (Green House Gas) emissions reduction of approximately 12.000 tonnes.

Benchmarking of municipal buildings

Elverum has initiated a dedicated programme for implementing all the identified energy efficiency potential and measures in all municipal buildings.

The SEC-BENCH project will help Elverum to identify priority buildings as well as to monitor the progress of each building after the implementation of energy efficiency measures. The target is to get the entire building stock below 150 kWh/m2 by 2015.



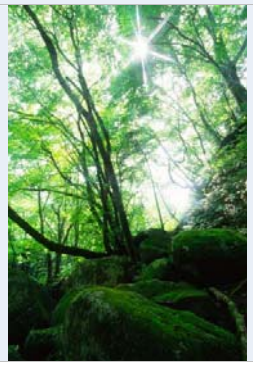
Contact

Terje Røe, Mayor of Elverum
http://www.elverum.kommune.no

Åmot, Norway
Sustainable Energy Action Plan
Executive summary

Municipality	Country	Population
Åmot	Norway	4.400

The municipality of Åmot is located in the western part of Hedmark county, 30 km north of Elverum in Sør Østerdalen. The municipality covers an area of 1339 km2, whereof 75 % is is forest. The population in 2007 was is 4.400 inhabitants. The municipal centre is Rena. The municipality of Åmot has for many years had close relations with the Norwegian Armed Forces, and is currently completing a new biomass fired district heating system in the army training site "Camp Rena".



The Sustainable Energy Action plan

Åmot's energy- and climate plan was adopted by the municipal Council in 2009 and identifies a whole range of potential follow-up projects related to RES and RUE in the municipality. The plan formulates the following strategic objective : *The municipality of Åmot will save costs and the reduce environmental impact by reducing own energy consumption. Moreover, the municipality will stimulate sustainable energy production, e.g. by activlty supporting local bioenergy production and by expanding the district heating system.*

Part I - Facts and figures

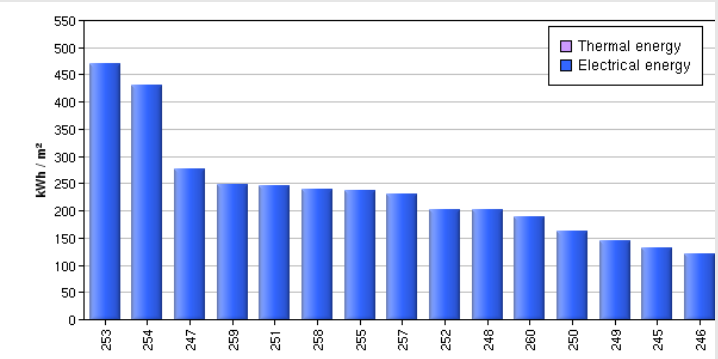
- Total energy consumption: 118.000 GWh/year
- Total GHG emissions (2005): 31 000 tonnes of CO_2
- CO_2 emissions will be reduced by 10% by 2012 and 20% by 2020, compared to 2005.

Part II - Measures and activities

- Energy efficiency measures in municipal buildings will reduce consumption by 20% by 2015 compared to 2007
- Private building owners will be encouraged to replace old woodstoves and oil-fired heating systems with clean-burning stoves, bioenergy and heat-pump systems.
- The existing district heating system in Åmot will be further expanded, and fossil fuels for heating purposes will be phased out by 2020.
- The municipality will establish automatic Energy Monitoring Systems in all municipal buildings.

Benchmarking of municipal buildings

Åmot collaborates with the neighbouring municipalities in 5-year programme for implementing all the identified energy efficiency potential and measures in all their municipal buildings.
The SEC-BENCH project will help Åmot to identify priority buildings as well as to monitor the progress of each building after the implementation of energy efficiency measures. The target is to reduce consumption by 20% by 2015.



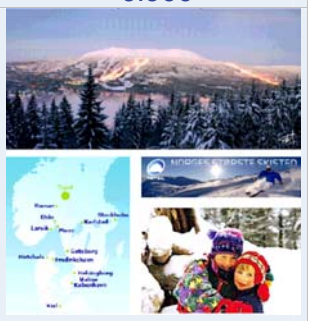
Contact

Ole Gustav Narud, Mayor of Åmot, http://www.amot.kommune.no

Trysil, Norway
Sustainable Energy Action Plan
Executive summary

Municipality	Country	Population
Trysil	Norway	6.900

Trysil is located 200 km north-east of Oslo, and is the biggest skiing destination in Norway. (www.trysil.com). 55% of Trysil is productive forest and the municipality itself is a major forest owner. However, the population is decreasing, and new economic activity is necessary to secure future prosperity. Trysil established their district heating system already in the 1980's as one of the very first in Norway, and the municipality owns 35% of its shares. This district heating system is steadily being expanded and will reach a total capacity of 40-50 GWh/year by 2012.



The Sustainable Energy Action plan

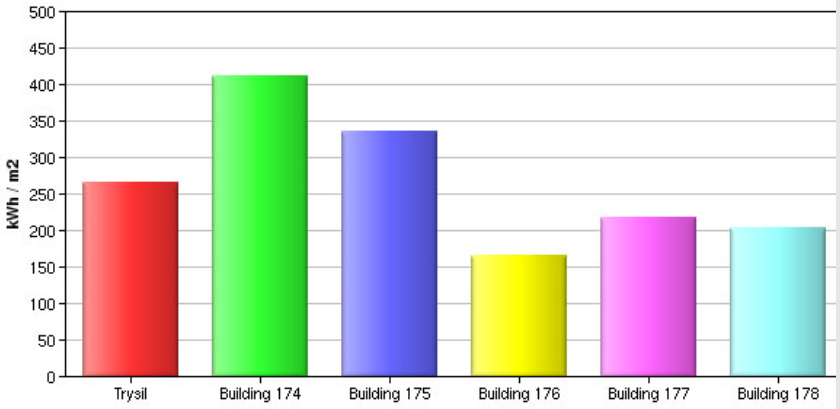
The Municipality of Trysil adopted their energy and climate plan as a municipal sector plan in May 2007. This energy and climate plan identified some 70 potential follow-up measures and activities related to RES and RUE in Trysil. The main focus is on developing a local market for bioenergy from local forest resources, as well as the reduction of energy consumption in municipal buildings.

Part I - Facts and figures

- Total energy consumption: 199.000 GWh/year
- Total GHG emissions: 32 000 tonnes of CO_2
- By 2020, emissions will be reduced by 5.200 tonnes of CO_2

Part II - Measures and activities

- Energy efficiency measures in municipal buildings will reduce consumption by 10% during the period 2010-2015 and another 10% by 2020.
- Private building owners will be encouraged to replace old woodstoves and oil-fired heating systems with clean-burning stoves, bioenergy and heat-pump systems.
- The existing district heating system in Trysil will be further expanded. In all these measures fossil fuels for heating purposes will be phased out by 2020.
- The municipality works with the local tourist industry in a public-private partnership to stimulate sustainable tourism



Benchmarking of municipal buildings

Trysil collaborates with the neighbouring municipalities in 5-year programme for implementing all the identified energy efficiency potential and measures in all their municipal buildings.
The SEC-BENCH project will help Trysil to identify priority buildings as well as to monitor the progress of each building after the implementation of energy efficiency measures. The target is to get the entire building stock below 150 kWh/m2 by 2015.

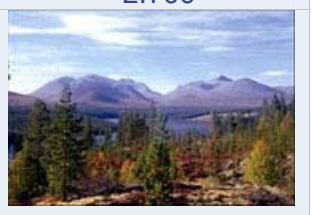
Contact

Ole Martin Norderhaug, Mayor of Trysil, http://www.trysil.kommune.no

Stor-Elvdal, Norway
Sustainable Energy Action Plan
Executive summary

Municipality	Country	Population
Stor-Elvdal	Norway	2.700

The municipality of Stor-Elvdal is located in the western part of Hedmark County, South in Sør Østerdalen. The municipality covers an area of 2167 km2, whereof 54 % is mountain districts, 45% is forest and 1 % is farm land. The population in 2007 was 2705 inhabitants. The municipal centre is Koppang. The municipality of Stor-Elvdal has concrete plans for the establishment of a district heating system. All municipal buildings have been audited and a range of energy efficiency measures have already been implemented.



The Sustainable Energy Action plan

Stor-Elvdal's energy and climate plan was adopted by the municipal Council 22 October 2008 and identifies a whole range of potential follow-up projects related to RES and RUE in the municipality. The plan also identifies a number of critical success factors for the implementation phase, and the need for a local coordinator or a "local champion" to drive the process is seen to be one of the most important. The municipality works actively together with the local business community on this issue.

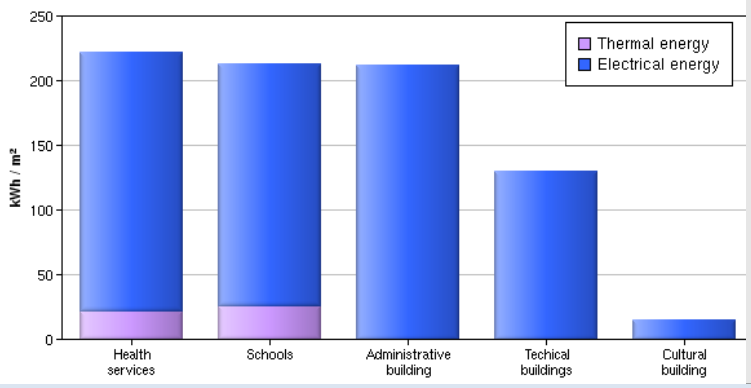
Part I - Facts and figures

- Total energy consumption: 77,5 GWh/year
- Total GHG emissions (2005): 9.982 tonnes of CO_2
- CO_2 emissions from stationary energy consumption will be reduced by 60% by 2020.

Part II - Measures and activities

- The municipality has already audited all municipal buildings, and will implement all profitable measures by 2015. Energy efficiency measures in municipal buildings will reduce consumption by 14% by 2020 compared to 2007
- The technical potential for small scale hydropower is estimated to 118 GWh/year, and a number of projects are under development. The municipality will strongly support these projects.
- The establishment of a new district heating system in Stor-Elvdal will contribute to the phasing out of fossil fuels for heating purposes by 2020.

Benchmarking of municipal buildings



Stor-Elvdal collaborates with the neighbouring municipalities in 5-year programme for implementing all the identified energy efficiency potential and measures in all their municipal buildings.
The SEC-BENCH project will help Stor-Elvdal to identify to monitor the progress of already implemented measures in each building. The target is to reduce consumption by 14% by 2015.

Contact

Sigmund Vestad, Mayor of Stor-Elvdal, http://www.stor-elvdal.kommune.no

Engerdal, Norway
Sustainable Energy Action Plan
Executive summary

Municipality	Country	Population
Engerdal	Norway	1.548

The municipality of Engerdal is located in the eastern part of Hedmark county, bordering to Trysil in the south and Sweden in the East. The municipality covers an area of 2195 km2, whereof 54 % is mountain districts, 45% is forest and 1 % is farm land. The population in 2007 was is 1548 inhabitants. The municipal centres are Engerdal and Drevsjø

The Sustainable Energy Action plan

Engerdal's energy and climate plan was adopted by the municipal Council 24 June 2009 and identifies a whole range of potential follow-up projects related to RES and RUE in the municipality.
Engerdal is a small municipality in terms of population and staff, and the energy plan reflects this in the way it aims to collaborate closely with local industry, citizens and well as the neighbouring municipalities. The main objective states that the municipality will become self-supplied with renewable energy for stationary energy consumption.

Part I - Facts and figures

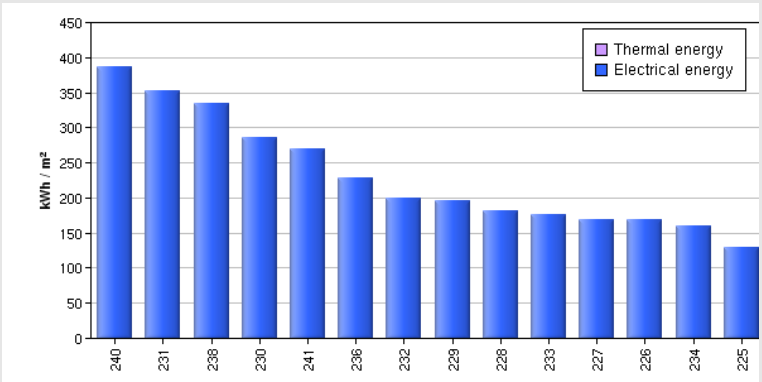
- Stationary energy consumption: 42,6 GWh/year
- Total GHG emissions from stationary sources (2005): 8.585 tonnes of CO_2
- CO_2 emissions from stationary energy consumption will be reduced by 1.500 tonnes by 2020.

Part II - Measures and activities

- It will be mandatory for all new building developments to have water-based heat system for connection to local heating systems or individual biomass systems.
- All municipal buildings (17.000 m2) will be energy audited, and profitable measures will be implemented, partly through EPC-contracts.
- The municipal car-fleet will gradually be replaced by low-emission cars.
- The local schools will be invited to take part in the national initiative "Rainmaker schools", integrating sustainable energy issues in the curriculum.

Benchmarking of municipal buildings

Engerdal collaborates with the neighbouring municipalities in 5-year programme for implementing all the identified energy efficiency potential and measures in all their municipal buildings.
The SEC-BENCH project will help Endgerdal to identify to monitor the progress of already implemented measures in each building. The target is to reduce consumption by 18% by 2015.



Contact

Reidar Åsgård, Mayor of Engerdal, http://www.engerdal.kommune.no

Fredericia, Denmark
Sustainable Energy Action Plan
Executive summary

Municipality	Country	Population
Fredericia	Denmark	49.500

The municipality of Fredericia covers an area of 134 square kilometres and has about 49.500 inhabitants, most of them living in urban areas. The town of Fredericia was established in 1650 by the coast to protect the crossing from Jutland to the islands and the capital Copenhagen. It has some of the largest and best-preserved ramparts in Europe. Today the past lives side-by-side with the present in a modern centre of culture, commerce and industry.

The Sustainable Energy Action plan

Fredericia Municipality was the first Danish municipality to acquire an Environmental Certification of Municipal Activities. The environmental and energy plants today are a part of the entire ISO 14001 Environmental Monitoring System. The municipality makes an annual Green Report of energy consumption in buildings and GHG emissions into the environment. The municipality has a tradition of giving a high priority to environmental projects and is continuously working to create sustainable development within various areas. Thinking about sustainability must become a natural part of our daily lives ï for citizens, for businesses and for the municipal employees. A number of specific focus areas have been identified, including waste, greenhouse effect, biological diversity, organic foods and construction.

Part I - Facts and figures

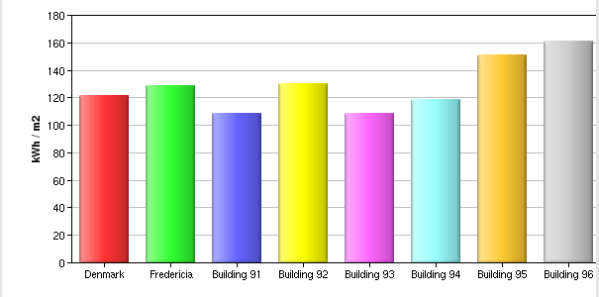
- 21% of Fredericiaôs heating comes from renewable energy
- Total electricity consumption 2008: 503 mil. kWh
- CO2 emissions 2008: 19.1 tonnes CO2 per citizen (44% from Shell refinery)
- CO2 emissions to be reduced by 25% by 2015 compared to 2006 (a total reduction of 207.000 tonnes)

Part II - Measures and activities

- In 2008 the municipality of Fredericia entered a partnership agreement with one of Europeôs leading energy companies DONG Energy. The overall object is to save energy at the municipalityôs own location and to support investments in CO2 neutral energy.
- The Energy labelling scheme for large buildings was developed early on in the municipality, including the following elements and associated activities: energy rating, energy planning, energy management, registration of consumption.

Benchmarking of municipal buildings

Fredericia municipality has a data collection system for energy consumption, but would like to increase the awareness about controlling energy consumption by making the benchmarking tool available to end user (schools, elderly homes, sports centres,etc.) Fredericia believes that the SEC-Bench benchmarking tool could be optimised by dividing the benchmarking areas into comparable climatic and infrastructural zones.



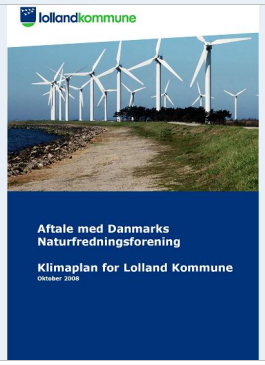
Contact

http://www.fredericiakommune.dk

Lolland, Denmark
Sustainable Energy Action Plan
Executive summary

Municipality	Country	Population
Lolland	Denmark	48.000

Lolland is Denmarkûs fourth-largest island and forms part of the south-eastern Danish archipelago south of Zealand. The Municipality of Lolland was created in 2007 by merging 7 smaller municipalities. Geographically, the municipality covers central and western Lolland and the small islands in Småland waters and Nakskov Fjord ï a total of 892 square kilometres (344 square miles) and approximately 48.000 inhabitants.



The Sustainable Energy Action plan

The municipality actively involves existing industries, the regionûs farmers and inhabitants in a shared green future. But Lolland Municipality is going even further. Together with industry, universities and through energy and environment networks, Lolland Municipality wishes to be Denmarkûs international exhibition case for environment and energy effective technologies in 2009 ï and thereafter! These ambitious goals will be realised through the municipalityûs own financing organisation for investment in energy, LOKE, and with support from Region Zealand as well as national and international partners. Lolland takes a proactive role in its own growth, benefiting climate and the environment and involving other municipal sectors in concrete initiatives.

Part I - Facts and figures

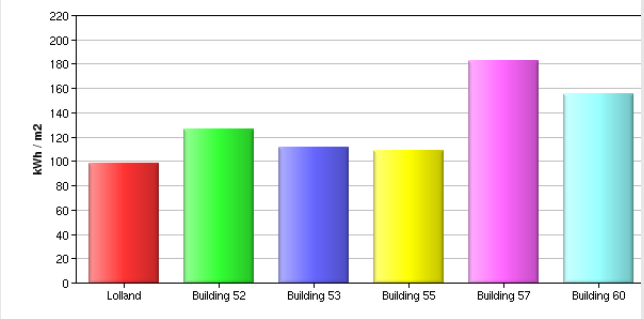
- Lolland municipality is one of Denmark's leading municipalities in renewable energy implementation and climate adaptation. The municipality generates more electricity from renewable resources than it consumes and approximately 70% of all energy needs for heating comes from renewable resources.

Part II - Measures and activities

- Reduce CO2 reduction by three percent annually until 2025.
- Exploit emerging renewable energy technology and energy production as a driver for growth that secures existing jobs and creates new ones.
- Lolland wants to be positioned as a leading full scale testing and demonstration area for energy technology and energy production (Lolland CTF).
- Lolland wants to be an exporter of know how regarding turn key solutions for renewable energy and climate adaptation.

Benchmarking of municipal buildings

Two years on from the merging of 7 smaller municipalities, Lolland is still facing challenges from 7 different administrational structures. The SEC-Bench project has helped to define the weaknesses in the existing BBR system, which is the foundation upon which all energy and investment calculations are made. The benchmarking web tool will be used to visualise the development and implementation of the municipalityûs Climate and Energy plan.



Contact

http://www.lolland.dk

Kolding, Denmark
Sustainable Energy Action Plan
Executive summary

Municipality	Country	Population
Kolding	Denmark	88.000

Kolding is a middle-sized municipality with approx. 88.000 citizens and an area of 603 square kilometres, situated at the eastern coast of Jutland. It belongs to the so called Triangle Region, which is one of the fastest growing areas in Denmark in terms of citizens and business. The Municipality of Kolding is characterized by market towns and its strategic good position in Denmark ï at the crossroad from Copenhagen and northern Jutland further down to Europe.

The Sustainable Energy Action plan

Kolding Municipality was one of the first to develop a strategic plan for reducing the consumption of electricity, water and heat in municipal owned and rented houses. The first Energy Action Plan was approved by the municipality in 1997 and covered the period from 1998 to 2006. The entire energy savings accounted for 6.3 mill DKK yearly, corresponding to a return on investment of 30%. In October 2008, Kolding was selected as one of Denmarkôs sixenergy towns. The Energy Towns are to serve as a model in Denmark when it comes to climate and the environment ï and as a visible inspiration to the outside world. As an Energy Town, Kolding has committed itself to continuous, well-thought out, future-proof and ambitious measures in this area, both on a national and an international scale.

Part I - Facts and figures

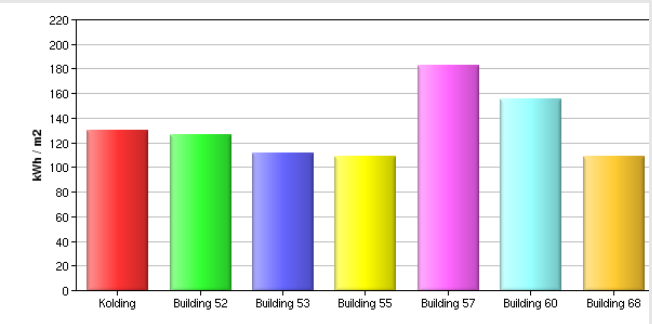
- 43 windmills, producing approx 9% of the municipalityôs electricity consumption
- Total electricity consumption: 737 GWh/year, hereof 25% renewable energy
- Total heat consumption: 1.254 GWh/year, hereof 26% renewable energy
- Total GHG emissions: Approx 1.000.000 tonnes of CO_2
- CO_2-emissions to be reduced by 75% per inhabitant in 2021 compared to 1990.

Part II - Measures and activities

- Kolding Municipality has decided to continue and strengthen ongoing efforts, which are being reported in the Energy Action Plan for the Municipality as an organization, period 2008-2016. This strategy contains further options for reducing energy consumption.
- In addition the Energy Action Plan, Kolding has prepared the strategic document ñEnergy Koldingò, which refers to the municipality as a geographical area with more technical aspects, facts and figures.
- In addition for this period the municipality is planning a CO_2 reduction of 60% compared to 1990.

Benchmarking of municipal buildings

Kolding municipality has a very complex system for collecting energy consumption data and CO2 reduction plans are well established. Despite this Kolding municipality recognises the potential of the SEC-Bench benchmarking tool. It is extremely user-friendly and is an effective interactive tool when presenting cases to decision makers. Kolding municipality believes that the benchmarking potential would be strengthened enormously once recognised as an approved system for reporting data required by the Covenant of Mayors.



Contact

http://www.kolding.dk/pdf/20090828085559.pdf

Bielsko-Biała
Sustainable Energy Action Plan
Executive summary

Municipality	Country	Population
Bielsko-Biała	Poland	175 500

Bielsko-Biała is the biggest town in the southern part of the Silesian Voivodeship. The town operates an administrative unit named Energy Management Office. This unit develop the local energy policy through various activities addressing as well the energy producers as the users. The town involves itself in many projects related among other to sustainable energy management, monitoring and energy planning. The town Bielsko Biała popularizes also in an outstanding way the energy management activities among other municipalities.

The Sustainable Energy Action plan

In the year 2009 the town Bielsko-Biała has developed an Action Plan for Sustainable Energy. The Plan defines objectives and methods to achieve them, within the context of establishing the Convent of Mayors. One of the main objectives of this Plan is to reduce energy use by 227 840 MWh/year compared to energy used in 1990. The Plan assumes also significant reduction of energy use and costs of its supply. Reaching of these objectives shall be supported by closer co-operation between particular units of the local self-government.

Part I - Facts and figures

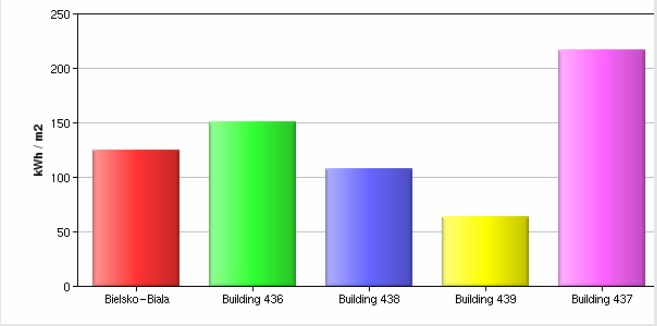
- Total CO_2 emissions (without industry sector): 1 529 943 tonnes
- By 2020, emissions will be reduced by 182 817 tonnes

Part II - Measures and activities

- Implementing of thermal retrofitting of town-owned - energy savings by 13 141 MWh/year.
- Thermal retrofitting of municipal residential buildings.
- Modernization and promotion of public transportation.
- Emission mitigation in private sector by implementing the Low Emission Mitigation Programme and promotion of thermal retrofitting – CO_2 mitigation by 18 050 tonnes CO_2/year.
- Modernization of lighting system in the town.
- Increase of energy distribution efficiency.

Benchmarking of municipal buildings

Since many years Bielsko-Biała has been monitoring the energy use and power demand in town objects. Benchmarking actions related to the SEC-BENCH project may be helpful for analyzing energy use in different groups of town objects and they make it possible to directly compare set of indicators for these objects to indicators found in other municipalities participating in this project.



Contact

Biuro Zarządzania Energią, Urząd Miejski w Bielsku-Białej
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Katowice, Poland
Vision & Strategy
of Energy Systems Development

Municipality	Country	Population
Katowice	Poland	309 800

Katowice is a City located in the central part of a conurbation which is the biggest complex of this type in Poland and Central Europe. At the same time Katowice is the capital of the Silesian Voivodeship. The city is involved in numerous projects related to sustainable energy management and energy planning. Within the City Hall structure a specially dedicated working post has been established for energy management.

The Sustainable Energy Action plan

In March 2009 the City Hall of Katowice has issued a *Vision & Strategy of Energy Systems Development in the City of Katowice.* The objective of this Plan is to formulate the local energy policy in a way convergent with 'zero-energy' economic growth, with use of RES to a technically and economically acceptable maximum extent and with greenhouse gases emission mitigation. Furthermore – important objectives have been defined along with potential for reaching these objectives in the area of the city operated energy systems, to make them socially acceptable as environmentally friendly solutions.

Part I - Facts and figures

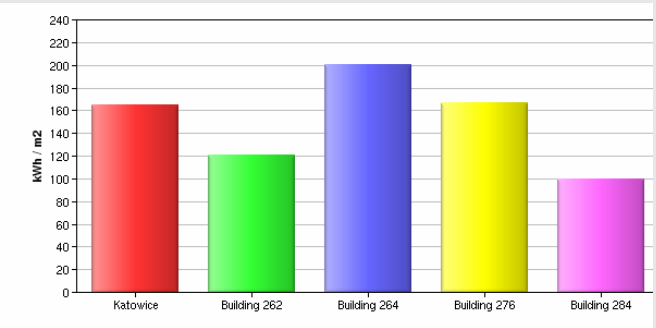
- Energy use for heating purposes: 3065.3 GWh/year
- Total CO_2 emissions: 1 597 000 tones
- Potential of total CO_2 emission mitigation deriving from heating of public service objects (including education sector objects) reaches 14 000 tones CO_2/year.

Part II - Measures and activities

- Implementing and upgrading of a permanent energy and environment management system in the City (inventory, planning, programming, coordinating, monitoring, reporting).
- Updating of „*Plan of Power, Heat and Gaseous Fuels Supply for the City of Katowice*", the existing assumptions to this Plan have been made in the years 1998 – 2000.
- Modernization of public service objects (including education sector objects) owned by the City – energy reduction potential reaches 35,8 GWh/year, i.e. 38,4% of the total energy consumption.

Benchmarking of the City objects

The City of Katowice has developed assumptions for thermal retrofitting of objects and buildings owned by the City. The SEC-BENCH project makes it possible to identify highly energy consuming objects with high specific costs for energy, thus helping to reach the aim of reducing specific energy use to the level below 120 kWh/m^2.



Contact
Daniel Wolny, Urząd Miasta Katowice
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Częstochowa, Poland the Local Action Plan for Energy Efficiency

Municipality	Country	Population
Częstochowa	Poland	242 300

Częstochowa is located in the northern part of the Silesian Voivodeship. The City is involved with many activities addressing sustainable energy management, among other related to energy use in the City owned buildings. An advisory body in the area of energy is the Council for Sustainable Energy Management in the City of Częstochowa. The City is one of the leaders among Polish towns in the field of energy management.

The Sustainable Energy Action Plan

In December 2009 the Częstochowa City Hall has developed a Local Action Plan related to energy efficiency. The objective of this Plan is mitigation of energy costs and environmental harmfulness by the objects and buildings in the City area, as well as implementation of „Assumptions for plan of heat and power supply in the City of Częstochowa", approved by the City Council in the 3rd Quarter of 2007 in the part related to rational use of energy. The Plan assumes reduction of energy consumption in the City owned education sector objects, by 31,6% by the year 2020.

Part I - Facts and figures

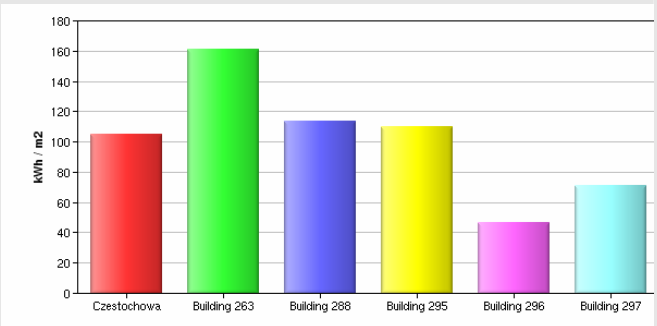
- Total energy consumption: 4465.8 GWh/year
- The main objective is mitigation of energy use in the year 2016 to the level 4063,9 GWh/year
- Total equivalent emission for education sector buildings reaches 23 170 tones CO_{2equiv}/year

Part II - Measures and activities

- Mitigation of energy use in City owned education sector buildings: I step – 2013 – by 8,4%, II step – 2016 – by 12,1%, III step – 2020 – by 31,6%.
- Mitigation of energy use in other public service objects by the year 2020 - by 25%.
- Putting special attention on energy use monitoring and energy efficiency in the transportation sector.
- Approximate energy savings potential related to heating demand of City owned municipal buildings reaches ca 152 GWh/year.

Benchmarking of City objects

Częstochowa is continuously monitoring the energy use in City objects. Some of these objects are characterized with an identified potential of energy use mitigation.
The main objective of the SEC-BENCH project activities is to reduce energy consumption in all City education sector objects to the level below 140 kWh/m^2 by the year 2020.



Contact
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Amaroussion, Greece
Sustainable Energy Action Plan
Executive summary

Municipality	Country	Population
Amaroussion	Greece	69.400
Municipality of Amaroussion	Today's modern city of Amaroussion, covering 13,093 km² of the Attica region, has become a large business centre in the region of Attica, with strong abilities and great potential in the field of environmental issues as well as in the field of energy. One of the main goals and areas of activity of the Municipality is the reduction of the greenhouses gasses, increase of energy efficiency and rational energy sources management.	

The Sustainable Energy Action plan

The Energy Plan of the Municipality of Amaroussion is the framework in which energy actions and projects will be integrated within the municipal vision for sustainable development and environmental policy. It is also in accordance to the Local Business Plan for the period 2007-2010 and various local development programmes. The municipal Energy Plan was accomplished under the supervision of the top management involving also consultation with local stakeholders and citizens. Furthermore, a working group was set by Municipal Council's decision in order to report the current situation and the related projects' proposals.

Part I - Facts and figures

- Planned energy retrofitting of public buildings will result in 470,65 MWh/year energy saving and 164.05tn CO_2 reduction, which amounts to over 29% reduction of current consumption
- The overall energy reduction from all energy efficiency interventions included in the current SEAP accounts to a total of 1033.41 MWh/year and 1148.66 tn CO_2 reduction

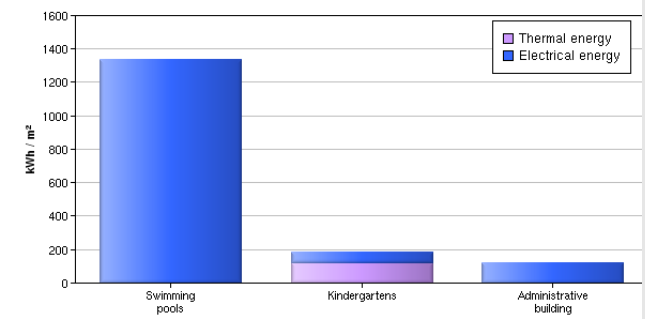
Part II - Measures and activities

- Energy saving is integrated as a main priority in the four pillars referring to specific interventions in municipal buildings, urban public spaces including road lighting, local transportation and finally, dissemination and information networking actions.
- Target setting and strategies relevant to the private sector where the municipality has no jurisdiction are still immature. However, the Municipality encourages and aids every attempt deriving from the private sector or the citizens towards energy saving.

Benchmarking of municipal buildings

The municipality has introduced in the SEC-BENCH benchmarking tool energy consumption data for 5 municipal buildings

The SEC-BENCH project has helped the municipality collect energy data and assess proposed interventions for the 1st phase of the sustainable energy plan



Contact

George Patoulis , Mayor of Amaroussion
email : european@maroussi.gr

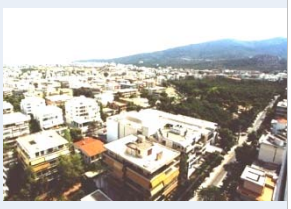
Holargos, Greece
Sustainable Energy Action Plan
Executive summary

Municipality	Country	Population
Holargos	Greece	50.000

http://www.holargos.gr

Pericles Street

The municipality of Holargos is located northeast of Athens at the foot of Hymettus Mountain. Its area is 350 hectares. The municipality has recently completed the natural gas infrastructure network. The connection to the network is optional for the citizens. Considerable technical and legislation framework problems currently prevent the data collection concerning the energy consumption for all buildings of the area. So, for the moment, the municipality has collected energy data for SEC-BENCH only in 14 municipal buildings. Ongoing sustainable energy measures include a gradual, since 2004 replacement of fluorescent interior light bulbs (City Hall, Schools) with low energy and efficient ones. 90% of these buildings have also been connected to the natural gas network and more will follow. Finally, the municipality has already scheduled energy-saving interventions for 7 of the above mentioned buildings until 2015 in order to achieve a 12% energy savings of the total consumption.



View of City

Town Hall

The Sustainable Energy Action plan

Holargos Municipal Council adopted its energy and climate plan in October 2007 through the Eco-Management and Audit Scheme “EMAS”. Also in 2009 the SEC-BENCH forms were used to record energy data of the buildings. The recording also lead to a funding proposal concerning bioclimatic interventions in existing schools in order to achieve a 55% energy reduction. The Municipality became an official member of the SEC-BENCH project in 2010.

Part I - Facts and figures

- ***290.000 kWh*** expected energy consumption per year and ***160 t.*** per year reduction of carbon dioxide CO_2 emissions due to the proposed interventions on the 7 of the above mentioned municipal buildings.
- ***41.600 lt*** per year, reduction on Petrol consumption, (equal to 496.000 kWh of energy) due to the implementation of the urban sustainable mobility program
- ***7.170 m*** of roads and ***52.000 m²*** public space surfaces under the implementation of bioclimatic Design interventions and Energy consumption techniques.

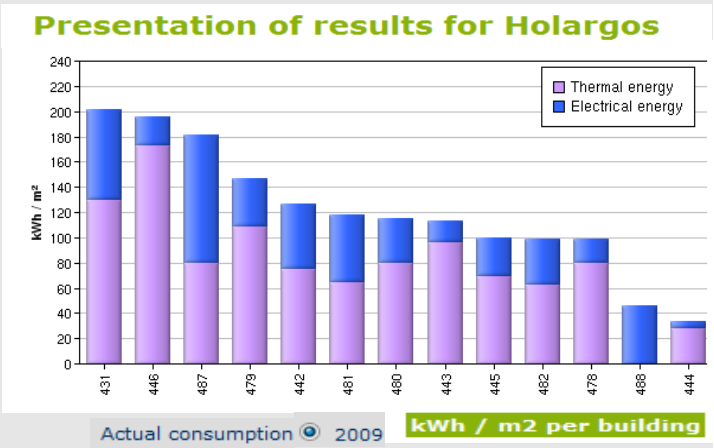
Part II - Measures and activities

- Energy efficiency measures at municipal buildings (for example: replacement of single glazed windows with double ones, outer insulation, roof planting, etc.)
- Reconstruction of roads and open public spaces with implementation of bioclimatic design principles.
- Completion of natural gas infrastructures concerning the residential buildings' connections.

Benchmarking of municipal buildings

The Technical Services of the Municipality of Holargos has begun data collection on energy consumption concerning: electricity, oil (for buildings' heating) and natural gas use for all municipal buildings for the years 2004, 2008 and 2009.

The SEC-BENCH project helps the Municipality of Holargos to identify priority buildings and to monitor the progress of each building after the implementation of energy efficiency measures in order to meet its energy targets by 2015.



Contact

Dimitris Nikolaou , Mayor of Holargos

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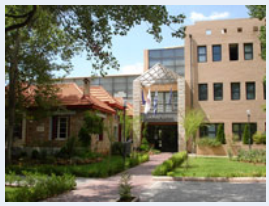
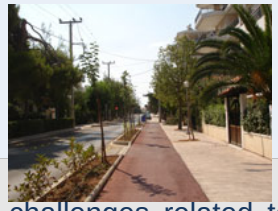
Vrilissia, Greece
Sustainable Energy Action Plan
Executive summary

Municipality	Country	Population
Vrilissia	Greece	46.000

Vrilissia is located at the north-east part of Athens and is a small Municipality of Attica. The resident population is about 46.000 and the area of the Municipality is 3.672km2. However, the population is increasing every year because of the recent construction of Attiki Road and the Metro Station of Doukissis Plakentias.
Since 2000 the municipality has been interested in finding ways to introduce bioclimatic design and increase energy efficiency and has focused on creating environmentally friendly conditions both indoors and outdoors.





The Sustainable Energy Action plan

In May 2007 the Municipality of Vrilissia discussed their vision and strategic challenges related to energy and climate issues and it was decided to develop a Sustainable Energy Action Plan as a basis for further work. Vrilissia's SEAP identified a whole range of potential follow-up projects.
One of the identified actions was to improve the energy performance of municipal buildings and installations. Vrilissia has now initiated a dedicated programme for energy efficiency in many of municipal buildings. The SEC-BENCH project has helped Vrilissia to monitor the progress of each building after the implementation of energy efficiency measures.

Part I - Facts and figures

- The total energy consumption of eight buildings that have been recorded, amounts to 530.000 kWh yearly
- The energy savings from the improvement of their energy performance is expected to reach 80.000 kWh, while from all proposed interventions 160.000 kWh savings are expected by 2011 (by interventions on municipal property only)
- CO_2 reductions resulting from the 1st phase implementation of the SEAP amount to over 15.000 tonnes yearly
- Further savings are expected through bioclimatic improvement of public spaces and energy retrofitting of the majority of public buildings at a later stage.

Part II - Measures and activities

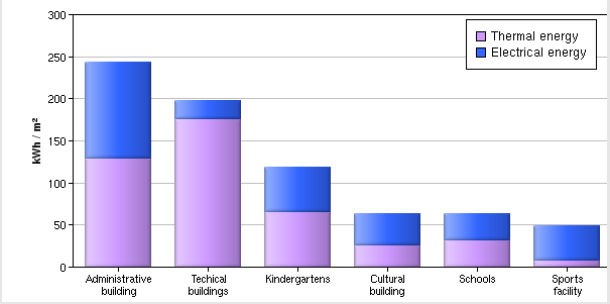
The Municipality of Vrilissia has identified a set of measures and activities that will be included in the Sustainable Energy Action Plan, and which have been submitted for funding under the National "EXOIKONOMO" Programme. These will be completed by the end of 2011.
The measures and activities that have been so far identified through the SEC-BENCH project and will be included in the "EXOIKONOMO" initiative include energy retrofitting of

- 8 municipal buildings
- the municipal lighting system
- the municipal car fleet
- municipal installations (pump stations)

Energy efficiency measures are also foreseen for most municipal buildings at a second phase.

Benchmarking of municipal buildings

Energy data from 2007 and 2008 for eight municipal buildings have been collected in order to create an inventory of the building stock.
The benchmarking has helped identify energy efficiency measures most appropriate for each building.



Contact

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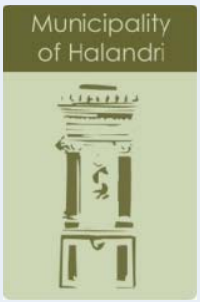
Halandri, Greece
Sustainable Energy Action Plan
Executive summary

Municipality	Country	Population
Halandri	Greece	71.684



The Municipality of Halandri is located in the ancient Municipality of Flya, 12 km NE of the city of Athens and its area is 963 hectares. Today it is one of the most important municipalities of the larger Athens area. Most of the buildings in Halandri have been constructed during the last 30 years.

The Municipality's involvement with the 3-NITY project set a new priority for Sustainable Energy Management. To support this priority, the Municipality initiated collaboration with CRES to elaborate a concrete and sophisticated sustainable energy management program according to the vision of the municipal administration. The Sustainable Energy Vision is characterized by the commitment of the Municipality to undergo several activities that will distinctively raise the energy sustainability of the city.

The Sustainable Energy Action plan

Several different approaches have been considered that the municipality can follow in order to lay out an efficient and sustainable action plan. The sustainable Energy Action Plan for the adoption of renewable energies and energy efficiency measures has been based on the 21OTA Sustainable Energy Plan.

The Plan covers the years 2008 to 2013 and its very first implementation will be through the program 'I CONSERVE' which will run for the next three years and will provide concrete data that will enable the city to analyze and assess the effectiveness of the SEAP and allow for possible revisions.

Part I - Facts and figures

The measures and activities with respect to buildings foreseen until 2013 will result in a significant reduction of the energy consumption. An estimated 30% energy reduction amounts to 110.000 kWh saved per year, through interventions onto three municipal buildings included in the SEAP.

Part II - Measures and activities

A series of measures and activities have been identified deriving from the six thematic poles around which the Sustainable Energy Action Plan (SEAP) is being deployed:

(i) Policy and Decision Making
(ii) Building Efficiency and Retrofitting
(iii) Energy Efficiency in Public Spaces and Infrastructure
(iv) Alternative Energy Sources
(v) Alternative Energy and Efficiency in Transport
(vi) Dissemination and Public Awareness Activities

Benchmarking of municipal buildings

Energy data from 2007 and 2008 for five municipal buildings have been collected in order to create an inventory of the building stock.

The benchmarking has helped identify energy efficiency measures most appropriate for each building.

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Slovenske Konjice, Slovenia
Sustainable Energy Action Plan
Executive summary

Municipality	Country	Population
Slovenske Konjice	Slovenia	14.000

The municipality of Slovenske Konjice is located in north eastern part of Slovenia. The municipality has already prepared energy concept and energy audits of particular (public) buildings are starting in 2010. In order to be able to monitor and record energy data better as well to prepare concrete implementation of energy efficiency measures in some of the selected buildings an energy manager was appointed and a working group established. Among other things they are preparing for energy labelling of the buildings and a project of retrofitting of public lighting has already started.

The Sustainable Energy Action plan

Municipal Council of Slovenske Konjice adopted its energy concept (plan) in summer 2009. The plan concept first analysis energy status quo in before all of public buildings and identifies the most critical of needed follow-up projects related to energy efficiency and renewable energy. Its aim is the noxious emission reduction both GHG and others in all sectors.

Part I - Facts and figures

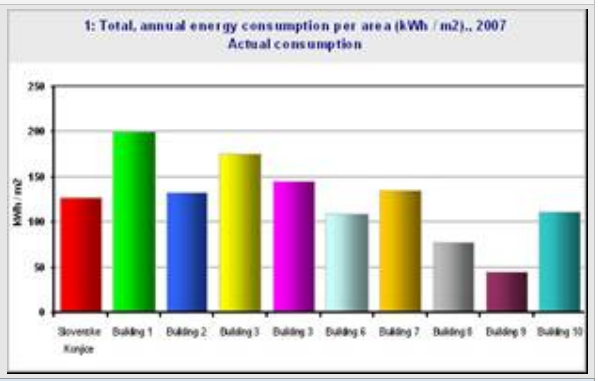
- Total energy consumption: 117.000 GWh/year
- Total GHG emissions in residential heating : 7000 tonnes of CO_2
- By 2020, emissions will be reduced by 85%.

Part II - Measures and activities

- More detailed energy audits – energy label - of the public buildings are going to be carried out until 2012.
- Retrofitting project of the public lightning is in starting phase. A pilot – testing project was arranged with a local producer of energy efficient lights. If good results attained the majority of lighting would be replaced with the more efficient and environmentally friendly.
- The existing district heating system on fuel oil is going to be replaced with a environmentally friendlier on natural gas or even with renewable energy if study would show possible. This will result in green house gas emissions reduction of approximately 6000 tonnes.

Benchmarking of municipal buildings

Municipality Slovenske Konjice has started a specific programme for implementation of the identified energy efficiency measures in municipal buildings.
The SEC-BENCH project will help Slovenske Konjice to better identify priority buildings and to monitor the progress of the buildings after the implementation of measures. The target is to get the 10% RES share in the school buildings and 10% reduction of energy of the public buildings stock and households by 2015.



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