esam

ENERGY STRATEGIC ASSET MANAGEMENT

Methods and tools to optimize the energy strategy in social housing entreprises

December 2008

Intelligent Energy Europe

OBJECTIVE OF THE DOCUMENT

Dedicated to the technical & general managers of social housing organisations, this document addresses the main issues professionals have to deal with when they consider the development and the implementation of an Energy Strategic Asset Management Information System (IS). It aims to:

- Guide the reader in the development of I.S. supporting the decision making process and enabling the asset managers to optimize their investments in terms of energy efficiency.

This involves:

- to enlighten the reader about the relevant information on its business environment and objectives. The reader should understand clearly what kind of results he can expect from the Information System. tools. Due to the variety of Social Housing Organisations involved in the ESAM project, this book covers almost all the institutional situations that can be found in the European Union.
- to present an overview of the I.S. tools produced in the frame of ESAM project.
- to describe the different potential functionalities of ESAM/PDBM Information System (I.S.) tools developed during the project.
- to present how the ESAM project has participated to the reflexion on energy issues in the social housing sector.
- to give an overview of the achievements of the project, the lessons learnt and the feedback of the market actors on the project outputs.

REALISATION OF THE DOCUMENT

This report was written by Baptiste Camus, DELPHIS, Project Manager of ESAM thanks to the contributions of all ESAM project partners.

The document gathers the conclusions of several deliverables of the project. It reproduces integrally the General Synthesis of the Book of Recommendations to Implement an ESAM I.S. Tool. It is also inspired by two other deliverables of the project: the Conceptual framework ESAM (Delivrable.11) and the General Framework and Description of Cooperation Management Best Practices (Deliverable.14) available on the project website www.esamproject.org.

It has been supervised and approved by the whole project consortium.

In order to improve its quality, the document was finally revised by a representative sample of organizations or companies targeted by the present publication.

E.g. EFFINEO, the French industrial partner that will take in charge further developments of the French ESAM I.S. read the document which was amended following their comments.

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SUMMARY OF ESAM PROJECT

The ESAM project is willing to promote an efficient energy management of large social housing stocks by institutional players.

Improving the energy performance of the social housing stock in Europe requires focusing on the Social Housing Organisations (SHOs), which can implement energy-retrofitting on a housing stock of several thousand dwellings. In order to do so, they need to integrate energy issues in their global strategy. This means making an energy diagnosis of the housing stock and to identify the most cost-efficient investments regarding the energy performance in order to define a strategy for upgrading their housing stock.

Due to the size of the concerned stock and the data attached, this management implies the development of corresponding Information System which can support all the decision making processes.

The project aims at developing methodologies and information systems supporting:

- the implementation of the energy certificates
- the use of the data extracted from the energy certificates to make an energy strategic diagnosis of the housing stock
- the definition of energy-retrofitting strategies for each estate/building with an evaluation of their energetic and financial consequences at the strategic level of the housing stock.

It also aims to improve the co-operation with the other stakeholders: inhabitants, local public authorities, facility and utilities companies, energy providers.

MAIN CONCRETE ACHIEVEMENTS OF ESAM PROJECTS

- ESAM project has permitted to improve the knowledge of the housing stock of the partners. It enabled them to:
  - Gather an important amount of technical, economic and sometimes social data concerning their housing stock,
  - Collect energy performance certificates of their buildings and in several cases to produce them (Germany, Italy), even when the legal methodology wasn't approved yet,
  - Classify their housing stock in typologies following technical & energy-related criterion,
  - Define strategies (also called "retrofitting scenarios") for different typologies of buildings,
  - Learn about other countries best practices in terms of energetic refurbishments.

  These lessons learnt from the project are useful for all EU SHOs as it spreads the good practices in terms of data collecting processes, typological approach of energy asset management and retrofitting best practices.

- Based on their corresponding books of specifications, methodologies and information systems have been developed for the integration of energy assessment and calculation tools into the strategic asset management process of social housing organisations. It is important to mention that it was not the case before the beginning of the project.
  This vast range of software enable SHOs to assess the energy & financial efficiency of different investment choices, at the level of one building or/and at the level of the housing stock. The 6 I.S. tools are very different, adapted to the national context of the social housing sector of the ESAM partner but also to its specific needs.

- A toolbox describing the best practices regarding cooperation with stakeholders has been written, in order to suggest solutions for the improvement of the energy performance in the social housing stock.

ESAM PROJECT PARTNERS

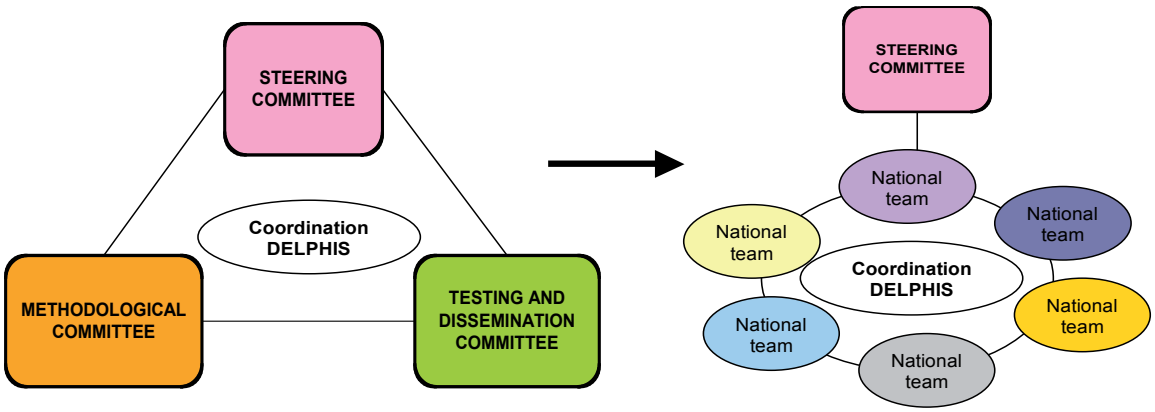
The ESAM project is led by a consortium composed of 14 organizations from 6 countries: France, Germany, Italy, the Czech Republic, Austria and Estonia.

- *Social Housing Organisations (SHOs):*
  Le Toit Angevin (France),
  Le Val de Loire (France),
  Nassauische Heimstätte (Germany),
  Gemeinnütziger Salzburger Wohnbaugesellschaft m.b.H (Austria),
  Mestska Realitni Agentura, s.r.o. Havirov (Czech Republic),
  ATC Torino (Italy)

- *Professional federations or associations of SHOs:*
  DELPHIS (France),
  Österreichischer Verband gemeinnütziger Bauvereinigungen –Revisionsverband (Austria),
  Baltic Union of Cooperatives Housing Association (Baltic states)

- *Research institutes and energy agencies:*
  Institut Wohnen und Umwelt (Germany),
  CSTB (France) & ARMINES (France),
  Österreichische Energieagentur (Austria)
  Agenzia Energia e Ambiente di Torino (Italy)

Project Management Structure



GLOSSARY

Building

A building can include one dwelling (single house) or several dwellings (multifamily buildings). The building level is the relevant unit for energy retrofitting issues.

Energy consumption and green house gas emissions

Energy certificates are based on the Energy Performance of Building Directive. Their calculation method is not the same in all ESAM countries but they all contain at least:

- the primary energy consumption in kWh per m2 per year of the building (1 litter of oil equivalent = 10 kWh)
- the emission of green house gas (GHG) in kilograms of equivalent CO2 per m2 per year

Energy Certificate or Energy Performance Certificate (EPC):

Stemming from the Directive 2002/91/EC of the European Commission "Energy Performance of Building Directive", Energy Performance Certificates are the documents supporting the assessment of the energy performance of the buildings generally given in kWh of primary energy / m^2 / year and in kg of greenhouse gas per year. These EPC are a legal obligation in all EU countries.

Energy Strategic Asset Management (ESAM):

ESAM is the process which integrates the energy dimension in the strategic asset management of the SHOs. In an ESAM tool, energy issues are considered from the point of view of the housing stock or clusters of buildings.

ESAM is defined in more details in the *WP2 Book of specifications – Common conceptual framework for the ESAM project* (deliverable n°11).

Estate:

An estate is a unit of one or several buildings which is defined by at least one of the following common features: building site, period of construction, financing and rent calculation.

Facility Management (FM) Information System:

FM Information Systems are used by housing companies to automate the collection and maintenance of facilities management information. FM systems provide the facility managers with tools to track and report on facilities information. Typically, FM systems track and maintain:

- the collection of information on (management of) facilities maintenance
- FM IS provide existing technical state of the art of the building's components
- FM IS track and update space characteristics and usage
- buildings plans and occupancy data
- Workplace assets (furniture and equipment)
- Business continuity and safety information
- Local Area Network (LAN) and telecom information

Housing stock:

The housing stock is composed of all estates of a given SHO, usually several thousands of dwellings at least

Information System (I.S.):

An I.S. is a (set of) software managing information in a SHO. An ESAM I.S. tool or PDBM I.S. tool refers to softwares that supports the ESAM or the PDBM functions.

Project Diagnosis and Brief Management (PDBM):

PDBM is the process by which the SHO tries to define the brief of a retrofitting strategy at the estate or building level, i.e. the main solutions which will be used; after the brief phase more detailed studies will determine the exact solutions to implement. In this document PDBM refers specifically to energy retrofitting. The *PDBM book of specifications* (deliverable n°14) defines in more details the content and functioning of PDBM.

SHO (Social Housing Organisation)

A Social Housing Organisation manages housing for medium and /or low-income households. In 5 of the ESAM countries, SHOs manage rental housing.

The case of Estonia is specific because the targeted SHOs are co-operatives of owner-occupiers as a result of the mass privatization of the former municipal housing stock, as it was the case in many new member states.

Strategic Asset Management (SAM):

SAM is the process which enables strategic decisions concerning the housing stock in order to allocate the investments as efficiently as possible. It is based on a diagnosis of the housing stock. Already used by 2 partners before the beginning of the project, it mixes social, commercial, technical and financial data and criterion. It aims to ensure the coherence of the investment choices. Technical data were generally extracted from existing facility management softwares. Up to the ESAM project, energy related data were not included as a full dimension in the SAM.

Precision concerning PDBM and ESAM I.S. tools:

During the project, project partners decided to merge these two instruments and to direct their own software development either on a PDBM aspect or on ESAM aspects. The resulting software generally includes functionalities of both aspects. As a convention, we will generally speak about ESAM I.S. tools even for software closest to a PDBM tool.

HINTS FOR A QUICK LECTURE OF THE DOCUMENT

This document presents in details the outputs of the ESAM project.

It is possible to speed read this document going directly to the part 2: *How to choose your ESAM information system tool*. The table p.19 will guide the reader to the type of tool adapted to his situation.

Once this defined, the reader can skip to the short description of the ESAM partner tool that corresponds to his situation (part 4: *Synthetic presentation of the 6 ESAM information system tools*) and have a look to the table 5 (*Summary of the main ESAM/PDBM features* p.33) in order to look for additional functionalities that may be interesting for the development of an ESAM I.S.. If the reader looks for more details on the tool concerned, he will find the detailed book of recommendations (*Guide of recommendations to create and implement an ESAM tool, Section 2*) on the ESAM project website: www.esamproject.org

GENERAL INTRODUCTION

One goal, various ways

The nature and the size of the participating SHOs, their differences in terms of institutional & business contexts, in terms of knowledge & I.S. tools but also in terms of technical issues (knowledge, state of the buildings,) was too important to enable a common development of the I.S. tools as it was planned at the beginning of the project. For that reason, each national team picked up the recommendations described in the books of specifications to build their own SAM/PDBM I.S. tool that fits perfectly with their needs and constraints.

In fact, the energy performance can be integrated in the strategic asset management in different ways which depend on the situations and objectives of each SHO:

- It can be integrated at all steps of the SAM process: that is the **ESAM in SAM** case. The precondition for this case is that a SAM preexists or that a SAM is developed at the same time as the ESAM.
- It can be used on its own to define an investment plan for the energy retrofitting of the housing stock. That is the **Energy alone** case. This case is generally suitable for small housing companies (less than 3.500 dwellings) with no existing SAM system.

- Energy can also be taken into account only in the implementation phase of SAM, through the use of specific tools to maximize the energy efficiency of the refurbishments.. That is the **Energy after SAM** case. This case corresponds to a situation where the running SAM IS system doesn't need to be changed.

The choice of separated national developments of ESAM tools made possible the construction of quite different tools. It enables the ESAM project outputs to cover the whole range of different institutional situations that can be found in the European Union countries (see table 1 below)

*Table 1 : Vision of social housing in the European Union and status of SHOs**

EU Countries	*Bulgaria, Cyprus, Estonia, Hungary, Ireland, Malta, Lithuania, Latvia, Romania, Slovakia*	*United-Kingdom*	*Spain, Greece, Portugal,*	*Belgium, Luxembourg, Poland*	*Slovenia*	*Finland*	*Denmark*	*Holland Sweden*
Participating countries	**Italy**	**Czech Republic**			**France, Austria**	**Germany**		***Estonia****

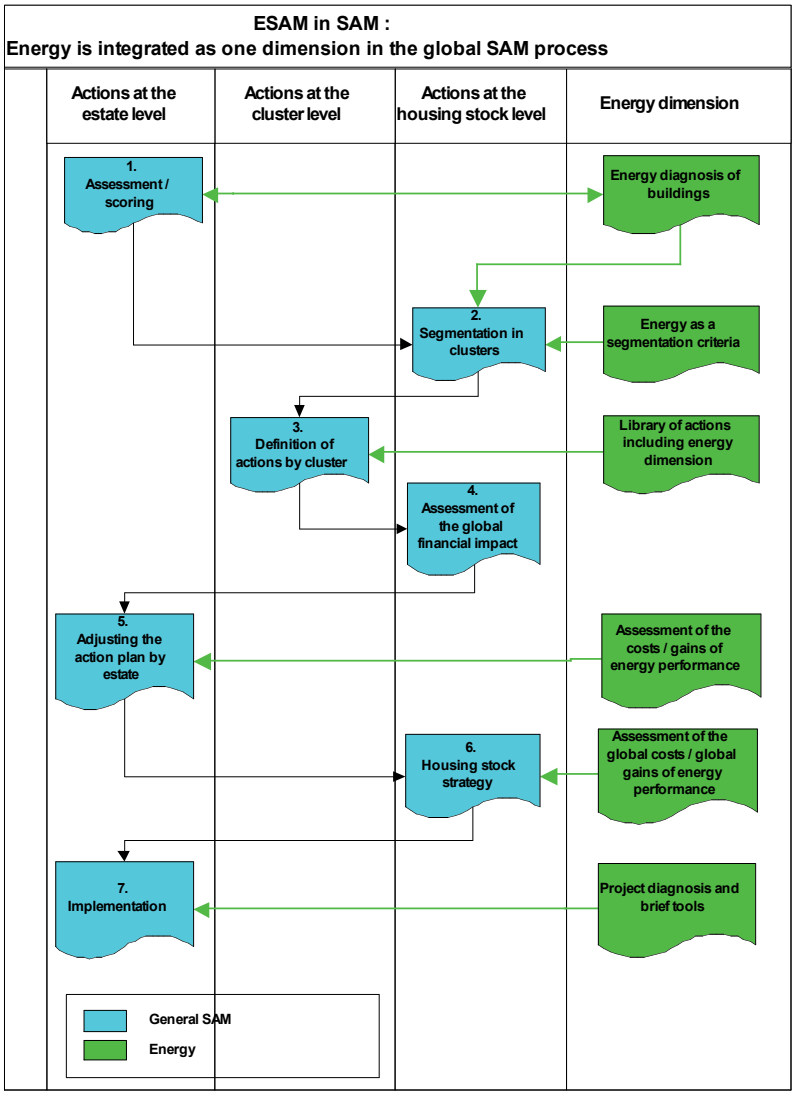
Model	RESIDUAL	GENERALISTIC	UNIVERSALISTIC
Target	Poorest families	Poor and Medium families + workers	Everybody
Price policy	Low rents, depending on revenues	capped rent	Capped rent / market prices
Status of housing companies	Strongly regulated (public bodies)	Public-owned or non profit private companies and cooperatives	Private companies (can be owned by public body)

* * Our Estonian partner involved in ESAM project is a federation of private cooperatives, social housing organisms also exist in Estonia

*Inspired by Laurent Ghekiere, *Le développement du logement social dans l'Union Européenne*, Collection Europe, 2007 p137.

Part 1: Brief presentation of the theoretical models of ESAM/PDBM tools

1.1 The "ESAM in SAM" case



Name of SAM step	ESAM (Examples)
1. Strategic framework	e.g. Energy saving goal (voluntary agreement with the municipality), strategic energy actions
2. Strategic diagnosis	Assessment of the energy performance of the total housing stock (simplified method), energy certification
3. Segmenting the housing stock	Energy as an additional segmentation argument, portfolio matrix with energy as an additional dimension (matrix of clusters)
4. Defining strategies	Library of actions including energy e.g. no additional investment in energy performance or improve energy performance (10-litre house; x €/m2)
5. Global impact	Definition of a global budget for the housing stock strategy including energy strategies, assessment of the impact of the global strategy on the energy performance of the housing stock
6. Adjusting the action plan	Including assessment of costs and gains of energy performance on estate level e.g. calculation of different scenarios
7. Implementation	project diagnosis and brief tools

ESAM in SAM means that energy is totally integrated in the global SAM process. The figure (draft) and the table above shows that energy aspects can be integrated at all steps of the SAM process, which was described on the pages 2 to 12.

Strategic framework

The SHO could express in its vision that it feels obligated to sustainable development and energy saving. This global goal could be broken down afterwards into concrete company goals with different strategic actions concerning energy: The SHO could commit itself to fall below the legal requirements concerning the energetic refurbishment of a building (e.g. by using a higher thickness of insulating or using an insulating material with better heat transition coefficient). Another task is to examine the legal, institutional and economic framework for energy strategies. Does the market honour a better energy performance of a building (dwelling) by higher rents or a lower vacancy rate (now and in future)? What are future trends in legislation concerning energy? How do the energy prices develop? Is public funding for a better energy performance of buildings available?

Strategic Diagnosis

The strategic diagnosis of ESAM in SAM includes the measurement of the energetic quality of the housing stock. The energy performance of the housing stock could be evaluated by energy certificates for every building (if they are available) or a cost efficient rating of the energy performance of every buildings e.g. by a simplified method.

Segmenting the housing stock

After the energy diagnosis of the total housing stock the segmentation of the housing stock is the next step. In the context of the "ESAM in SAM case" energy should be an additional segmentation criteria. If the degree of complexity is high (which depends on the aims of the SHO and the available data) energy is one segmentation criteria among some others (see the French context). If the required degree of complexity is low we need minimum only one other criterion (e.g. commercial criteria). In the following we present a simple example by using three segmentation criteria (dimensions) for the housing stock:

- the energy performance of the estate (e.g. the energy demand)
- the attractiveness of the site
- the technical quality (without energy e.g. the technical equipment of the dwellings)

By using the mentioned criteria and only two categories per dimension (weak, good) the following matrix of clusters can be developed:

Energy performance	Weak	Good	Weak	Good
Site attractiveness	unattractive		attractive	

Weak technical quality	stake 1	stake 3	stake 5	stake 7
Good technical quality	stake 2	stak e 4	stake 6	stake 8

Defining strategies

Every estate (cluster) in the matrix faces a certain (rough) strategy. By using only two categories per criteria (e.g. weak, good) the following 8 stakes are possible:

Stake 1:
Urban renovation or Demolition or Sale
Specific energy strategy: 'No investment in energetic quality or only legal requirements.'

Stake 2:
No further investments or Sale
Specific energy strategy: 'No investment in energetic quality or only legal requirements.'

Stake 3:
Urban renovation or Demolition or Sale
Specific energy strategy: 'No additional investment (only maintenance)'

Stake 4:
No further investments or Sale
Specific energy strategy: 'No additional investment (only maintenance)'

Stake 5:
Invest in technical building quality
Specific energy strategy: 'Improve energetic quality (legal requirements or more)'

Stake 6:
Preserve standard
Specific energy strategy: 'Improve energetic quality (legal requirements or more)'

Stake 7:
Invest in technical building quality
Specific energy strategy: 'No additional investment in the energetic quality of the building or invest in energetic quality if the market honours the better energetic quality with higher rents or lower vacancy.'

Stake 8:
Preserve standard
Specific energy strategy: 'No additional investment in the energetic quality of the building or invest in energetic quality if the market honours the better energetic quality with higher rents or lower vacancy.'

In this context the coupling of the energetic refurbishment to the general refurbishment cycle of the building, the readiness of the tenants to pay higher rents for an increased energetic quality, legal requirements, public funding and the general strategy are important. Moreover it is necessary to describe the rough strategic recommendation coming out of the matrix of clusters in more detail. This is the objective of the library of actions.

For each estate one can define a certain number of topics on which strategic action will be implemented:

- level of the rent
- energy performance of the building

In our example the energy performance of the building is an additional topic. For each topic, several actions are possible, which entail different levels of costs. The result of this is a library of actions which classifies all strategic actions according to the topic they are related to and their cost (see table below).

Based on the library of actions the defined stake per estate can be described in more detail e.g. the specific energy strategy 'Improve energetic quality' can be divided in:

1. Improvement due to legal requirements
2. Improvement to a 'sustainable' energy performance (e.g. a 10-litre-house)
3. High energetic building quality (e.g. 7-litre-house or better)

	Levers of action	Hypothesis 1	Hypothesis 2	Hypothesis 3	Hypothesis 4
A		...	...	...	...
B	....	...	...	...	...
C	Level of the rent	Low : x€/an/m2	Current level	Increase: x€/an/m2	Increase to ceiling value
D	Energy perfomance	Current level : (250 kWh/m2) x€/an/m2	legal requirements: x€/m2	Increase: 100 kWh/m2 x€/m2	Increase: < 70 kWh/m2 x€/m2

	Levers of action	Hypothesis 1	Hypothesis 2	Hypothesis 3	Hypothesis 4
A	Outer wall insulation	without	Legal requirements x €/m2	Improve: 12 cm x €/m2	Improve: 18 cm x €/m2
B	Roof insulation	without	Legal requirements x €/m2	Improve: 10 cm x€/m2	Improve: 20 cm x€/m2
C	Glazing	simple glazing	Legal requirements x €/m2	Improve: thermal glazing x€/m2	Improve: triple glazing x€/m2
D	...	...	...	...	...

Concerning the energy performance it could be helpful to use more topics based on building components e.g. the thermal envelope and the heating system or more detailed features (the outer wall insulation, the roof insulation, the insulation of the cellar ceiling, the quality of the glazing, ventilation system ...):

Global impact (financial, energy performance)

The strategies of all clusters are aggregated at the housing stock level. This defines a global budget for the housing stock strategy including energy strategies over the next years. The housing company can thus see whether it will be in capacity to implement the strategies defined, or whether the budgets need to be modified. The housing company can then define a target budget for each cluster and/or for each category of action e.g. for the improvement of the energy performance, based on the financial capacities of the company. In addition an assessment of costs and gains (energy savings as well as possible returns) of the improved energy performance of the buildings should be possible on housing stock level.

Adjusting the action plan

In this context the financial consequences of the selected strategy and possible alternatives have to be discussed on the estate level. For this it would be helpful if ESAM includes a software model which calculates the profitability of an energy saving investment on estate level (the savings of energy and energy costs as well as the possible rent increases, funding, lower future vacancy rates and lower future maintenance costs of the energetic refurbishment). The calculation model should also provide information about the development of the living costs of the tenants.

Implementation

For the implementation of the energy strategies ESAM in SAM uses project diagnosis and brief tools.

1.2. The "Energy after SAM" case

This approach integrates energy mainly at the end of the SAM process. This means that SHO will first do their normal steps of Strategic Asset Management. Only if the strategic decision is 'Invest' for a certain estate (or cluster) energy will be examined in detail on the operational level of a single building. Nevertheless typical investment costs for several energy performances (e. g. a 10-litre-house or a 7-litre-house) should be known to the management of the SHO. Based on these typical costs for a defined energy performance energetic aspects can be integrated into the assessment of the global financial impact of the planned measures. After that the SHO has to come to a decision pro or against energy saving measures – taking into account that energy saving measures should be connected with maintenance measures required at all. This procedure reduces the (extra-) investment costs for the (extra-) energy saving measures and is a precondition for the profitability of energy saving investments.

The basic advantages of this approach in comparison with the versions described above are:

- It is not necessary to know about the energetic standard of each building of SHO's building stock.
- A running SAM system (in the structure described above) has not to be changed.

As mentioned above most of the actions take place on the operational level within the implementation phase. Nevertheless information about energy saving measures and costs are necessary on the strategic level. The procedure of 'Energy after SAM' will be described in the following:

Actions on the strategic level:

Strategic framework

The precondition of this approach is the definition of energy relevant goals in the global mission of the SHO that will have a major impact of the investment strategy. The definition of a global target concerning the energy performance of a building after refurbishment e.g. a "10-litre-house" or a "7-litre-house" or targets relating to EPBD classification could be at first a hypothesis which has to be confirmed or adjusted within the further procedure.

Development of a typical library of actions including typical energy saving measures

The development of a building typology should include the current condition of different building types and the condi-

tion after energetic refurbishment connected with a library of standard actions and costs for energy saving measures. The information coming out from this step is used within the normal SAM process for the definition of actions for each cluster and the assessment of the global impact including gains and costs of energy saving measures. After these steps it is possible to adjust the global targets concerning energy.

Actions on the operational level (implementation):

Selection of refurbishment projects (results from SAM)

This means that the energy performance will be increased only in buildings where investments for strategic reasons are planned in any case. From the ecological sight energy saving measures has to be connected to measures of maintenance required at all. This procedure reduces the (extra-) investment costs for the (extra-) energy saving measures. Mostly this connection of maintenance measures required at all with extra energy saving measures is a precondition for ecological advantage.

Energy diagnosis of the selected buildings

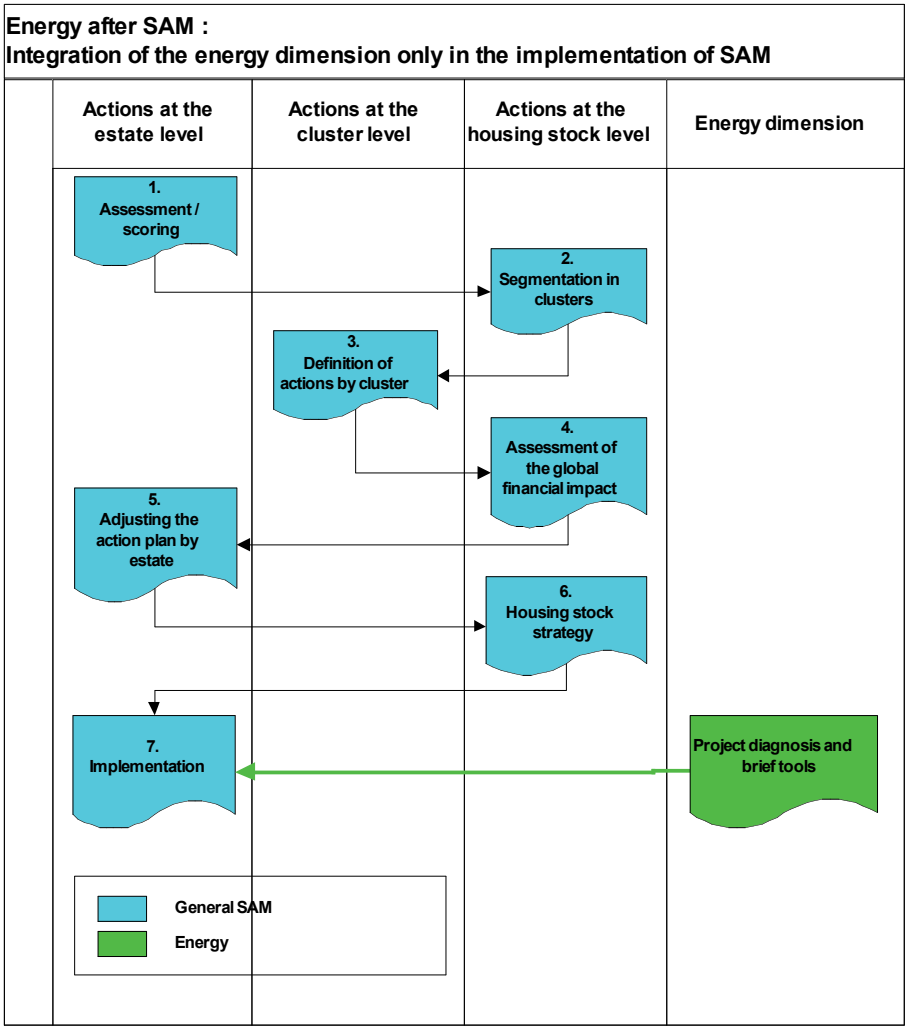
A detailed energy diagnosis has to be done only for the selected buildings e.g. with a simplified method or in analogy with the national EPBD regulation. This depends on the requirements of the SHO.

Calculation of scenarios for the selected buildings

A calculation of scenarios should be done by integration of the profitability of the energy saving investments for the SHO and the consequences for the living costs of the tenants with the help of a software tool (e.g. based on net present value method).

Adjusting the action plan for the selected buildings

The check of the results includes an adjustment and optimization of the planned measures for the selected buildings. What has to be done more or less compared to the standard measures (under consideration of additional costs, returns and risks). The check of the results also delivers information for the strategic level. Especially the following questions should be answered: Are the standard actions and costs realistic? Should the global energy target of the SHO be revised?



1.3. The "ESAM alone" case

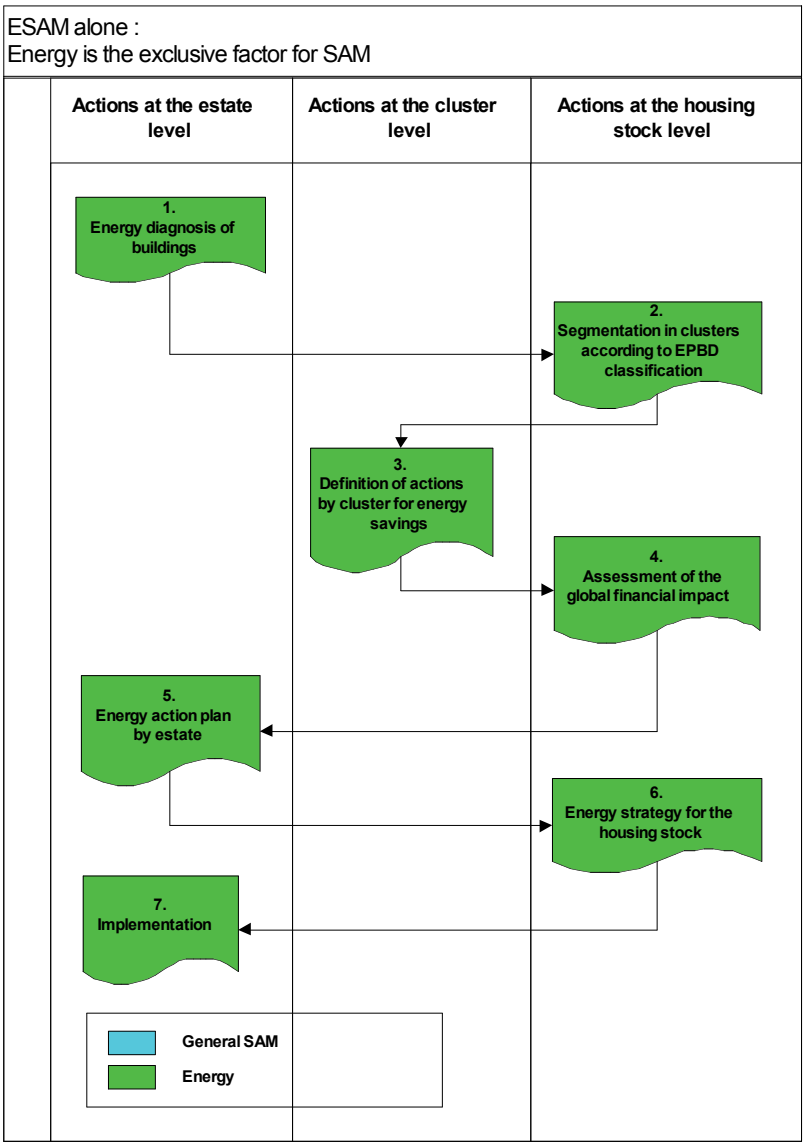
'Energy alone' is mainly suitable for SHO with no running portfolio management system (e.g. smaller companies with no special need for Strategic Asset Management). Nevertheless as a preparation for pilot projects concerning energy and for negotiations with the municipality it could be necessary to get information about the energy performance of the housing stock. In these cases it is helpful to segment the housing stock with energy criterion and to define strategic objectives on this level.

Strategic framework

The definition of a global target concerning the energy performance of a building after refurbishment e.g. a «10-litre-house» or a «7-litre-house» or targets relating to EPBD classification could be at first a hypothesis to be confirmed or adjusted within the further procedure.

Energy diagnosis of typical buildings

The precondition of "Energy alone" is that the energy performance of the total housing stock is known to the SHO. Therefore it is helpful to define typical buildings representing relevant parts of the housing stock of the SHO. By these typical representatives the building stock of the SHO can be represented. The advantage is that you only have to know about the energetic standard of these representatives – and not of the whole building stock [e.g. the simplified method].



Segmentation in clusters according to EPBD classification

In the context of the "Energy alone case" the next step is the segmentation in clusters e.g. according to the national EPBD classification. The result of that segmentation is a strategic overview about the energy performance of the total housing stock of the company. Energy could be the only segmentation criterion or as shown in the following table could be completed by another criterion (building type or living space or rent categories ...)

The table shows that e.g. 30 % of the current housing stock has a poor energy performance (level D).

Defining of actions per clusters for energy savings

It is helpful to define now a global strategy for the future energy performance of the total stock on this level (target situation e.g. in five or ten years) in discussion with e. g. main stakeholders, tenant organisations, local authorities ...

Based on the strategic framework of the housing company (energy saving as part of the mission of the company) and the general refurbishment rate of the company it is possible to define energy strategies for the next years:

1. 'Reduce the number of estates with energy level D from 30 % to 10 %'.
2. 'Increase the number of estates with a 'sustainable' energy performance (Level A) up to 30 %'.

To achieve these targets it is useful to define standard measures (e.g. for multi-family houses with energy performance D: 10 cm wall insulation, double glazing windows, 12 cm roof insulation...).

Assessment of the global impact (financial, energy performance)

To assess the global financial impact it is necessary to identify standard costs for the defined standard measures. The total costs have to be compared with the financial means of the company and the actions per cluster have to be adjusted if necessary (long-term investment plan). In addition an assessment of costs and gains (energy savings as well as possible returns) of the improved energy performance of the buildings should be possible on housing stock level. Therefore the building typology representing the current building stock should also include the possible energy performance after refurbishment.

Segmentation Model 1 Energy / building type	Energy Level A < 100 kWh/m²	Energy Level B 100-150 kWh/m²	Energy Level C 150-200 kWh/m²	Energy Level D > 200 kWh/m²	Situation
Single Family Houses	A–1	B–1	C–1	D–1	7%
Multi-family Houses	A–2	B–2	C–2	D–2	53%
High-rise buildings	A–3	B–3	C–3	D–3	40%
Situation	10%	20%	40%	30%	

Adjusting the action plan on estate level

The choice of the actions per estate is related to

- the global strategy,
- the general refurbishment cycle of the building (or the building components)
- the costs of the measures
- the gains of the energy performance
- the financial and operational capacities of the SHO (funding, rent increases).

A calculation model on estate level is helpful to assess the costs and gains of the improved energy performance of the buildings (for SHO and for tenants).

Implementation

The implementation of the energy strategy for the housing stock is supported by project diagnosis and brief tools.

1.4. Differences between the three cases

The (theoretical) differences and similarities between the three cases are charted in the following table:

SAM step	ESAM in SAM	Energy alone	Energy after SAM
1. Strategic framework including goals	yes	yes	yes
2.1 Diagnosis concerning energy (strategic level)	**each building**	**typical buildings**	**typical buildings**
2.2 Strategic diagnosis concerning other criteria (commercial, technical...)	**yes**	**no (no existing SAM)**	**yes**
3.1 Segmenting the housing stock with the help of energy data	**yes (energy as one criterion among others)**	**yes (energy as central criterion)**	**no**
3.2 Crossing energy data with other management data – portfolio matrix	**yes**	**no**	**no**
4. Defining strategies	yes (**detailed** library of actions)	yes (**standard** measures based on typology)	yes (**standard** measures based on typology)
5. Assessment of global impact	yes (**detailed** costs for **detailed** actions)	yes (**standard** measures / costs)	yes (**standard** measures / costs)
6. Adjusting the action plan on estate level	**yes**	**yes**	**only for selected buildings**
7. Implementation	project diagnosis and brief tools	project diagnosis and brief tools	project diagnosis and brief tools

Part 2: How to choose your ESAM I.S. tools

The final objective of the project "to integrate energy issues in the strategic asset management decision-making process through I.S. tools" can be achieved through a large range of possibilities.

This part of the document aims to establish a link between the situations of ESAM project social housing partners and the main choices national teams have made in order to guide the ESAM development of any social housing company that would like to do so.

ESAM tool development is conditioned by two kinds of factors: external (business context of social housing sector) and internal (situation of the social housing company). The external factors influence the objectives of the tool, the internal factors condition the possibility of the developments related to the ESAM I.S.(constrains of development).

2.1. Decision-making processes: the main factor that affects the choice for an ESAM tool

In the European Union, the social housing companies have very different functions and statuses. Their *raison d'être* changes from "providing a house for the poorest" to "providing houses for all, following their capacities"[1] . But the ESAM project focuses on strategic decision-making process, the essential factor that influences the ESAM I.S. tools is less the end beneficiary of the companies' activities than the nature of the company and its role in the energy retrofitting decision-making process. This nature, depending on the history of the social housing sector, is also very different from one EU country to another. Its level of dependency toward public authorities can be very high (Italy, the Czech Republic) or moderate (France, Germany).

Strategic asset management tools have to be shaped according to the situation each SHO is facing as strategic management doesn't refer to the same level of decision for all SHOs. The functionality of an ESAM tool won't be the same if the SHO manages directly its assets without referring to any authority or if the SHO has a delegation from a public body which is in fact the actual owner of the housing stock.

The table 2 enables the future ESAM tool developers to see which ESAM project partners' example they should follow, according to their national context.

1. See Laurent Ghekiere, Le développement du logement social dans l'Union Européenne, *Collection Europe, pp 89-164.*

INVESTMENTS Who takes the initiative of the investment?	**FINANCING** Who pays for the refurbishment?	**OPERATIONAL LEVEL** Who is in charge of the energy retrofitting process?	**Similar situations in the European Union**	**Main objectives of the ESAM Information system**	**ESAM Partners**	**Countries with a similar context**
SHO	Mostly a share between the SHO and its tenants	SHO	SHOs operating on economic basis (self-financing organizations)	Improvement of the existing Asset Management tools with the integration of energy issues	German	Sweden, Holland Germany,France, Denmark, UK/Ireland (housing associations)
				Integration of energy retrofitting simulations in the strategic investment decisions	French	
				Setting the priorities of energy retrofitting for the housing stock & improvement of the existing SAM tools	Austrian	
Public authorities (municipality, region, state)	100% Public authorities	SHO	Social Facility Management companies owned by several public authorities	Convince the public owners to invest for energy retrofitting on a specific administrative area	Italian	UK/Ireland (housing departments of municipalities), French OPH, Spain, Portugal, Belgium, Poland
			Social Facility Management companies owned by a single public authority	Expose to the public owner a better investment plan through a Energy Strategic Asset, Management tool area	Czech	
Organisations of private owners (cooperatives, condominiums,...)	100% owners	Private owners	Cooperatives of tenants, condominiums, Private ownership	Convince the owner to invest for energy retrofitting on its specific building and guide the technical choices	Estonian	Finland, Romania, Hungary, Slovakia, Bulgaria, Czech Republic (cooperatives)

Table 2: ESAM project partners and similar housing sector situations in EU countries

When the SHO controls the energy retrofitting investment choice and its technical implementation

The first situation is the one that involves SHOs which have a full control on the energy-retrofitting process: from the initial decision to the implementation of the technical measures that improve the energy consumption of buildings. This case is illustrated by Germany, France[1] and, in a slightest proportion (because of their very specific development choices) by Austria.

In this case, SHOs have a great interest in all ESAM tools from the SAM which integrates energy to PDBM tools because they are in charge of the whole process, strategic and facility management.

Countries with a very universalistic vision of social housing, which goal is "a dwelling for most of the people", will tend to be closest to this situation which is perfectly illustrated by the Dutch situation (see table 1 above for a comparison of social housing models and status of the social housing players).

When the SHO has little influence on the energy-retrofitting investment decision but manages its technical implementation

The second situation illustrates the case of the countries where SHOs are strongly regulated by Public Authorities and whose the main function is to manage the dwellings (facility management) more than implementing the social housing policy on their own (in terms of construction / significant refurbishments). This situation is more frequent in the southern countries of the European Union where the social housing role tends to be more residual ("To provide dwellings for the poorest part of the population").

These companies do not have the possibility to decide on their own on which building and when an important refurbishment has to be done. As the price of the rent is strongly below the market price on most of the housing stock they manage, their self financing capacity is very low and they depend on public authorities to finance important technical interventions.

Companies that evolve in this context are more likely to develop tools that are closer to a PDBM tool. If such a tool doesn't permit to optimize the allocation of investment for energy-retrofitting, it enables the user to evaluate the different technical solutions available for a concerned building.

Even though, ESAM functionalities are not useless for these companies, especially when they have strong links with the public authority that control them. These companies would certainly be interested in the Czech ESAM partners' realisations.

When one of the ESAM's tool objectives is to convince a third part (a municipality, for instance), the developers shall stress on the communication aspects of the tool, following the Italian partners' choices to display the PDBM simulations through a Geographical Information System for example.

When the SHO has little influence on both the energy-retrofitting investment choice and its implementation

The last case includes all organisations that have a very little influence on the strategic decisions and a small influence on the implementation of these strategic decisions. It is the case of all organisations of private owners (cooperatives, condominiums,...) that have not necessarily social (or public) aims. This situation is typical in the new Eastern members states in which the public housing stock was massively sold after the fall of the communist regimes.

Following the Estonian partner example, the organisation in such a case will focus on the technical aspects and on the simplicity of the I.S. as its end users and beneficiaries will be the owners of the dwellings, owner-occupiers who generally have no technical competences.

Such a tool could interest also condominiums of private owners all over Europe.

Once the context of the SHO has been considered and the main objectives have been defined, the ESAM tool developers have to take into account their development capacities which are mainly conditioned by the initial state of the art regarding the I.S. tools/ processes in the organisations.

2.2. Initial state of the art of the tools/process of the SHO

Different levels of development of Intelligent Technologies (I.T.) have been noticed among participating housing companies. More than the country, the size of the company was the main factor that distinguished a company with a high level of computerization and the others. As the size of the housing stock grows, the number of data increases, so does the risk of knowledge fragmentation. Then the performance of the I.S. to support the working process appears as a key factor

Level of accuracy of the existing database & data collection

The level of accuracy of the existing database conditions different phases of the I.S. tool development. Information about economic, social and technical parameters of the buildings influences the capacity of the company to elaborate typologies and to adapt the retrofitting scenarios to these typologies.

At the beginning of the project, three different levels of accuracy of the data existed among ESAM project consortium (see table 3 below)

Table 3: Level of accuracy of the existing database regarding the housing stock

	Low	Medium	High
ESAM PARTNER	CZ EE	IT	FR DE AT

1. In France, the Offices Publiques de l'Habitat (or « OPAC ») owned and managed by local public authorities, are closer to the Italian or Czech situation, even if these organisms have the direct control on their investments.

The collection of data is an obligatory preliminary condition for the ESAM I.S. tool development. Technical, social, financial and energy-related data have to be collected to implement an ESAM tool. However, different levels of accuracy in the data can lead to the development of an ESAM I.S. tool. There is no preliminary situation which prevents to develop an ESAM I.S tool.

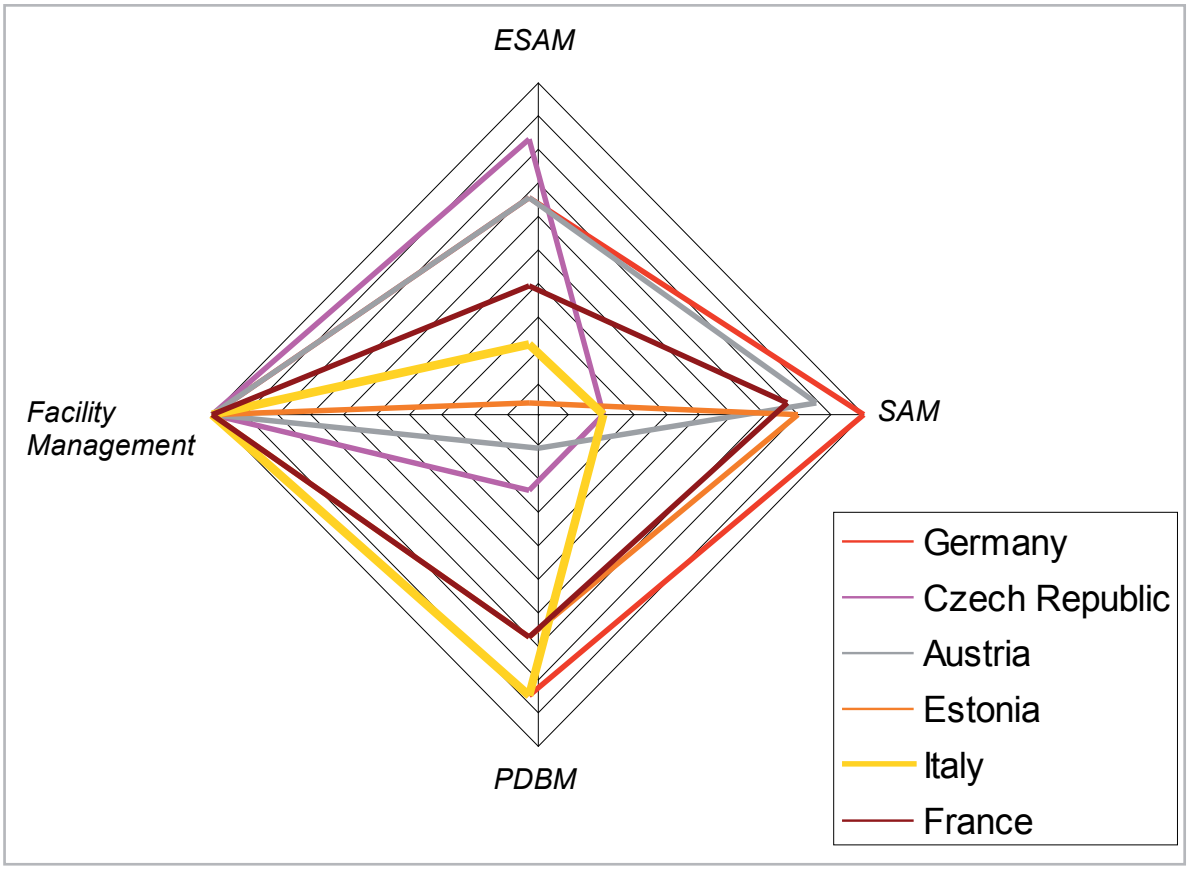
Generally speaking, it is advisable for a company with an initial low level of knowledge to follow the Estonian and the Czech partners examples. On the contrary, an organisation with a high level of data collection and processing would rather follow the German or French examples.

Existing SAM & FM tools and processes available in the company and level of development

Graph 1 illustrates the differences of choices made in the tool development in terms of accuracy of the results. As shown, the tools generally combine strategic (ESAM) and technical (PDBM) aspects but they insist more on one of these aspects.

If Facility Management tools are widely implemented in SHOs' practices, it is

Graph 1:Level of Development of the existing I.S. tools/ of the ESAM/PDBM tools



How to read the graphic:

Horizontal (Facility Management / Strategic Asset Management): level of development of the existing I.S. tools

Vertical (Project Diagnosis and Brief Management / Energy Strategic Asset Management): level of development of the I.S. tools produced in the frame of the project.

not the case of SAM tools. As shown on the graph 1, a high level of development of SAM tools enables to stress the strategic dimension of an energy retrofitting policy.

The table 4 gives a more precise view of the ESAM partners' initial situation, by the beginning of the project. It aims to inform the reader if one partner's particular situation really fits with its own situation.

Table 4: *Detailed initial situations of the ESAM project partners*

Initial situation		Fr	Ge	Cz	It	Au	Est
Institutional context of Housing sector	Status of the SHO	Private non profit	Public company	Public company	Public body	Private non profit	Cooperative association
	Regulation of SHO's status	Strong	Low	medium	Very Strong	Low	Low
	Regulation of the price of the rent	High	Medium	Strong		High	
	Regulation of the investment financing		Low	Strong		Medium	
Institutional context on energy issues	EPBD certificate method defined ?	Y	Y	Y	N	N	Y
Size of the company	Number of dwellings	<10 000	+60 000	<10 000	20 000 to 40 000	20 000 to 40 000	+40 000
	Number of employees	100 to 200	+800	100 to 200		+100	<50
	I.T. department exists?	Y	Y	N	Y	Y	N
Characteristics of the housing stock	Diversity of the typologies	++	++	-	+++	++	-
Initial level of equipment of the society (IT tools, data collection – data processing)	Existing SAM tools	Y	Y	N	Y	N	N
	Quality level	Good	Good	Bad	Medium	Good	Bad
Initial level of ESAM issues Medium		Medium	High	Low	Medium	Medium	Low

2.3. Irrelevant aspects

An important number of fundamental characteristics that generally define the housing companies have not been broached intentionally as they have no significant impact on the nature and functioning of the ESAM I.S. tool.

All these irrelevant factors will not be exposed but we can quote one of them: the state of the art of the housing stock (age, types, diversity and quality). Actually, if these factors impact the usefulness of the ESAM tool, it doesn't affect deeply the way it should work. A company which housing stock has been recently deeply refurbished won't have the same necessity of an ESAM/PDBM I.S. tool than a company which stock consumes a lot of energy but the corresponding tools can works the same way.

2.4. Conclusion

The administrative status of the SHO is the major factor which influences the development of ESAM IS tool. The level of autonomy of the SHO on investment decisions affects the future use of the ESAM IS tool . The initial level of development of the Information systems conditions the accuracy of the future ESAM/PDBM I.S. tool but is not an absolute obstacle. Starting from its situation, any SHO can learn lessons from the individual case of each ESAM partner and begins its own I.S. development

If these great lines of correspondence between SHOs' situations and ESAM tools have been drawn, there are exceptions and it is wise to see in details how the ESAM partners' tools work before turning directly to the guide of recommendations of each ESAM partner.

Part 3: Comparison of the 6 national ESAM I.S. tools: development choices, functionalities and the most influent factors

3.1. Remarks on general common aspects

Simplicity of the I.S. development solutions (use of Excel)

The simplicity is a common point of all the tools developed by the ESAM project partners. A large majority (apart from Italy) have chosen to develop the tool under Excel, sometimes in addition to Visual Basic for the graphical interface (France). The major advantage of such simplicity is to favour the use of the tool by a high number of people (including top management). A minimum of technical knowledge is generally required to handle the tools in a useful way. It also avoids the obligation of developing training sessions.

The rejection of a totally automated solution

The initial goal of the project was to produce decision-support tools, not fully automated tools. All national teams rejected the idea to produce a completely systematised instrument that could have gone further choosing the best retrofitting solutions.

By the beginning of the project, the Consortium imagined to develop a sophisticated tool that would have been able to build an automatically investment strategy through few indications by the user such as "reduction of 20% of the energy consumption of the housing stock for the best value for money" or "best energy refurbishments for a defined amount of money". This would have required to build a tool able to apply systematically all technical solutions for each building or cluster and to compare the results for each action. This was considered as too complex and not useful by the project partners.

Typological approach

Given the number of buildings concerned, ESAM partners (excepting the Italian partners) have chosen to have a typological approach of their housing stock, based on the observations that most of the social housing stocks have been built in an «industrial» manner, using a few architectural models. It is possible to identify for each SHO a small number of building typologies, which have the same physical features and on which the same type of energy saving strategies can be applied.

The same orientation has been taken in two others IEE funded projects "Factor 4"[1] and "EPI-SOHO"[2].

Each participating social housing operator has identified typologies in their housing stock (see *PDBM Inventory and analysis of the existing state*, WP3, p24). Two main criteria were used to build these typologies: the age of the construction (Austria, Estonia and France), its shape (the Czech Republic, Germany). Some additional criteria improved the accuracy of this segmentation (e.g.: shape for the French tool)

Pilot sites in which each typology (or the more important ones) was represented have been selected in order to analyse more carefully the costs and the effects of energy retrofitting scenarios.

The typological approach enables to avoid fulfilling all technical data for

1. http://www.suden.org/Factor4
2. http://www.epi-soho.eu

each building as the system will work with analogies. It also simplifies the calculation of simulated refurbishment: the system uses typical values of energy saving & cost observed for the typology the building belongs to. It motivates the company's personnel as a first result can be more rapidly obtained. Past experiences have shown the importance not to spend too much time to obtain tangible results. With an approach based upon typologies, there is always the possibility to get a more precise picture of the housing stock later.

The Italian team is a noticeable exception to the common use of the typological approach. As their ESAM software deals with individual buildings and calculates precisely (through the core of calculation) the energy performance of the building after retrofitting simulation, it doesn't need to use approximate data stemmed from the typological approach.

3.2. Objectives of the tools

We can point out 3 families of tools that have been created by the 6 national teams of the project. The distinction among these 3 categories is based on the central objective of the tools, even if additional functions always complete this objective.

The 3 categories are the following:

1- Strategic decision-making supporting tools (focusing on the level of the housing stock). These tools are the closest to what has been defined as Strategic Asset Management (SAM) tools in the previous methodological work of the project (see Book of specifications: Common *Conceptual Framework – version of 30 May 2007*).

With different levels of precision, the Austrian and the Czech I.S. tools belong to this category. The main objective of these tools is to build a global long term (3-5 years) investment plan. In order to do so, they generally have to go through the simulation of retrofitting scenarios (PDBM) but the analysis of these scenarios done at the level of a building, is not the major purpose of the tool.

2- Refurbishment decision-making supporting tools focusing on the level of a building. This category of tools is closer to the Project Brief Diagnosis and Management (PDBM) as it has been defined in the *WP3 Book of specifications for the PDBM tool – version of 5 June 2007* (See in particular the workflow p 7).

The French I.S. tool is an illustration of this category even though, strategic aspects are also treated. The main objective of this tool is to improve the existing investment plan with a short term focus. The impact of the tool on the long term investment plan can be a rebound effect of the accumulation of knowledge that is linked to the use of the tool (e.g. if the user notices that an improvement of the windows has systematically a very good return on investment, he will build his next investment strategy integrating the change of the windows for all the buildings).

The Estonian and the Italian tools also belong to this category even if the final decision-maker in terms of investment is not the social housing organisation but a third party (cooperative owners, municipal authorities). In this case, the focus deals less with technical accuracy of the simulation results but more on the communicative aspects. The Italian tool for example is linked to a Geographical Information System (GIS).

3- Global tools (ESAM & PDBM) that go from the level of a building to the level of the whole housing stock.

This is the case of the German I.S. tool. This tool focuses on the energy issues.

It excludes for the moment other strategic issues (social, financial,...) at the level of the stock. That's why it can be considered as an Energy SAM tool, not as a classical SAM tool. That is due to the choice of the "ESAM after SAM" development. The decisions on energy matters (and their financial & technical consequences) are considered once the global strategy has been defined.

From the general workflow that was made by the middle of the project, the national teams have extracted the functionalities that were adapted to their own situation (see previous paragraphs "general architectures of the national tools").

This adaptation led to the creation of tools which natures are quite different as they stress either on the strategic aspects or on the technical aspects. Nevertheless, the tools generally integrate both aspects. For instance the Czech I.S., which is more an ESAM tool (tackling strategic aspects) also includes technical aspects (simplified PDBM tool). On the contrary, the French PDBM tool has strategic functionalities.

3.3. Integration of the different I.S. tools

The tools have to be adapted to the internal context of the company: the capacity of the company, the available human skills and the existing tools. We can assume that the use of the tool will be higher if the software is integrated to global I.T. equipments (mainly Facility Management tools). The ESAM tool is then complementary to the existing tools and is, when possible, integrated to the existing system in order to avoid useless processes and manipulations (e.g. if the ESAM tool is integrated to the Facility Management tool, it won't be necessary to update the technical data used by the ESAM tool each time there is a technical intervention on the building).

The existing I.S. tools

The initial level of development of the I.S. tools conditions the development and the incorporation of the ESAM/PDBM tool (see 3.2.).

The initial existing I.S., related to asset management issues can be of two kinds: Facility Management I.S. and Strategic Asset Management (SAM) I.S. which can be sometimes interfaced.

Facility Management I.S. is used by all the companies. Generally linked to the accountancy I.S., it enables them to save the data on the technical & financial state of the buildings and the situation of each single dwelling in terms of rent (price, updated payment of the rent), of occupation, past and planed technical interventions,... These facility management tools (software) are used on a daily basis, which main goal is to administrate the housing stock. Their level of accuracy and their functionalities can be quite different from one to another.

SAM I.S. tools are less spread in the professional sector. In many cases, the legal requirement to provide to the national authorities a long term investment/strategic plan (3 to 5 years as in France for instance) doesn't imply the systematic use of an I.S. for that purpose. The ESAM project partner situations generally show that the level of development of these I.S. tools is linked to the size of the company (with a noticeable exception for the Italian partner).

Integration of the existing tools

In general, Facility Management and SAM I.S. tools are disconnected; the strategic tool cannot use the usual data to assess the housing stock, organise it into clusters, and suggest a global strategic plan. The only case in which these elements are totally interconnected is the German partner case.

The separation observed in most of the situations is due to the fact that strategic decisions generally don't integrate all technical details at the level of a dwelling (exchange of data from Facility Management to SAM I.S.) and, inversely, strategic decisions are not translated into a very detailed action plan that technicians would follow on a daily basis (exchange of data from SAM to Facility Management I.S.).

Interface between the ESAM/PDBM I.S. tools with the existing software

The possibilities of integration of the ESAM/PDBM with the existing I.T. tools are diverse:

- They can be totally separated (Estonian & Austrian tools). The possibility of further development establishing a link between these new tools and the others remains.
- The PDBM/ESAM I.S. tool can be "fed" with the technical data from the Facility Management I.S. / general database through a permanent interface (German tool, Italian tool) or a punctual interface (French tool)
- The ESAM I.S. tool can transmit its data to the SAM tool in the case of "ESAM after SAM" through a permanent interface (German tool) or a punctual one (French tool).
- The ESAM and the existing SAM tool can be merged ("ESAM in SAM"), this possibility has been experienced by the Czech team which developed the two elements in the frame of the project.

The full integration of the tools requires important I.T. skills and can generate complex processes (in terms of reporting, access rights management, quality process,...). If such an I.T. solution can be too complex for a small company, it is particularly useful in a big company in which the number of actors is high and the knowledge is very fragmented.

Naussauïsche Heimstatte, the German social housing company participating to the project is the perfect illustration of this analysis; its important size in terms of employees and housing stock led to the development of a very integrated system as shown of the following graph.

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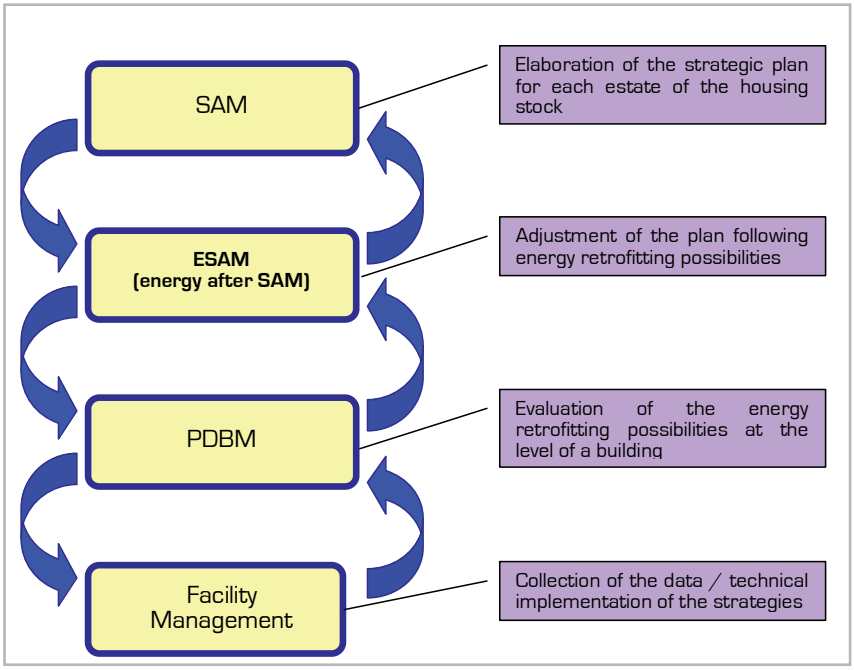


Graph 2 : *Illustration of an integrated I.S. :*
Flow-chart of Naussauïsche Heimstatte Information System

3.4. Collection of the data

The PDBM has to be fed with the data that influence the energy performance such as technical data and energetic data.

The ESAM tool, apart from energy data, has to be linked to strategic data such as financial data, social data and, in the case of "ESAM after SAM", all SAM outputs (long term strategy settled for each building).

General information

General data correspond to the usual data the housing company uses in its everyday work: location of the buildings, the agency that manages the buildings, number of flats, data about the tenants, etc. The collection of these data is generally quite simple. The information system integrates this general information: it allows when selecting a building to get an overview of its major characteristics. They can also be used in the data processing as explanatory factors (e.g.: age of the building).

Some of the tools associate a building to a certain typology; in this case, the most influent factor needed as an input is the information related to the criterion on which the typology is based (date of construction or shape of the buildings).

The technical data

All I.S. tools have in common the necessity to gather technical data providing information on the *state of the art of the buildings from a technical point of view* (envelop, system, condition,...).

Quite surprisingly, the requirement of the technical data collection has been an important amount of work for the partners of the project. This task has generally been linked to the data collection required for the production of the energy performance certificates (EPC)[1] . This was not true for the countries in which the official methodology for the calculation of energy certificates wasn't established or officially validated (Estonia and Italy but also Austria by the beginning of the project).

Most of the partners have launched an important audit of their building stock (or a part of it) to provide the data needed for the tool (in link with the EPI-SOHO project in the German case) The most important surveys were done in Italy and the Czech Republic. Even in France or Germany, where the housing companies thought they had a good knowledge of their housing stock, additional surveys proved to be necessary to gather the technical data. This work enabled the partners to build up the typologies among others.

Technical data can be divided in two categories: envelope and systems data.

The level of accuracy of the technical data is different between the partners. Generally, the level of accuracy is lower when the strategic aspects have more importance (SAM functionalities). Germany is a noticeable exception to this rule as the tool equally works at the level of the housing stock and at the level of single buildings.

1. Stem from the European directive 2002/91/EC.

Energy data

The initial energy performance of the buildings was needed. It has been obtained through three distinguished ways:

- The integration of the Energy Performance Certificates results for the energy-consumption part (linked to the application of the EPBD directive), when they were available. This solution is conditioned by the fact that an official method has been settled and validated by the public authorities. The Czech, French and Austrian teams have chosen this solution. The EPC advises for renovation works had been dismissed because their relevancy is often poor.
- The calculation of the energy performance using the tool through technical data and an officially approved motor of calculation. The German and the Italian teams have chosen this solution, which enables to produce the energy certificates.
- The last solution is required when the energy certificates are not available. In this case, the real energy consumptions have to be inputted. The Estonian I.S. tool (made for cooperative managers, who have no obligation to have the energy certificates) uses this solution. The Austrian team has chosen to use empirical values observed by the Austrian SHOs as a transitive solution until all energy certificates are available.

Some partners, such as the French or the Czech ones, felt the necessity of supplementary data: energy saved by an elementary action of retrofitting. They assessed the potential of one action (e.g.: change of the windows) on one certain typology in terms of costs and energy saving potential. These external supplementary data are then processed by the tool which cumulates the energy saved per action on one building (which is not a simple addition).

The strategic data

Classic strategic data includes market, economic and social data that influence the market conditions of a building.

These data are needed only for the SAM functionalities of the tool. In the "energy alone" solution, such as in the Estonian case, these data are not used.

If the solution "ESAM after SAM" has been chosen, the ESAM/PDBM tool doesn't need strategic data either because those data have been already processed. Then, two solutions are possible:

- SAM outputs are just the starting point of the ESAM/PDBM tool. In the Italian I.S. for example, the user will choose to make a retrofitting simulation only if the decision to refurbish a building has already been taken as a consequence of the SAM analysis (computerized or not).
- Strategic data are automatically extracted from the SAM I.S. by the ESAM tool as in the German tool.

In the "ESAM in SAM" case, the data can be taken from the database of the company when it is available (objective indicator, e.g. number of unemployed people as a social indicator) or a subjective rating (e.g. scale from 1-5 for the social environment). The developer has then to attribute a weight to each indicator (see, *Book of specifications for a WP2 & WP3 information system, Collection of data*, p15-16).

Given the lack of knowledge they had on certain issues of the housing stock, the Czech team used questionnaires to collect most of the technical and social data.

Financial impact of retrofitting measures

The costs of the retrofitting actions are defined according to the empirical knowledge of each national team. These costs have been generally defined according to a typology, depending on the initial state of the art of the building and the surface concerned by the refurbishment.

The accuracy of this data is quite different from a tool to another. French and German I.S. tool are the most accurate as the developers resorted to a survey to analyze these costs. At the other side of the scale, the Austrian and the Czech tool uses average prices observed in the past years through a survey analysing the refurbishment costs.

As the prices of materials, systems and human resources fluctuate a lot; the user must be able to modify easily the cost of each action.

3.5. Definition of retrofitting scenarios

From the three initial possibilities, only two ways of defining set of actions have been chosen by the partners.

The first method is the manual definition of the measures to improve the energy performance at the level of a building. As in the French or the Estonian cases, it can include a certain level of automated and logical rejections/suggestions of certain measures (e.g. the I.S. won't suggest an implementation of a 10 cm insulating material when the existing one is already thicker). This method generally implies that the user has a good technical knowledge but the process can be improved through user-friendly functionalities (e.g. in the French tool, the user has a synthetic overview of each retrofitting action through a graphical interface). A similar method is used by the Czech & Austrian tool but at the level of a typology.

The second method consists in defining a few numbers of scenarios which are systematically applied to all buildings. It is the choice made by the German team.

The last possibility, evoked in the *Book of specification for a PDBM tool*, is the automation of the elaboration of sets of actions adapted to a building (or a typology). The choice can eventually take into account specific request ("final energy consumption for the minimal cost" or "best energy

consumption for a given cost"). This possibility was assessed by the different teams but its too high complexity in terms of I.T. development led to abandon it. Nevertheless, the tools developed in the frame of the project are generally made to be able to integrate such a function. The Italian I.S. tool, for instance, will be improved through a statistical analysis of the results of the first uses; if a retrofitting solution is generally preferred to another, the system will suggest automatically this solution for a similar building (according to the more relevant factors that are also determined on a statistical basis).

Simulation of the energy performance

The calculation of the energy performance after refurbishment (simulation) can be realized by different methods:

- In the case of the I.S. tools generating the energy certificates through a motor of calculation, the simulation of retrofitting actions changes the data used for the calculation of the certificates and the motor of calculation recalculates the energy performance according to these changes. That is the way Italian and German tools work.
- When the developers aimed to avoid a too complex and data input (such as in the French case), a simplified motor of calculation has been created. The energetic gain for each action applied on a typology has been determined by a thermal survey (subcontracted) and the simplified motor of calculation calculates the sum of the energy saved by each retrofitting action (for further details see the book of recommendations of the French tool). Estonian team has also chosen the use of a simplified motor of calculation.
- A more empirical method can be settled following the examples of the Austrian or the Czech teams. The method consists in applying empirical energy saving values for each set of actions (predefined) for each cluster. This motor of calculation only works if the knowledge on the past refurbishments is sufficient and accurate (as it is in Austria because of a high number of refurbishment in the recent years).

Calculation of the financial impact

The calculation of the costs of the retrofitting doesn't need any data processing as the cost of refurbishment has been collected thanks to the analysis made on the pilot sites. When the costs are based on estimations, weighting factors (according to the size of the building, its shape, the number of dwellings,...) can improve the quality of the results and/or guarantee the coherence.

For this functionality the scale of the possibilities is again quite vast and ESAM project partners have chosen distinct solutions.

German I.S. tool, through the EProf-Economy module, is the most performing in terms of financial assessment and returns on investment analyse. Effectively, the tool not only integrates the cost savings linked to the retrofitting actions, but also estimates the potential raise of rent according to the actual price and to the administrative constrains.

At the other scale of the scope, because of their institutional situations (tenants are paying the energy bill and refurbishments are not paid by the social housing companies), Italian and Austrian teams chose not to focus on this issue.

The Czech and Estonian ESAM I.S. tools translate the energy saved into financial saving per square meter.

The French I.S. also focuses only on the earnings due to the energy saving measures but it displays this information through the number of years needed to reimburse the investment.

3.7. Consolidation of the results for the whole housing stock: the strategic level

In order to improve the asset management, ESAM I.S. tools need to consolidate the results of the retrofitting simulations at the level of the whole housing stock. This doesn't necessarily imply to add up all the results at the level of the housing stock, as strategic decisions are generally taken building per building (even if an overview is generally useful).

The German, Czech and Austrian tools display the results at the level of the whole stock but the others don't: In the case of the Estonian tool, such functionality is not relevant.

The French and Italian partners have planned to develop this functionality within the coming year using e-platform technologies. For the moment they compare manually their pre-existing SAM which consolidates already all the technical, financial and social data for the whole stock with the ESAM IS outputs which give them per building.

3.8. Saving of the results

At the level of a building as at the level of the housing stock, results must be saved in order to improve the knowledge concerning the possibilities of energy saving measures, but also to enable the multiplication of the number of uses of the tools. Almost all the tools offer this possibility and those that don't by today will do so in further developments.

3.9. Use of the ESAM/PDBM outputs

The final aim of all ESAM/PDBM I.S. tool is to integrate the energy issues (in terms of investment needs, energy-saving opportunities) in the strategic asset management. Strategic asset management decisions are not taken everyday but once or twice a year, rarely more often. Apart from the German partner (that represents quite well the rest of the German housing companies in this sense), social housing companies don't translate their long term investment plan into a very detailed action plan that the technicians would follow precisely. This means that ESAM/PDBM outputs are mainly useful when strategic decisions are made.

Some of the I.S. tools are dedicated for managers in order to evaluate different strategies at the level of the stock (Czech or Austrian I.S. tools, in general tools that focus more on the ESAM functionalities). In these cases the tools will be used when strategic decisions are taken. The tools with stronger PDBM functionalities, generally manipulated by the technicians, will be used prior to strategic decision-making. Diverse retrofitting simulations (at the level of a building or a cluster of buildings) will be then exposed to the top management that makes the strategic decisions.

If the solution "energy alone" has been preferred and the housing company has a SAM I.S., results of the analysis of the ESAM/PDBM I.S. tools are used as an input for the SAM I.S. For example, the Austrian tool outputs ("this building has a strong energy-retrofitting potential") will be used by the top management as they define the strategy for the estate the buildings belongs to, orienting them on an investment for technical refurbishment.

In any case the results have to be displayed on a synthetic and visual way that facilitates their exploitation. Solutions employed by the partners are diverse but we can notice that the graphic symbol of the energy certificate is often used to display the simulation of energy consumption of a building after refurbishment.

Czech team proposal to display the results at the level of the housing stock (bubble graph) is particularly recommended for a good global display of the results.

3.10. Improvement of the tools

Most of the tools will be improved through an accumulation of the knowledge stem from the use of the tool (self-learning tool).

The Italian tool, ENER-GIS, for example, with an everyday-use will increase his internal database of retrofitting simulation. The database will be used in the future to build up a statistical approach which can be provided to public authorities which finance the investments..

Following the testing period, a lot of further improvements are planned. Four kinds of developments can be noticed:•

Improvement of the automation of the data collection. For instance the French tool will certainly be connected permanently and no more punctually to the database of the SHO.

- Interconnection of the tool with the SAM I.S. The German team has planned to do such development in order to achieve the total integration of the ESAM I.S.
- Increasing of the perimeter of action of the tool. Most of the tools are directly connected to the building typologies of the ESAM partner or to the actual tools of the partners.
- Improvement of the quality of the energy/technical data. The French team, for example, has planed to change the estimations of the energy saved per action on a certain building typology for the real data collected through the concrete realisations of all ECOSIM users (thanks to a users' association which will be created in cooperation with industrials).

3.11. Table 5, Summary of the main ESAM/PDBM features

The following table summarizes the choices of ESAM I.S. development made by the 6 ESAM national teams. It presents in a synthetic way the main objectives and functionalities of the I.S.. This aims to give to the reader a quick overview of the possible functions / processes that a future ESAM I.S. could integrate. If the developer has chosen to develop an ESAM I.S. close to an existing one, the table will enable him to consider the possibilities and choices chosen by the others existing tools.

	France	Germany	Czech Rep.	Italy	Austria	Estonia
Strategic choices for an ESAM I.S. tool						
ESAM development choice	ESAM after SAM	ESAM after SAM	ESAM in SAM	PDBM alone	Energy alone	PDBM alone
Final users of the tool	Management & technicians	Management & technicians	Management, Investment department	Technicians	Management & Technicians	Local managers
Question the user wants to answer	If I make this improvement work on this building, what will be the energy saved and the cost?	According to 3 predefined retrofitting scenarios, how much energy will I save, at what price and how to finance it at the level of a building and at the level of the whole stock?	If I do this improvement work on a building what will be the energy saved, the cost of it, its impacts on the building attractiveness?	If I make these works on this building, what will be the energy saved and the cost?	If I realise an average retrofitting investment – what will be the energy saved and the cost?	If I make these works on this building, what will be the energy saved and the cost?
Additional question	How many years are needed to reimburse the initial investment?			What is the energy performance of my buildings in a certain area?	Which buildings offer the best energy-saving potential for the smallest cost?	How many years are needed to reimburse the initial investment?
Integration with the general I.S., (facility management I.S. / database)	- (punctual link)	+	-	+	Possible, interfaces have to be developed individually	-
ESAM I.S. functionalities						
SAM usual functionality (Assess the financial, social and technical state of the art of the housing stock)	No	Very light	Yes	No	Very Light	No
Permanent interface with the existing database of the SHO	No	Yes	No	Yes	No	-
Data to input for each use?	Energy consumption + adaptation of the technical data possible (if they are differences between a building and the typology he belongs to)	Technical & economic		Technical data + energy consumption	Year of construction, m2, past refurbishments, data from EPC if available	Typology of the building, age, main features, energy consumption
Level of accuracy of the technical data input	++	+++	+	+++	+	+
Does the tool need energy certificates data?	Yes	No	Yes	No	Initial stage: N (empirical averages) Advanced Stage: Y (replacement of averages by certificates results)	No

		France	Germany	Czech Rep.	Italy	Austria	Estonia
Need to rate the housing stock		No	No	Yes	No	No	No
Use of a typological approach	In the diagnostic phase (clusters)?	Yes	Yes	Yes	No	Yes	Yes
	In the retrofitting simulation phase?	Yes	Yes	Yes	No	Yes	Yes
On what data are the typologies based on?		Main: AGE					
Sub-typologies: Ventilation system / heating system		Main: Shape of the buildings	Main: Shape of the buildings	-	Main: age, indirectly: energy performance, Sub-typology: market situation	Main: AGE	
How a building is associated to a typology ?		Manually	Manually	Manually	Yes	Automatically	Automatically
Existence of a library of actions?		Yes	Yes	Yes	Yes	No	Yes
How are retrofitting scenario defined?		Manually, building per building	Systematic application of 3 sets of actions	Manually, typology per typology	Manually, building per building	Manually, typology per typology	Manually, building per building
What does the return-on-investment calculation integrate?		Energy saved	Energy saved + potential rent increase Loans interests	Energy saved	Energy saved	-	Energy saved
Possibility to save the past simulations		Not yet	Yes	Yes	Yes	Yes	Yes
Level at which results are given (housing stock, clusters, buildings)		Building, clusters	Building, Housing stock	Housing stock	Building	Building, Housing stock	Building

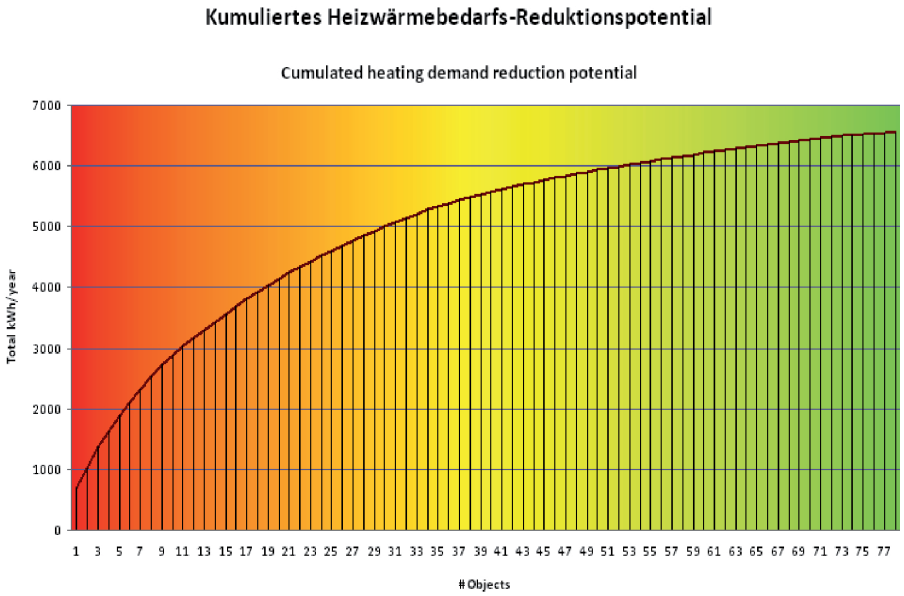
Part 4: Synthetic presentation of the 6 ESAM information system tools

This part presents a general overview of the I.S. tools developed in the frame of the project; the detailed descriptions of these outputs is presented on ESAM website: *www.esamproject.org*. Despite of the approximations due to this exercise, the author tried to present the different tools through a common graphical representation ("general architecture of the tool")

4.1. The Austrian I.S. tool

Separated from the existing I.S., the Austrian tool named "ENERGY COMPACT 1" aims to function as a supplement to the Strategic Asset Management tools used by the SHOs. Some "compact" data display the energetic situation of the single estates to complete the already existing technical and economic data and allocate a tool that enables the staff (working on the level of general management and administration as well as technicians) to evaluate all strategic aspects of the asset and develop a general strategy for the housing stock.

The tool includes two stages: The first, **initial stage** uses general data for the definition of the heating demand reduction potential. The heating demand reduction potential is automatically allocated to the estates according to their age class



The final screen of the I.S. shows the housing stock prioritized following the potential of energy saved per building

and former refurbishments. Additionally, a reference value for the refurbishment costs is allocated. These data are based on empirical values surveyed from the members of the national professional association, GBV.

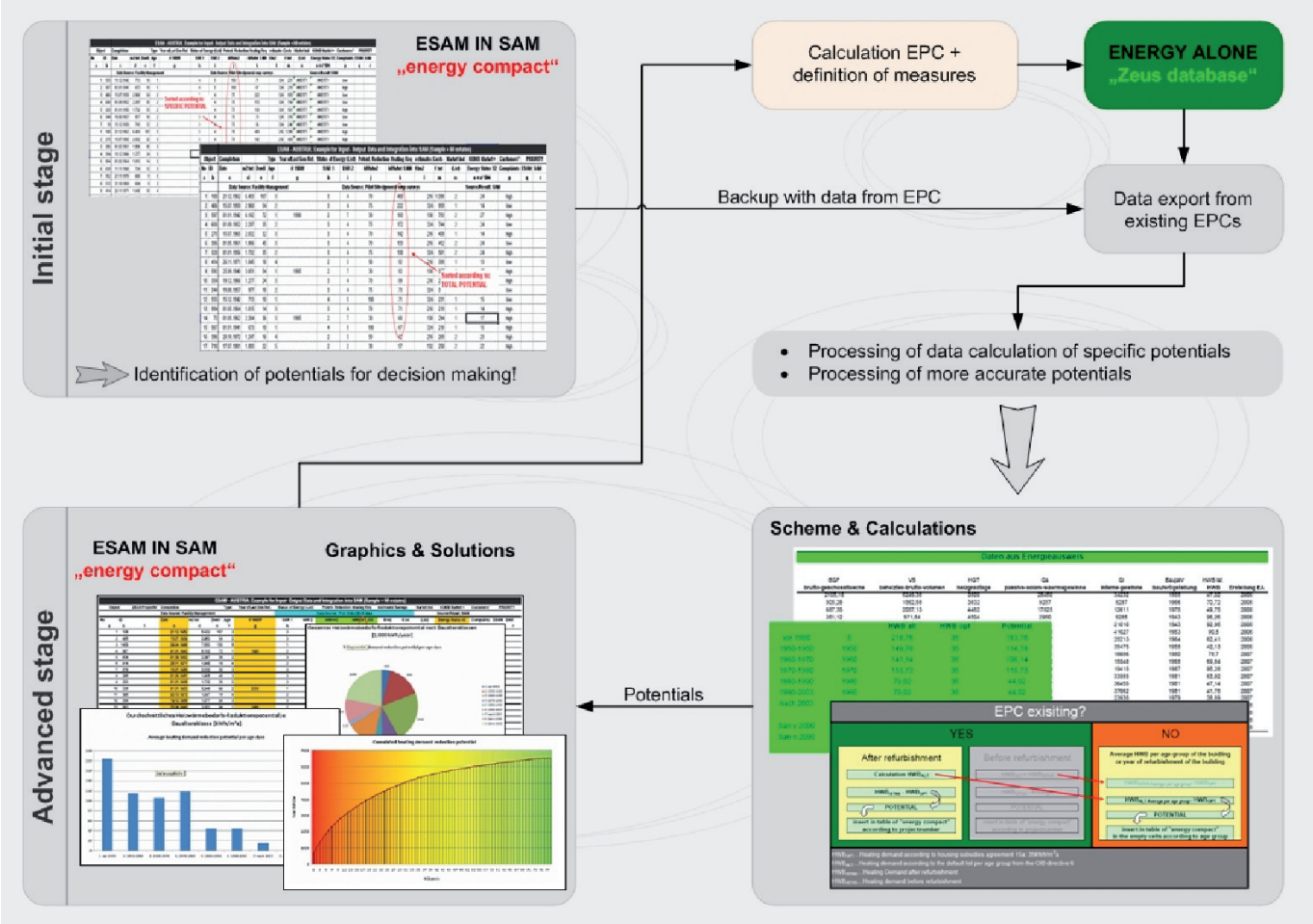
The **advanced stage** of the tool replaces the empirical data with data from already existing Energy Performance Certificates (EPC). The heating demand reduction potential is either calculated individually (as the difference between a defined target value and the heating demand from the EPC) or through a global approximation for the objects without EPC (as the difference between the target value and the average heating demand according to building age class and possible former refurbishments). The average heating demand is calculated on the basis of the existing EPCs. Since the costs of the refurbishment highly depend on the target value (that can be defined by the user), the average refurbishment costs were replaced by average energy costs savings over the life cycle of the refurbishment measure.

On **both stages** it is possible to rank the objects according to different parameters e.g. their specific (per m2) or total heating demand reduction potential. Such an analysis allows the identification of the estates with the highest reduction potential (see graph). On the basis of the information provided by the tool, it is possible to define specific refurbishment strategies as well as general strategies for the housing stock. The integration into the general management tool is achieved via the construction of clusters of estates according to their market position and energy state which support the decision making process and setting of priorities.

The Austrian tool is mainly an Energy Strategic Asset Management tool that defines the heating demand reduction potential for the single estates and the whole housing stock with data from the existing I.S. and information on the market situation and technical/energetic status (according to the age) of the building.

The tool delivers an input to the definition of the strategic objectives for the single buildings as well as the housing stock. However, the tool does not give information on the actions required to allocate the heating demand reduction potential or about the best way to save a certain amount of energy in the housing stock. Instead it provides information on the buildings with the biggest heating demand reduction potential.

"ENERGY COMPACT" allows allocating a heating demand reduction potential for buildings were no further information about the energetic status is available (initial stage). With the calculation of EPCs more specific information on the heating demand of the objects becomes available. The advanced stage of the tools is based on the EPCs information in order to produce a more accurate calculation of the heating demand reduction potentials. In

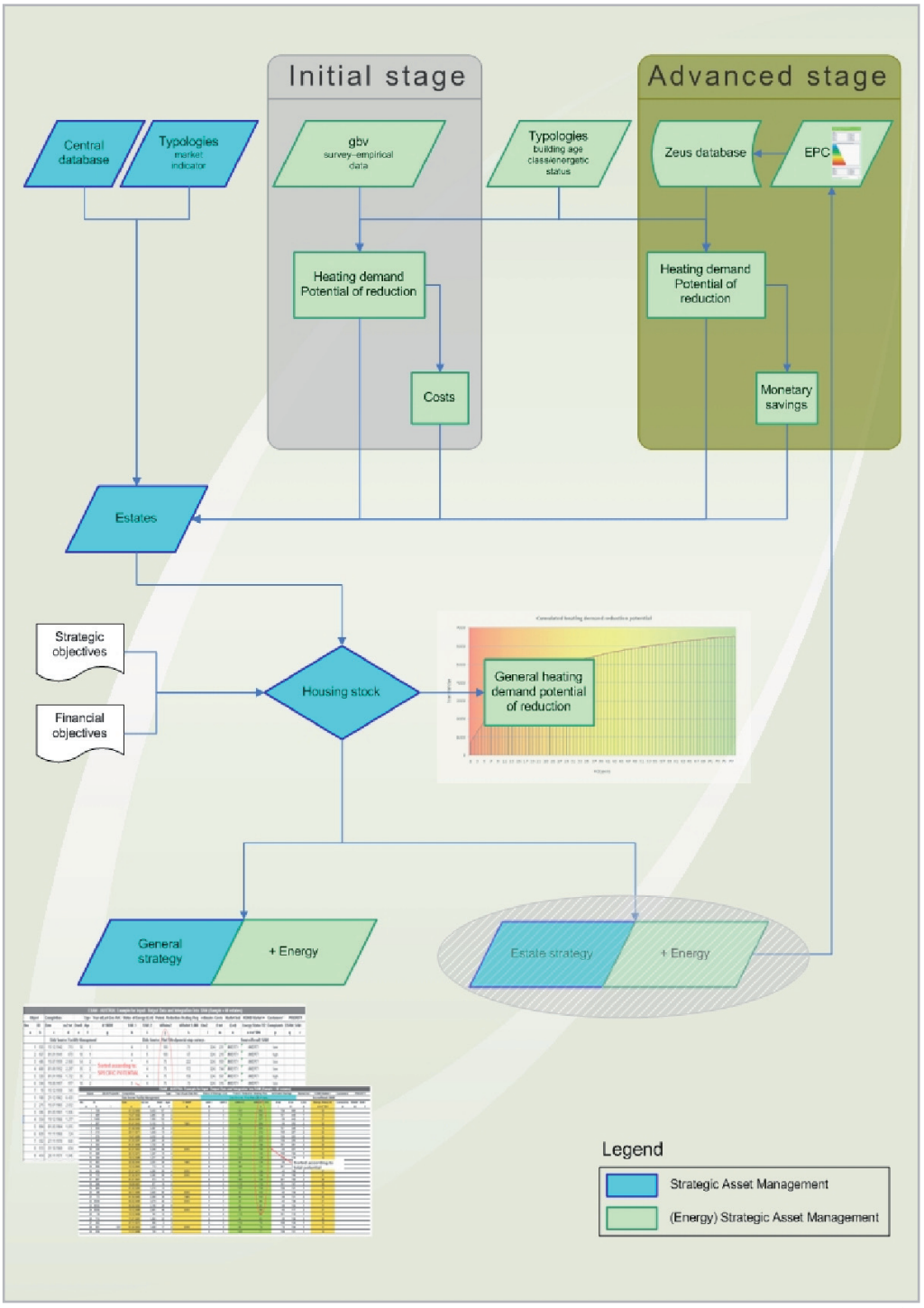


Austrian ESAM I.S. general workflow

the advanced stage the tool is configured to use energy data imported from the On-line-database ZEUS, where the EPC can be stored, administered and analysed.

The general workflow shows how both stages of the tool are linked. Every EPC is added, adds to the basis used for calculating the heating demand reduction potentials.

The Austrian I.S. general architecture



4.2. The Czech ESAM I.S. tool

Czech ESAM I.S. tool is a whole Strategic Asset Management tool which means that, apart from energy issues, it includes social, economic and technical assessment of the housing stock. Developed under Excel, it is particularly advisable to small housing companies with a low level of initial strategic I.S. equipment.

The ESAM I.S. is independent from the existing Facility Management software. Its objective is to give the user the possibility to analyse the existing situation of his portfolio from different points of view and to set forward several scenarios to be evaluated and rated.

The user first assesses his housing stock upon three evaluation criteria:

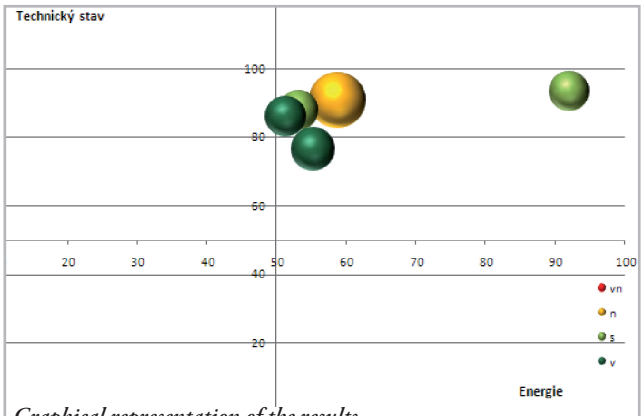
- the technical state of the building,
- the energy efficiency of the building,
- the social situation in the building.

Because of the lack of existing data, MRA chose to evaluate these criteria mainly through questionnaires fulfilled by technicians or local caretakers.

The housing stock has then has to be organised in clusters with comparative technical characteristics.

The tool suggests a list of actions that can be applied to a selected building, the user selects the most relevant actions and the tool evaluate the potential of energy-saved, the cost of the actions and the time of return on investment. The simplicity of the use has been preferred to the accuracy of the calculation (based on averages) because the aim is to consider the whole stock, not to analyse deeply the possibility of each building.

The results are consolidated at the level of the housing stock and displayed in a bubble presentation.



Graphical representation of the results
The size of the bubbles indicates the size of buildings
The colour qualifies the social environment
The vertical axis represents the technical condition,
and the horizontal axis the energy efficiency

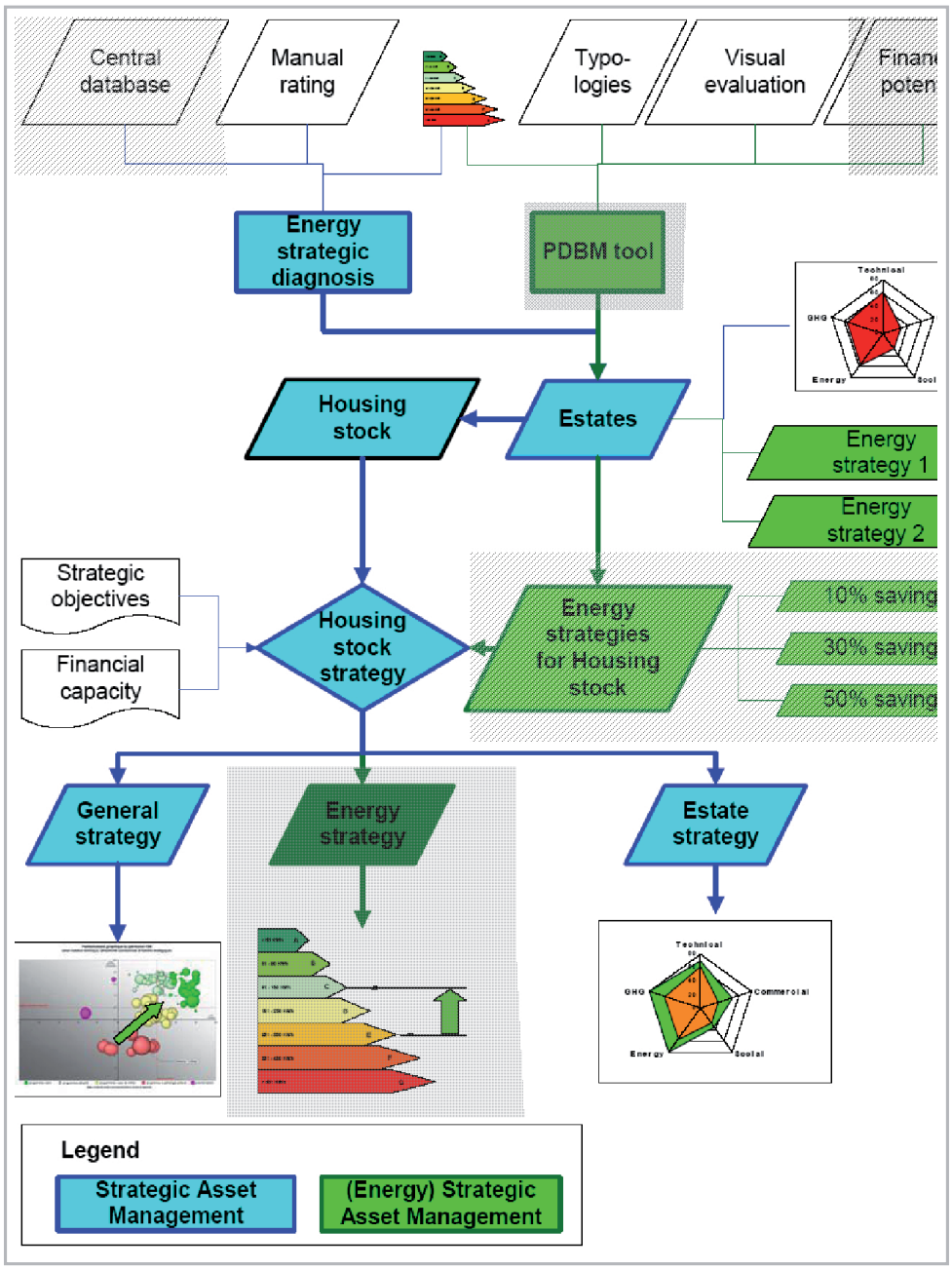
The Czech I.S. general architecture

The Czech I.S. tool is mainly a Strategic Asset Management tool which PDBM functionalities are limited to the necessary (impact of packages of actions on the energy performance of a building + costs), that is why they appear in grey.

If the consolidation of the results (in terms of global energy impact of the housing stock) is not available for the moment, this is a possible further development.

The hatching shows that:

- The tool is not linked to the Central Database, the list of buildings with the main characteristics of the tool have to be defined by the user.
- the tool doesn't permit to define automatically a global strategy according to energy saving objectives (through an automation of the process of selection of scenarios to be applied on a building).



4.3. The Estonian I.S. tool

Made for the local managers of cooperatives residential buildings, the tool is essentially done to encourage these local decision-makers to consider energy saving retrofitting as good opportunities to save money. The tool aims to show these specific users the best way to invest on energy-saving refurbishments.

The tool has been developed under Excel. The user needs to specify: which one of the 5 predefined typologies (on the basis of a technical analysis of its stock) applies to his stock, –real- energy consumption of his building. He can also specify the costs of some refurbishment actions (an indicative cost is already defined but it can be changed, according to the region, for example).

The tool shows the user the potential energy and money saved by 2 retrofitting strategies (I & II) and the return on investment.

Specific training program of a couple of hours has been defined to teach the final users how to manipulate the tool. It will guide the user to the most efficient refurbishment according to their property.

3.1. EKE tüüpi maja energiamajanduse investeeringud.

Sisesta oma hoone andmed valge taustaga lahtritesse.
Kasuta omi andmeid kollasel taustal, kui oled kindel et need erinevad oluliselt tabelis sama värvipõhjaga ruutudes juba olemasolevatest

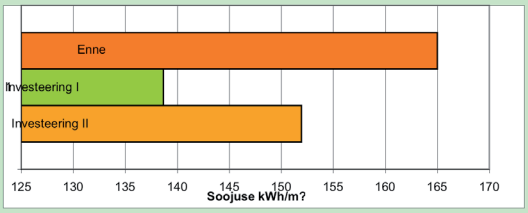
Hoone osad	Tegevuse tunnus	Tööde nimetus (a)	Pind, *korterite arv* (b) m?	Maksumused (c) kr/m?	Arvatav soojuse sääst (d) kWh/m?	Aastane soojuse sääst (e) kr	Tasuvusaeg (f) aastad	Investeeringu eluiga (h) aastad
			tk	*kr*	*kWh*	*kr*	*aastad*	*aastad*
Välispiirded	02-janv	Pööningu või katuse soojustus,	461	350,00	65	23 972	6,7	20
	2.2.	Otsaseinte soojustus, 10 cm	160	750,00	60	7 680	15,6	30
	2.3.	Fassaadide soojustus, 10cm	649	825,00	62	32 190	16,6	30
Küttesüsteem	2.4.	Majasisese küttesüsteemi renov.	*18*	*8000,00*	*79 894*	***136 682***	*7*	*30*
Arvestuspind	**3035**	m?						
Soojuse hind	**800**	kr/MWh						

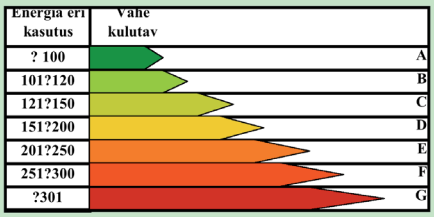
3.2. EKE tüüpi maja energiamajanduse investeeringu indikaatorid.

Tulemused

Soojuse erikasutus	kWh/m?		Investeering	Sääst	Investeering
enne investeeringut	**165**	Tegevuse tunnus	*kr/m?*	*kr/m?*	*kr/ säästetud kWh kohta*
peale investeeringut I variant	**139**	2.1;2.1a;2.2;2.3	**317**	**21**	**12,0**
peale investeeringut II	**152**	2.1;2.1a;2.2;2.4	**140**	**10**	**10,7**

Eeldatud on, et akendest toimub normaalne õhuvahetus
Küttesüsteem on kahetoru ja küttekeha tasandil termoregulaatoritega reguleeritav





Majanduslik külg

Investeering I variant	136 682	Kr
Aastane sääst	960 775	Kr
Intress	**8%**	
Eluiga	**30**	aastat
Toetuse suurus investeeringust	**10%**	

Majandusnäitajad	Ilma toetuseta	Koos toetusega
Aastane sääst	136 682	136 682
Investeering	960 775	864 698
Intress	8%	8%
Eluiga	30	30
Tasuvusaeg	7	6
NPV	577 966	674 043
IRR	13,94%	15,60%

Final results displayed by the estonian tool

The Estonian I.S. general architecture

As the Estonian tool is dedicated to simulate energy refurbishment at the level of a single building, it can be assimilated to an exclusive PDBM tool; it excludes the strategic aspects linked to portfolio management that characterize the other tools.

This tool uses the typological approach to simplify the calculation of the consequences of refurbishment interventions in terms of energy & money potential savings.

As they were not available, the energy certificates are not required.

Real energy consumptions are used instead of the certificates.

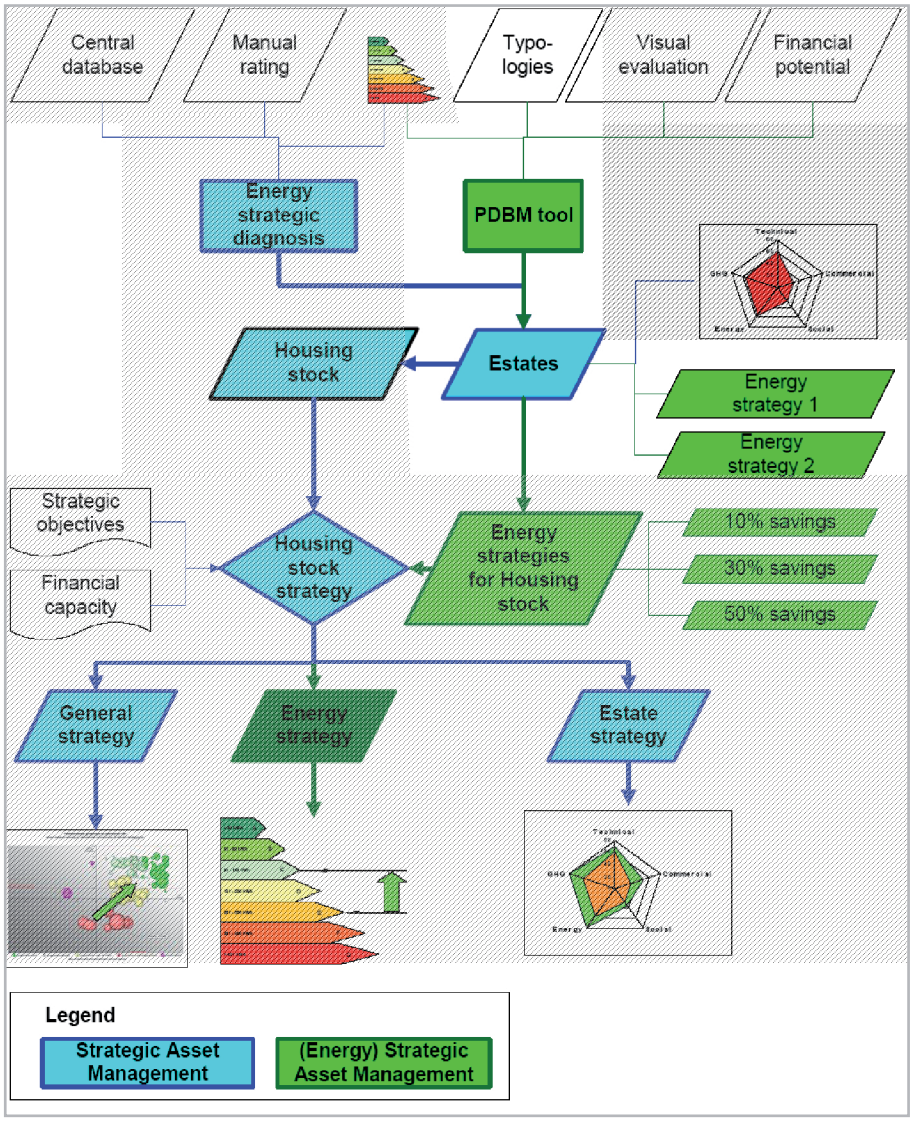


Illustration of the Estonian typologies treated in the project

These buildings illustrate the buildings built in Estonia during the 60's (photo 1), in the 70's (photo 2) and in the 80's (photo 3&4). All are multifamily prefabricated buildings with a bad insulation. As in most of the ex-Soviet countries, the dwellings are occupied by their owners in more than 90% of the cases

1

2

3

4

4.4. The French ESAM I.S. tool

The French tool, named ECOSIM and developed with Excel and Visual Basic, enables the user to simulate the consequences of some refurbishment interventions, in terms of costs and energy saved, at the level of a building.

ECOSIM can be used alone with no previous work of building up an interface with the database of the SHO.

The use of the tool is simplified thanks to the use of typologies that enable to spare the work of entering all technical data for each building. For a given building, all the data that differ from the typology, the user can modify the characteristics of the building according to its real situation. Energy certificates final results have to be input in the software. The core of the tool is a database in which each single technical intervention for one particular typology is associated to a price & potential of energy saving (a motor of calculation enable to consolidate the energy saved as the energy saved by a series of actions is not the linear addition of each action).

For practical reasons, the SHOs have integrated their list of buildings in the database of ECOSIM.

Final results displayed by the estonian tool

An important "plus" of ECOSIM is that, while the user is building the simulation, the tool displays the potential impact (financial and energy) of each action on the global results.

The consolidation of all simulations at the strategic level of the whole stock is under development. For the moment, it has been chosen that ECOSIM would produce a synthesis of the present state of the building and of the simulation outputs. This synthesis will be used when making the strategic plan (PSP) in order to optimize the investments.

Another strength of ECOSIM is its capacity to be improved. For the moment the cost and energy list (mentioned above as the core of the tool) is based on estimations. In the future, advanced thermal surveys and concrete results of energy saving interventions will enrich the quality of the database. As the number of users increases, the efficiency of the tool will be improved because the user will have to enlarge the database of the tool with its own typologies (and the core database of tool).

Developed according to the typologies owned by the French SHO partners (LTA & VDL), the tool can be easily transferred to another SHO. The new user will have to extend the perimeter of action of the software by integrating his own building typologies (if different from the existing ones) in the database. The user can make a survey on the energy & financial impacts of all the possible works applied on these new typologies. That work is estimated at one man-month work. An industrial partnership is being build to improve the tool and to widespread its utilisation. Two French SHOs, that are not part of the Consortium, are about to implement ECOSIM in their company (Promologis, Foyers de Seine-et-Marne).

Owned and managed by the French SHOs (Le Toit Angevin and Le Val de Loire), these buildings of Angers are a good representative sample of the French social housing buildings.

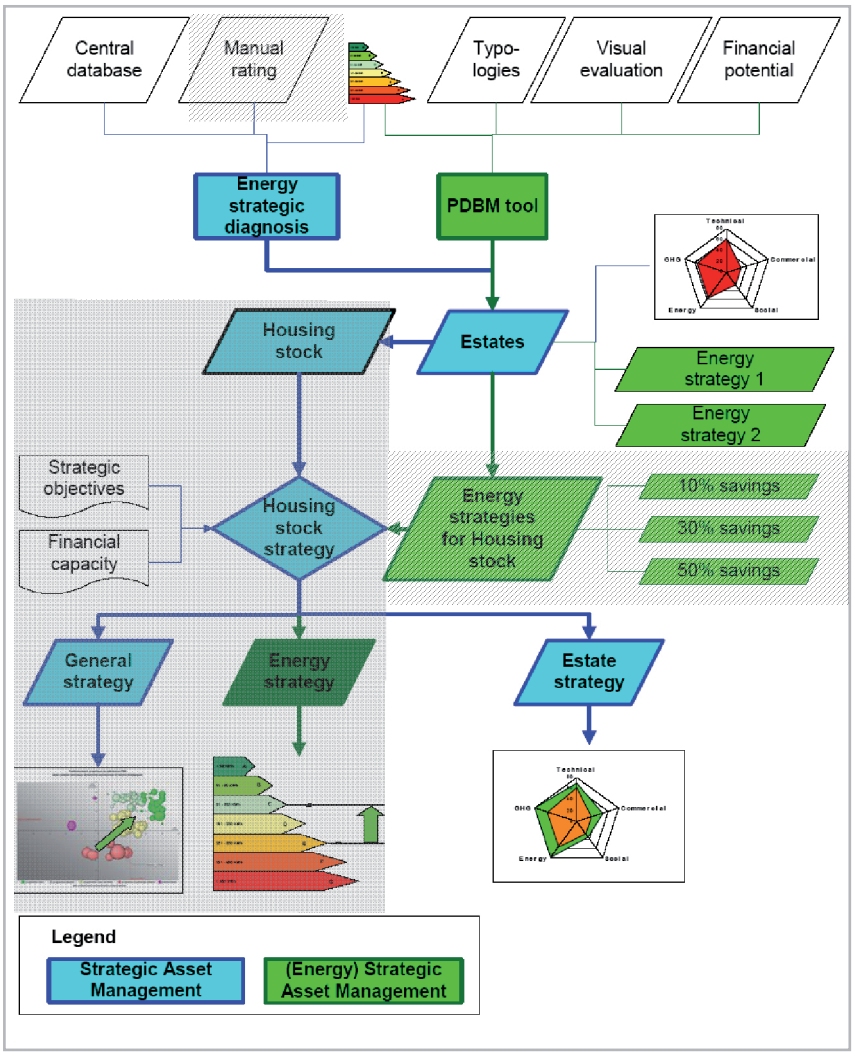
The French I.S. general architecture

The coloured parts represent the development of the tool. As we see, ECOSIM is, for the moment, mainly a PDBM tool.

This PDBM tool enables to adjust the asset management strategy when the housing company builds its long term strategy. Hence, the asset strategy will take into account energy issues.

In grey, we can see the future development of the tool, which is about to be integrated to the tool in the first half of 2009[1] . These new functionalities should enable the user to consolidate each refurbishment simulation results (energy saved, costs, and return on investment) at the level of the housing stock in order to have a global overview of energy savings possibilities.

The hatching shows the functionalities that haven't been developed yet by the French partners. The tool will permit to evaluate the energy/financial/technical consequences of the simulated refurbishments but it won't permit to define by itself a global strategy according to energy saving objectives (e.g. "reducing 10% of the energy consumption of the stock" or "getting the best energy performance for an initial investment of 10 millions €").



1. *ARMINES and SHO partnership should enable them to go on with the I.S. development.*

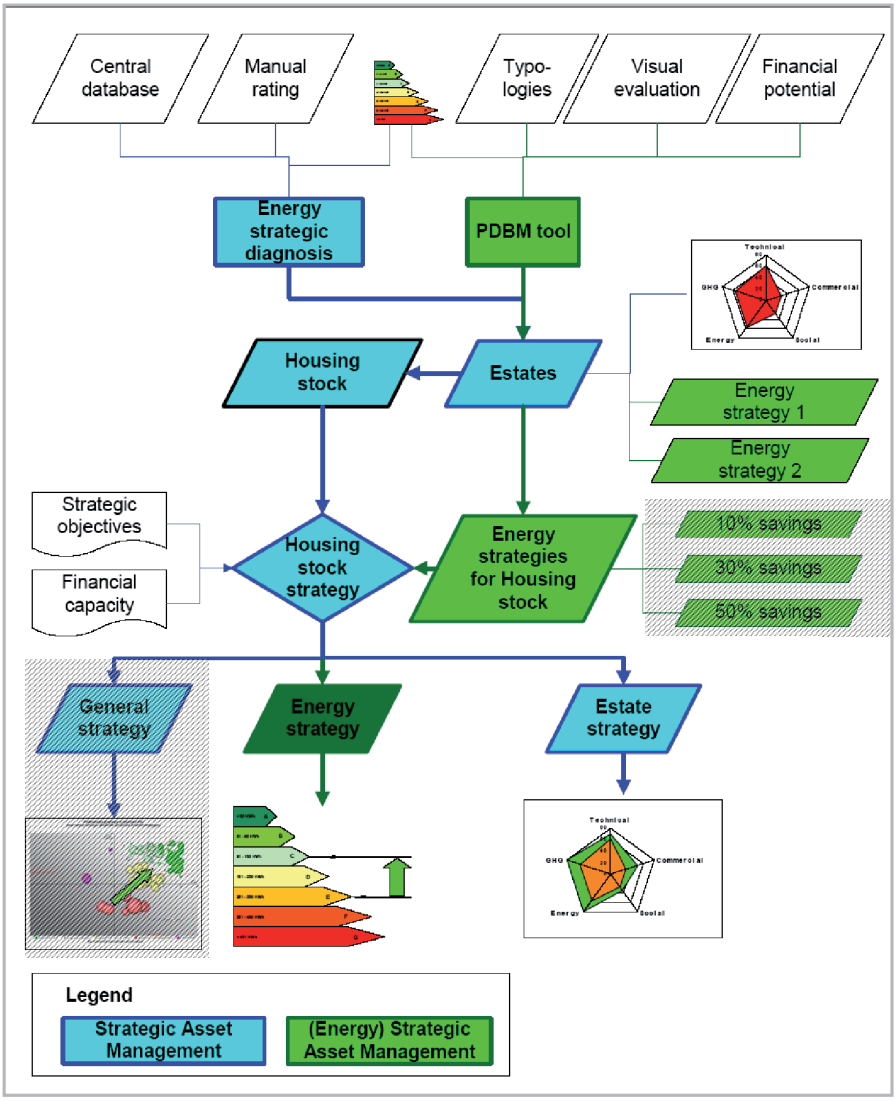
4.5. The German I.S. tool

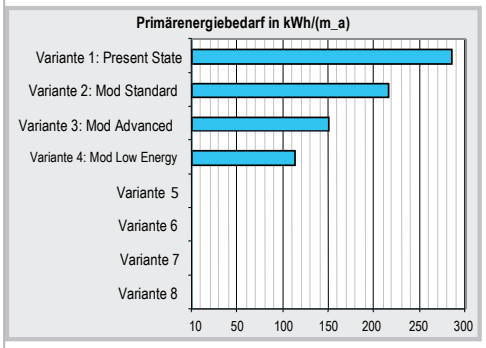
Interfaced with the existing I.S. (but external to it), the German tool aims to produce the energy certificates for a building, assess the potential effects -energy and financially speaking- of different retrofitting scenarios on a building and consolidate the results at the level of the stock in order to improve the portfolio management and the investment plan of the company.

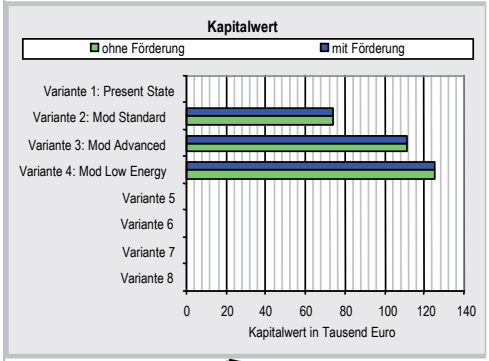
The tool is linked to the general database of the housing companies that enable the user to avoid most of the input of complementary data. The tool then specifies the energy performance of the building. According to the building typology, the tool applies to the building selected three predefined scenarios of refurbishment and displays the costs and energy saved for each scenario.

The sets of measures composing the scenarios can be edited or expanded by the expert user.

The tool then applies different financing scheme for the refurbishment scenarios according to the profitability related to the saving of energy and to the potential of rent increase (according to strict legal rules).







Simulation of the energy consumption (above) and investment needed (below) for a building, according to 3 retrofitting predefined scenarios

The German I.S. general architecture

The German tool is a global tool giving more importance to the strategic aspects but integrating a PDBM tool that evaluates the application of 3 predefined (or more) retrofitting scenarios on all buildings.

This simulation is done after the strategic objectives have been defined for each building. That is why the "general strategy" is represented with hatching; it is not an output of the tool but an input.

Finally, the tool consolidates the results at the level of the housing stock, including the consequences of the refurbishment scenarios on the CO2 emissions.

The tool offers the possibility to consolidate the results of the simulations at the level of the stock but it is not possible to make a request that would indicate the best way to save 10% energy on the stock.

The graph doesn't show that the tool enables the user to assess the economic feasibility of the retrofitting simulated in terms of self investment (possibility to raise the rents).

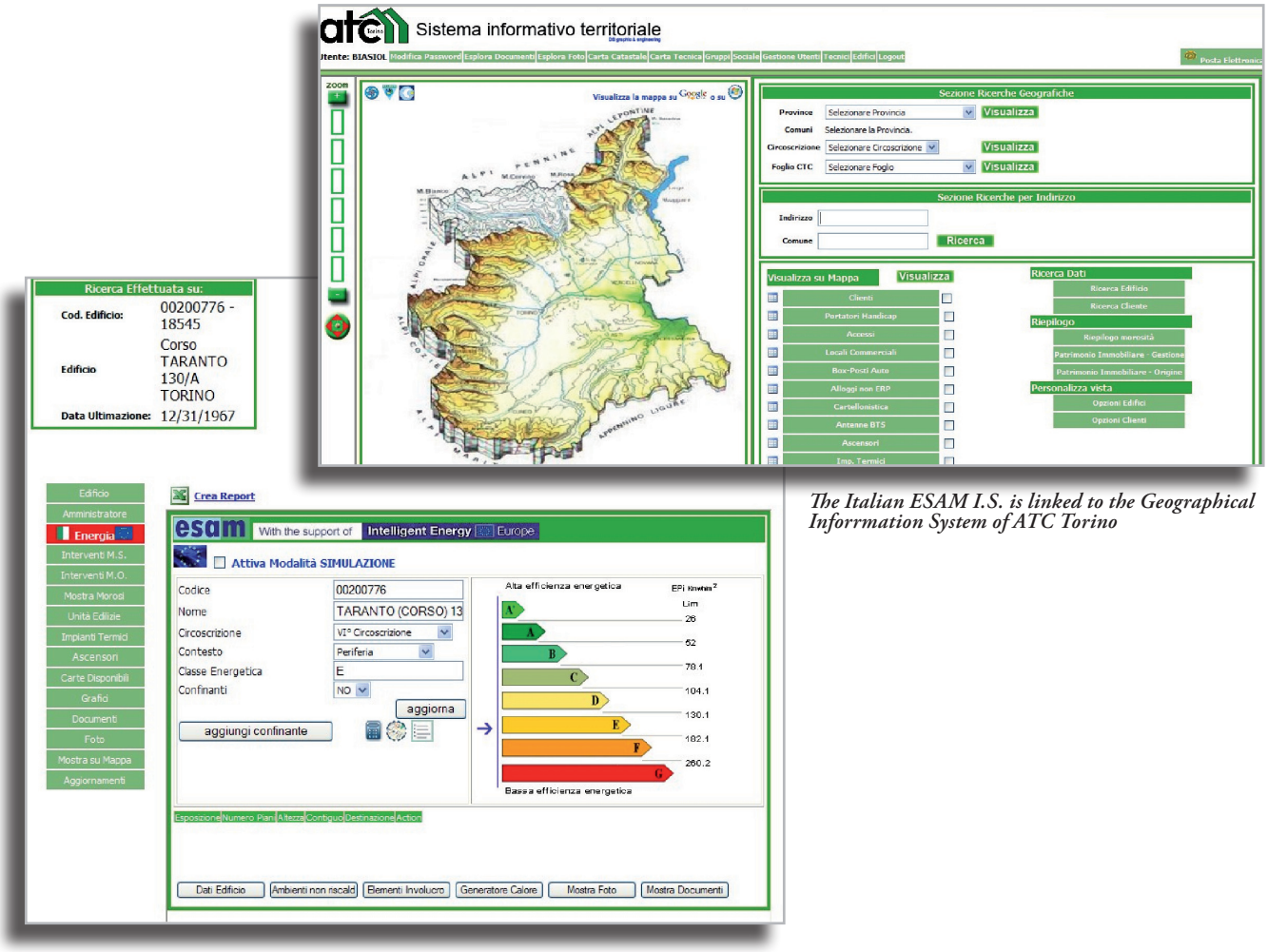
4.5. The Italian ESAM I.S. tool

The Italian tool assesses the impact of retrofitting measures building per building and for a group of buildings. Its main target is to assess the energy saving impact that can be achieved with a retrofitting intervention on a building or in a district, comparing it with the corresponding economic implications. Furthermore, ENER-GIS aims to share information with external decision makers (local authorities), in order to help them to allocate economic resources in a refurbishment plan, (for a building or a district of the town), taking into account the energy saving issues.

For that reasons, the tool is also available on the web (personal password required) it can be used everywhere (for instance, during meetings or briefings). It is linked to the Geographical Information System of ATC Torino that enables the user to select a building through its localisation on a map, and to show on the same map the outputs of an investment in terms of energy saving on the territory. At the same moment, the integration with the GIS allows also a general on-line overview of the settlement, with special regard to the social situation of the tenants.

Through his calculation's system (that needs the inputs of a detailed technical description of the building), the tool can produce the energy certificates at the level of a building

In the end, with an everyday use, the tools will gather an interesting data base of simulations. It will allow, in the future, to build up a statistical system for the calculation of the energy performance of buildings having the same age.



The Italian ESAM I.S. is linked to the Geographical Inforrmation System of ATC Torino

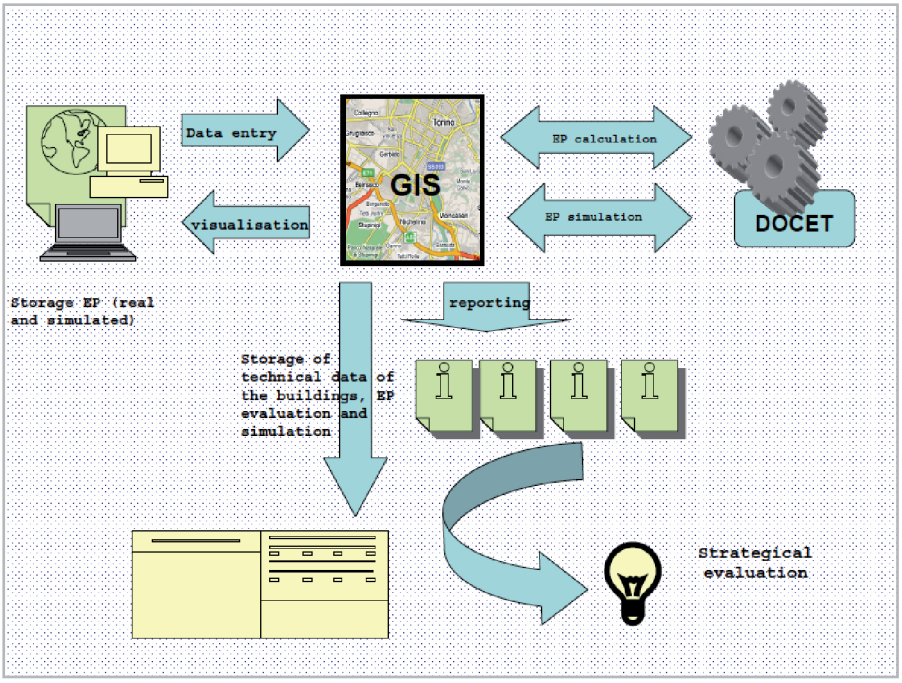
The Italian I.S. general architecture

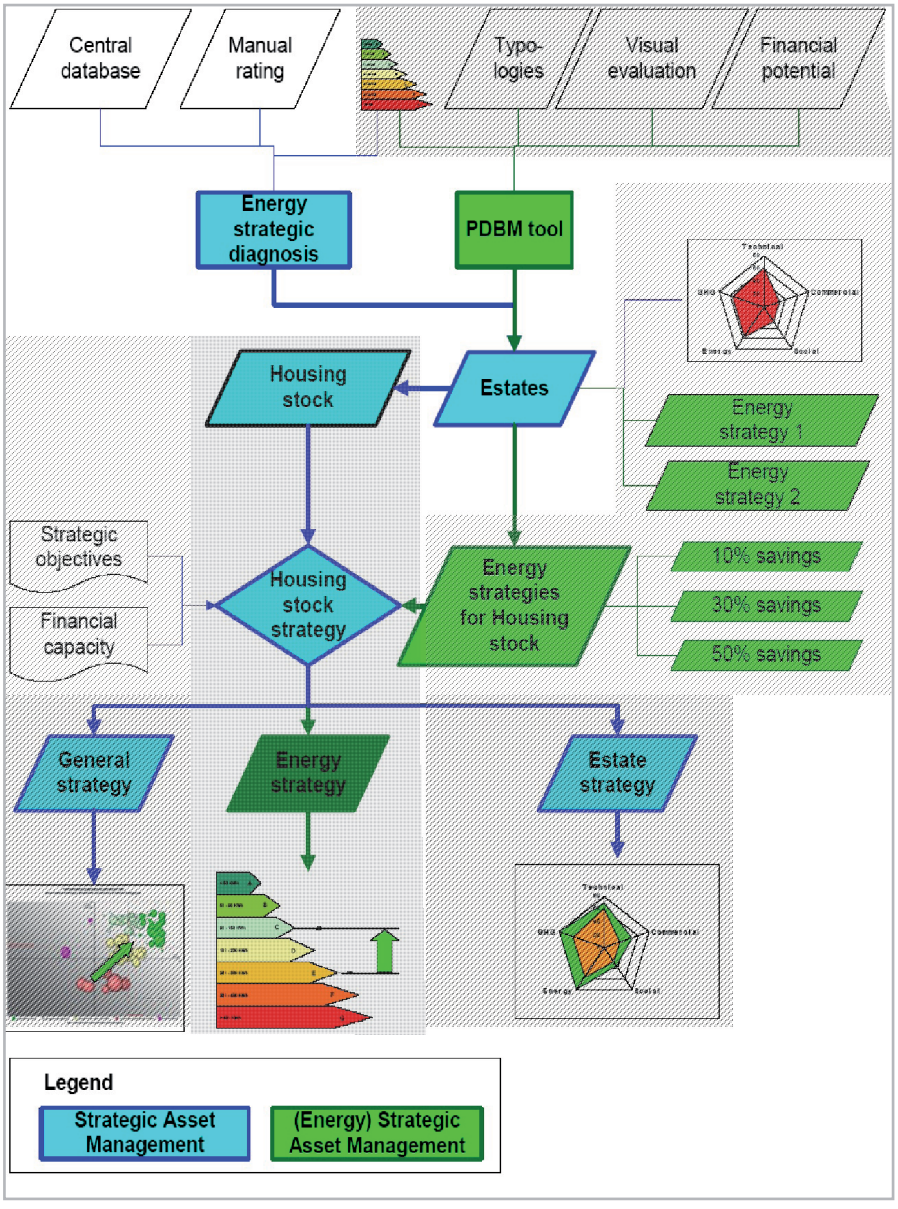
The Italian tool ENER_GIS is installed into a section of the Geographic Information System of ATC Torino. The technical data of each building and of group of buildings are stored in the main data base (Linux) and the data entry is done through an interface with the GIS system.

At the level of the simulation interface, the technical suggestions of retrofitting are evaluated and priced building by building by a technician. The data are available from the main server, in the GIS, in a *Java ds_dove* environment.

From the GIS, the data are sent to DOCET, a free tool for the calculation of the energy performance of a building, using a translation system that is been studied in cooperation with ITC-CNR.

Opening the GIS, in the company's intranet or in the web, is it possible to do quick simulation of the energy performance of the building and of a group of buildings, comparing the costs and the benefits of a retrofitting operation





Part 5: Cooperation with stakeholders

Developing co-operation with stakeholders involved in the management of energy is a key-factor of a successful implementation of a really energy-efficient strategy.

The stakes are not the same for all the SHOs but the main categories of stakeholders are:

- The occupiers living in the social housing stock (tenants, owner-occupiers, co-operators,...). This category is predominant due to the fact that, in a lot of countries, individual heating is widespread in the social housing stock not only in single family houses but also in multi-storey buildings. The inhabitants' behaviours are crucial.
- The suppliers of technologies (e.g. heating engineers), maintenance (subcontractors exploiting the heating systems), heating suppliers (in case of urban heating like in Czech Republic), energy suppliers...
- The local authorities prescribing some level of energy performance or technologies (e.g. renewable energies) to be reached or implemented.

Therefore, ESAM project developed a methodology that enables the SHOs to consider the cooperation with stakeholders at each potential step of an ESAM approach, from the diagnosis of the stock to the technical implementation of the strategy.

5.1. The different types of cooperation

In the housing field, one can discern between different types of cooperation with regard to the intensity of the involvement, formality and complexity of communication of/between stakeholders:

- Information (basic information and knowledge exchange among partners in advance of planned measures and alongside their implementation)
- Consultation (retrieval of knowledge, opinions and experience among partners in dialogue with the housing company)
- Participation (active participation of the partners in the decision making process, e. g. within projects or working groups)
- Co-Management (transfer of competences and responsibilities in decision making processes to partners/customers/occupiers)
- Negotiations (participation on a very high level of formality like in court processes required by the respective legislation)

5.3. Matrix of the processes of cooperation in all ESAM steps

The following scheme presents the different processes of co-operation according to the strategic and operational steps in ESAM.

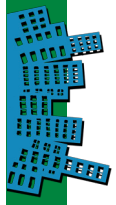
It aims to enable SHOs implementing an ESAM tool -or not- to questions their company policy about all the kinds of measures that can improve the energy-efficiency of their housing stock through cooperation processes.

A list of best practices ordered following this matrix is available on ESAM project website (WP4 Cooperation Management, D18 - *Cooperation Management Toolbox*).

Table 6: Cooperation Management - Classification of ESAM Cooperation Management

NO	ESAM step	(Strategic) Goal	Type of Cooperation	Stakeholders involved	Description of ESAM Cooperation
			STRATEGIC LEVEL		
1	*Strategic framework*	*Definition of mission and strategic objectives, analysis of legal, institutional, market and economic framework and available strategic actions*	*Information, consultation, participation*	*Local authorities, political authorities, SHOs, professional associations, shareholders*	• *Secure cooperation in the mission statement* • *Facilitate interaction with stakeholders (meetings, round tables, contact persons) to define energy saving /efficiency targets* • *Assessment of the markets general wishes and demands regarding energetic refurbishment (now and in future)* • *Political communication regarding the legal/institutional framework e.g. about financing possibilities for energetic refurbishment and energy price development* • *Political communication regarding the legal framework for realisation of energetic retrofitting measures (in respect to tenants' or owner occupiers' rights and duties)* • *Political Communication concerning Greenhouse Gas Emission Targets (national and European) and their realisation*
2	*Strategic diagnosis*	*Assessment of the current energy performance of the housing stock* *TECHNICAL – OBJECTIVE ASPECT*	*Consultation*	*Tenants, energy Suppliers, metering organisations, energy consultants*	• *Consultations (via professional unions) of integration of Energy Certificate into energetic assessment of housing stock* Level A: Consultations concerning the legal form of Energy Certificate Level B: Application of Energy Certificate • *In case of assessment by consumption:* *Getting data about the energy consumption of representative buildings from energy suppliers, metering organisations and tenants in case of non-central heated buildings ore central heated buildings with individual metering* • *Cooperation with energy consultants about a cost effective method to check the energy consumption/ demand/performance of representative buildings of the housing stock*
2 A	*Strategic diagnosis*	*Assessment of the current energy performance of the housing stock* *SUBJECTIVE ASPECT*	*Consultation*	*Tenants, Owner Occupiers*	• *Detailed inventory and analysis of wishes, problems and desires of the tenants regarding the (energetic) refurbishment e.g. by systematic capture of occupants complaints / request / suggestions*
3	*Segmenting the housing stock*	*Integration of energy as additional segmentation argument, development of a portfolio matrix with energy as additional dimension*	*Consultation*	*Consultants, software developers*	• *Facilitate interaction with consultants and software developers*
4	*Defining strategies*	*Defining standard measures of (energetic) refurbishment connected with standard costs (library of actions)*	*Information, Consultation*	*Shareholders, tenant organisations*	• *Information and consultation with the tenants and other major stakeholders about the planned strategic actions regarding energy*
5	*Global financial impact*	*Definition of a global budget for the housing stock strategy including energy strategies, assessment of the impact of the global strategy on the energy performance of the housing stock*	*Information, Consultation*	*Shareholders, local authorities credit institutions*	• *Negotiation with local authorities about subsidisation to achieve different energy saving targets* • *Negotiations with commercial credit institutions in order to develop adequate financial instruments* • *Negotiations with commercial (credit) institutions in order to invent new models of financing like Contracting-Models*
6	*Adjusting the action plan*	*Discussion of the financial consequences of the selected strategies and possible alternatives on estate level, selection of a housing stock strategy*	*Information, consultation, participation*	*Tenants, shareholders, local authorities*	• *Information should be provided to the tenants and to other stakeholders to involve them into the chosen strategic action plan regarding energy*
7	***Implementation***	*A – G see details below*			

NO	ESAM step	(Strategic) Goal	Type of Cooperation	Stakeholders involved	Description of ESAM Cooperation
OPERATIVE LEVEL (IMPLEMENTATION) ESAM STEP 7					
A	*Diagnosis*	*Project preparation*	*Consultation, Participation*	*Tenants, energy Suppliers, metering Organisations, energy consultants*	• *Detailed inventory and analysis of wishes, problems and desires of the tenants regarding the (energetic) refurbishment e.g. by systematic capture of occupants complaints / request / suggestions* • *Getting detailed data about the energy performance from energy suppliers, metering organisations and tenants in case of non-central heated buildings or central heated buildings with individual metering (area and block residents meetings, monitoring of current energy-use in the blocks and demonstration of improvement potentials, suggestion box, interviews)*
B	*Brief (Planung)*	*Project preparation*	*Consultation, Participation*	*Tenants, owner occupiers, consulting organisations*	• *Workgroups and workshops with tenants involved, can the tenants remain in their dwellings during and after the energetic refurbishment or have they to move?* • *"Voluntary" participation of tenants to reduce complaints; adapt project design* • *Negotiations with tenants upon rent* • *Negotiations with tenants to obtain agreement for energetic* • *Negotiation with Owner Occupiers to get required majorities*
C	*Legal Steps*	*Project preparation*	*Formal Procedure*	*Court (Arbitration Committee Austria)*	• *If there is no unanimous agreement in case of a rent increase the agreement might be obtained by court in some countries*
D	*Design (Ausschreibung und Vergabe)*	*Project preparation and realisation*	*Participation, Co-management*	*Tenants, construction companies, craftsmen*	• *Participative design of a quarter, infill packages: tenant design based on a do-it-yourself kit*
E	*Construction*	*Project realisation – technical measures*	*Information, Participation*	*Tenants, local authorities, energy consultants; mediators Construction companies*	• *Construction progress communication (e.g. Baustellentage)* • *High efficient energy strategies require additional user information to the tenants (e.g. user manual)* • *Care for occupants during construction period*
F	*Application: Assessment*	*Project evaluation*	*Information, Consultation*	*Tenants, metering organisations*	• *Metering of realised energy consumption and comparison with planned energy savings* • *Inventory about the satisfaction of the tenants with the new energy standard?*
G	*Application Property and facility management*	*awareness raising / training activities/ Preventing Rebound Effects*	*Information*	*Tenants, metering organisations*	• *Providing information/instructions on use of new technologies (eg for passive houses)* • *Providing information/instruction for functioning of heating system after retrofitting* • *Providing information to tenants about individual energy consumption e.g. via internet tools and metering instruments)* • *Providing instructions for energy saving (e.g. brochures, telephone hot-line)*



Part 6: Achievements and lessons learnt

6.1. Major achievements

Through concrete outputs ESAM project has enable SHOs to improve their management of energy issues. For the partners of new members states of the EU as Estonia and Czech Republic, it also made them progress on strategic asset management in general.

Achievements for the SHO

ESAM project outputs enable SHOs managers to pilot their energy performance policy. ESAM tools permit to evaluate better the actual and future energy-performance of the housing stock, to adapt the investment plans and to communicate on the present and future performance of concerned estates to other stakeholders.

More precisely, ESAM project succeeded in:

- Equipping with simple and practical tools the staff of the participating SHO
- Improving the knowledge of the social housing stock of the 6 participating countries; particularly on energy issues.
- Improving the knowledge of professionals on feasible energy retrofitting solutions.
- Integrating energy issues in SHOs' long term strategy of their portfolio management in a way which could be adapted to most of the European Union contexts.
- Improving the visibility of technical choices concerning energy-retrofitting for the technicians but above all for the top management and the stakeholders (such as Public authorities).
- Improving the knowledge on cooperation management with stakeholders regarding energy issues.

These major achievements don't only impact the participating SHOs but also their closest partners (Public authorities, SHOs, professional networks & federations) and, in a near future, a great part of the EU social housing organisations. The issues attached with ESAM IS explained in this report can be seen sometimes as a little bit too abstract. In fact they are essential for the adoption of performing energy policies in the social housing sector

Improving the environmental footprint of the social housing

ESAM project results will permit SHOs to build strategies that consider and reduce the environmental footprint of the social housing stock through optimized decision processes on energy-retrofitting investments.

As the use of the ESAM outputs is still at its beginning, it is quite difficult to evaluate the improvement of the SHO practices in terms of energy consumption with figures. Having said that, the short ESAM partners' experience tends to show that since they are using ESAM I.S., they improved the allocation of the punctual public funds specially dedicated to energy refurbishments. It also has to be mentioned that ESAM outputs are not the only way SHOs try to reduce the energy consumption of their housing stock.

ESAM I.S. tools that include strong SAM dimension (cf. the German, Czech, Austrian and soon French tools) will enable SHOs to report easily on their actual and future global environmental performance.

Beyond improved choices of investment on asset management, ESAM outputs will favour a clear communication with SHO stakeholders concerning their energy strategy. Italian ESAM I.S. is a perfect illustration of a tool encouraging shared decision making processes on energy issues. If the stakeholders (and particularly the Public Authorities) have a better understanding and visibility on energy issues SHOs are facing, their demands will be more realistic and more relevant.

In a near future, improved version of ESAM I.S. could insist more on the greenhouse gaz effects (which have been excluded by 3 of the 6 tools) and other environmental and health issues (monitoring and strategy of other gaz emission, of the environmental quality of the products used for buildings,...).

6.2. An improvement of the research at a European level

ESAM project was fed by the scientific research and development European programs and it intends to feed this field of research.

ESAM project has based its initial analysis of the needs on the state of the art of the knowledge regarding asset management tools & energy performance. On a European level, EU-financed research programs such as E-TOOL or EPIQR participated to the initial reflexion of the development of the ESAM outputs. The I.S. developed in the frame of EPIQR[1] (which could be assimilated to a PDBM I.S. tool) had inspired the *Book of recommendations for a PDBM tool.* In fact, the leading partner of the PDBM aspects, CSTB, had participated to the EPIQR project.

Apart from some conceptual elements that inspired ESAM project, the main lesson learnt from this project was that the I.S. should not be too complicated otherwise they may not be used by a large number of SHOs, as for the EPIQR tools.

In fact, such a complexity has not been always avoided by the ESAM project development, particularly regarding the common PDBM tool. This was actually one of the reasons that led the ESAM partners to abandon the idea of a common I.S. tool.

Among the many scientific works that feed the ESAM project, two other SAVE projects have to be mentioned because of their tight link with ESAM: EPI-SOHO and Factor 4.

EPI-SOHO settled a frame for the implementation of an approach integrating sustainable development in the SHO practices. The outputs of this project in which several ESAM project partners were also involved (CSTB, IWU) are perfectly compatible with ESAM outputs. From a same starting point as ESAM project (the EPC directive), EPI-SOHO focused more on a global approach of the energy performance issues in the SHO, in particular on its organisational aspects but also on EPC collection.

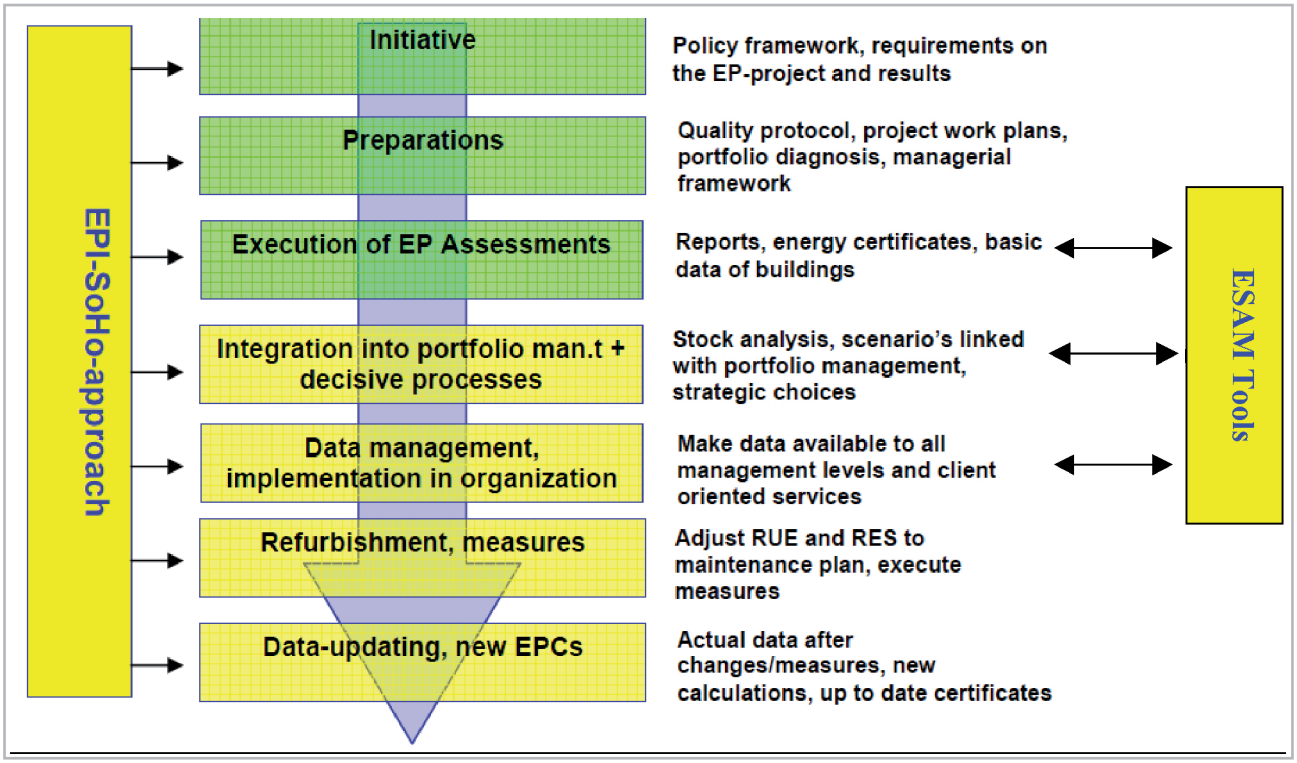
The Factor 4 project has settled several models for the calculation of the Life Cycle Cost (LCC) analysis of social housing buildings. These methods enable SHO to evaluate all the investments a building will need in the future to optimize the initial investment (for construction or major refurbishment).

The Factor 4 outputs consider housing stocks but the usefulness of the tools produced seems more obvious at the level of a building or an estate than at the level of the whole housing stock. Indeed, the level of accuracy of the input data is particularly high, limiting the strategic aspects of the tool at the level of the housing stock.

In the countries for which Factor 4 has developed a LCC analysis tool (Romania, Denmark, France, Germany and Italy), a synergy between ESAM and LCC tools could be established:

1. *The tool was developed in the frame of two European projects JOULE II in 1996 and 1998. Information can be find on http://www.epiqr.ch/outils_epiqr.html#telechargements*

Graph 3 : *the synergy of EPI-SoHo and ESAM approaches*



Factor 4 outputs could be used to improve the economical assessment modules of the ESAM I.S. as it makes the return on investment calculation more accurate.

When ESAM and Factor 4 tools are available in a country, we would advise to use the ESAM I.S. for the scoring of the housing stock and, to apply the LCC analysis to the buildings or estates for which the ESAM tool has revealed an important potential of energy-saving for a low investment. It will enable the user to consider over-investments, interesting from a LCC point of view that he wouldn't have initially considered.

Another SAVE project also has to be mentioned because of its link with ESAM: the SAVE@WORK4HOME project, in which two ESAM partners are also involved (l*e Toit Angevin* and *Nassauische Heimstätte*). The link between these two projects was established and maintained through several presentations of this project during ESAM meetings, which led to a cross-fertility of the work of both projects. Hence the French ESAM tool will certainly be disseminated and commercialized in link with SAVE@WORK4-HOME French outputs (an online monitoring of the energy consumptions).

6.3. Lessons learnt about strategic asset management and energy issues

Understanding of the expression "Strategic Asset Management" in SHOs

The consortium agreed on the general definition of Asset Management provided by Gruis/Niebor (2004, p.5) referring to Priemus et al (1999; p. 211):

> *Asset Management refers to all the activities linked to the production and the allocation of housing services for the existing housing stock. It focuses on the physical housing stock and concerns maintenance, renewal, sale, allocation and rent policy.*

This first definition has to be completed with the definition of Strategic Planning provided by Gruis/Niebor (2004, p.6):

> *Strategic Planning refers to the process of developing and maintaining a viable fit between the organisation's objectives and its resources, via a systematic, rational and transparent planning process which implies:*
> - *A systematic information gathering*
> - *A clarification of organisational directions*
> - *The establishment of priorities*
> - *A quality decision making*
> - *The communication and understanding of strategic intents*
> - *A solid organisational responsiveness, effective performance,*
> - *A conscientious framework*
> - *A useful application of expertise*
> - *The attention to organisational learning*

These different faces of the strategic dimension have been taken into account differently by the six tools produced in the frame of the project, according to the institutional and business environments.

A SHO with the full power on its investments and with an important number of dwellings will stress more on the quality decision making aspects. On the other hand a company directly managed by a municipality will insist more on the "transparency" aspects of its ESAM tool.

The way that energy issues are considered by SHOs' managers when defining the asset strategy

Most of the partners have opted for the "ESAM after SAM" model, which implies that decisions of investments concerning energy come once the great lines of the strategic policy for each building (or group of neighbour buildings) have been settled. SHOs' top managers generally consider energy issues after the other strategic issues. Another reason to make such a choice was the pre-existence of the SAM IS in the organisations before the beginning of the project.

On the other hand, the "ESAM in SAM" model doesn't necessarily guarantee that the energy issues will be assessed on an equal basis as the other strategic issues (economic, social and technical), since the weight of each criterion is attributed by the user. However, it makes possible to define clusters and, for each cluster of buildings, to define a strategy mixing energy issues with the other criteria.

The preference for the "ESAM after SAM" model is not only related to the low original level of development of the SAM I.S. tools. It is also due to the way SHOs consider energy issues. SHOs' top managers tend to base their energy policy on few principles (concentrate the effort on a few energy wasting buildings, be reactive to public punctual subsidies, no consideration for the carbon balance of the housing stock...) that seem to lead to only one alternative: a total and expensive refurbishment or doing nothing. That is why the partners invested more time and money in the operational level of the tools (PDBM) than in the strategic aspects (ESAM); the strategy regarding asset management and energy is clear but it is necessary to have more knowledge on how to implement it. Using this way, they can evaluate precisely which level of energy performance and which level of investment they have to target to improve a low-performance building.

SHOs rarely think about the global performance of their housing stock. It is too vague and too general. It's more practical to conceive this global performance as the sum of concrete feasible actions on identi-

fied buildings. It is well underlined by the choice of most of ESAM project partners whose ESAM tool doesn't include a functionality that enables the user to know how to reach a 10, 20 or 30% reduction of the consumption of their stock.

Concerning the great strategic principles of SHOs, we can notice that they generally choose to:

- Focus essentially on the small part of the stock with the worst energy performance as they consider it as environmentally, politically and socially risky. Through the collection of energy certificates, SHOs have now a good general overview of the actual state of the energy performance of their stock. It enables them to identify which parts of the stock they should invest in.
- Establish a priority order that is deeply linked to the energy performance of the buildings.
- Think about energy issues separately from other issues, also in terms of investments as specific sources of financing exist in all participating countries.

Remaining barriers to the full integration of energy issues in the asset management policy of SHOs

If energy efficiency investments are taken into account by the SHOs top management -and in a better way thanks to the ESAM outputs- some barriers remain to a systematic reflexion on the improvement of energy efficiency when they build up their investment plan. These barriers are mainly institutional.

The major barrier is the fact that the energy bill is paid separately from the rent by the tenants in most of EU countries (Sweden is one of the only few exceptions). It means that investments on energy efficiency made by the SHOs can't be paid back only by the energy savings. This implies that, apart from political or social reasons (concerning generally the worst buildings), there is no direct & financial interest for SHOs to improve the energy performance as they will not be allowed to get any payback from their customers.

Vagueness surrounding public subsidies to sustain the energy efficiency (in terms of objectives & eligibility, of amount, of administrative procedures) implies that housing managers have to seize the brief opportunities and are not encouraged to build up a long term strategy based on a scientific return on investment calculations.

Such a context will encourage a punctual use of the ESAM I.S. when more stable financial situation would encourage a continuous use of the ESAM I.S. which is possible only through a complete integration of ESAM tool with the existing FM and SAM I.S.. They need to be made to convince public authorities about a fair share of the investments between the customers and the building's owner.

Other kinds of barrier remain, for instance:

- The instability of energy prices that makes difficult to plan the return on investment of energy retrofitting measures,
- The European, national and local constrains on energy issues are maybe not coercive enough (there are constrains when retrofitting or constructing, but there are rarely obligations to refurbish).

6.3. Lessons learnt about strategic asset management and energy issues

At the European level, the Commission has adopted an Action Plan for Energy Efficiency (2007-2012) aimed at achieving a 20% reduction in energy consumption by 2020. As the part of the final energy consumption attributable to the building sector is very high (roughly 40% in Europe) especially for residential buildings (2/3), the legal requirement put a particular stress on the energy performance of buildings.

These objectives are declined into European Commission directives, international and inter-European agreements, national policies and local requirements that all settle objectives of reduction of the energy consumption of buildings.

ESAM project outputs encourage the implementation of these objectives, since they improve the knowledge on housing stock energy consumption, the definition and the implementation of energy asset strategy and the cooperation with SHO stakeholders. Furthermore they improve the monitoring of these objectives of reduction of the environmental footprint of the housing sector. Finally because ESAM project outputs and best practices will inspired others, they enable to spread the housing companies' capacity to respect these objectives.

Accompaniment of the EPBD Directive implementation

The major legal instrument of the European Union to encourage energy efficiency on buildings is the EPBD directive, 2002/91/EC.

EPBD directive and EPC in particular were the starting point of the project as it was decided to turn the EPBD certificates from an obligation into an advantage. This means that the companies planned not only to collect the data necessary for the energy certificates but also to process it in order to build an energy strategy.

Through the ESAM tools

All ESAM I.S. tools are using the energy certificates but at different levels. These differences mostly depend on the existence of a legal methodology and on the objectives of the tool (especially the level of technical accuracy). All tools are using the final results of energy efficiency and most of them (apart from the Czech and Estonian tools) are using the CO2 emissions results of the certificates.

The German and Italian tools are very special from this point of view because they don't use the conclusions of the certificates and they don't extract the technical data input in the energy certificates. The tools produce the energy certificates at the level of a building thanks to a motor of calculation. The possibility to insert this calculation module is linked to the tolerance in the adaptation of the EPBD at a regional level.

The Italian tool includes the calculation module called DOCET which has been validated by the Region Piemonte as a valid methodology of calculation.

The Austrian tool is closely linked to the ZEUS database that gathers all energy certificates in the country. This tool is alimented by this general energy certificates database, which also fuels the information system.

As the national energy certificate methodology is not officially defined, the Estonian partners have decided to mix technical data and the real energy consumptions. In definitive the tool also produces a kind of energy certificates. However, this result is not as formal as for the Italian and German outputs: it won't permit the future user to fulfil the legal requirements.

Through the reflexion and implementation of energy certificate methodologies

In the frame of the project, the French team made a special focus on the methodology of the most well-known energy certificate legal motor of calculation (3 CL) through a survey & scientific analysis of Angers pilot sites[1] . The aim was to analyse its quality and deficiencies and to suggest a method to calculate the energy efficiency of a whole building which result can be given afterward dwelling per dwelling. This survey was a success and received a good echo from the Ministry.

More than any other housing companies, the ESAM project partners are ready to implement quickly the EPBD Recast as soon as it will be done.

Accompaniment of the local environmental policies

For the same reasons that ESAM project encourages the environmental objectives of the European Union, it encourages the accompaniment of the national & local environmental policies which are strongly influenced by the European decisions.

As they encourage energy efficiency on buildings, ESAM tools support national and local policies at all levels.

As local public authorities (and particularly the municipalities) are the natural partners of the SHOs in most of European countries. They are generally the ones who implement the urban planning and housing policies, and they often are shareholders of the SHOs.

ESAM tool will be, for most of the national teams, a tool that will encourage co-decisions regarding energy performance and investment between SHOs and local authorities. Such cooperation should work, as the ESAM tool can produce a synthesised and pedagogical description of the SHO strategy in terms of energy

In fact, SAM tools have been created in France in link with the implementation of a national law that obliged SHOs to define a strategic investment plan. It aimed to make possible the sharing of the decisions regarding strategy and investments for national and local authorities (*Plan Stratégique de Patrimoine*).

The need of public authorities for a tool such as the ESAM tool is growing as more and more local authorities implement local Agenda 21 and their needs to clarify the SHO consumption and strategy are getting stronger. The German partners situation shows perfectly how a political request was at the root of the creation of the ESAM tool. The following citation shows how the political demand (because of decision-makers need for visibility) can urge the implementation of ESAM tools:

> *To clarify the urgency of energetic innovative actions from SHOs we refer to a proposal of resolution for the state parliament by the social democratic party (SPD) chairwomen and (meanwhile former) candidate for Prime Minister of Hesse, Mrs. Ypsilanti.*
>
> *In this resolution, the SPD asks the state parliament to demand all Social Housing Operators of Hesse to give a statement about improving their energy performance of their housing stocks and how to relieve the tenants from extreme high running costs.*
>
> *Explicitly, they have asked about the necessity of energy-retrofitting of their own housing stock to achieve the national and European climate goals. This resolution will in all likelihood be accepted by the parliament of Hesse.*

This means that, through ESAM tools, environmental issues linked to the general interest will be less monopolized by technicians, but will be handled by SHO top management and public authorities.

1. Published and Downloadable on the EPDB Platform: http://www.buildingsplatform.eu/cms/index.php?id=118&publication_id=3307

esam

ENERGY STRATEGIC ASSET MANAGEMENT

The ESAM project is willing to promote an efficient energy management of large social housing stocks by institutional players.

Improving the energy performance of the social housing stock in Europe requires focusing on the Social Housing Organisations (SHOs), which can implement energy-retrofitting on a housing stock of several thousand dwellings. In order to do so, they need to integrate energy issues in their global strategy. This means to make an energy diagnosis of the housing stock and to identify the most cost-efficient investments regarding the energy performance in order to define a strategy for upgrading their housing stock.

Due to the size of the concerned stock and the data attached with, this management implies the development of corresponding Information System which can support all the decision making processes.

The project aims at developing methodologies and information systems supporting:

- the implementation of the energy certificates
- the use of the data extracted from the energy certificates to make an energy strategic diagnosis of the housing stock
- the definition of energy-retrofitting strategies for each estate/building with an evaluation of their energetic and financial consequences at the strategic level of the housing stock.

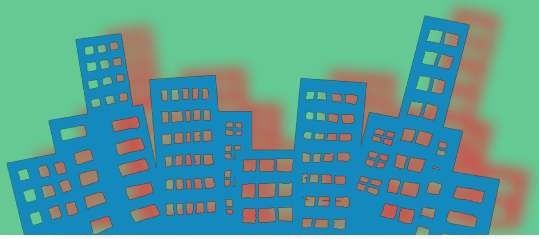
It also aims to improve the co-operation with the other stakeholders: inhabitants, local public authorities, facility and utilities companies, energy providers.

This report was written by Baptiste Camus, DELPHIS, Project Manager of ESAM thanks to the contributions of all ESAM project partners.

The document gathers the conclusions of several deliverables of the project. It reproduces integrally the *General Synthesis of the Book of Recommendations to Implement an ESAM I.S. Tool*. It is also inspired by two other deliverables of the project: the Conceptual framework ESAM (Delivrable.11) and the General Framework and Description of Cooperation Management Best Practices (Deliverable.14) available on the project website **www.esamproject.org**.

It has been supervised and approved by the whole project consortium.

In order to improve its quality, the document was finally revised by a representative sample of organizations or companies targeted by the present publication.



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