



ACTION FOR
ENERGY EFFICIENCY
IN BALTIC CITIES

ACT NOW!




GUIDELINE

Identification of Most Effective Energy Efficiency Measures

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About the *Act Now!* project

The *Act Now!* project approaches energy efficiency in the existing building stock of small and medium sized municipalities around the Baltic Sea. The project's scope is to help municipal staff involved in building energy efficiency measures by improving their knowledge about energy losses, competences for preparing investments, and skills to stimulate private investments in energy efficiency.

The *Act Now!* project wants to support Baltic municipalities to succeed from Strategic Energy Action Plans (SEAPs) to achieve an actual reduction of CO_2 emissions. Energy efficiency is the key and the building stock is the treasure to be unearthed for a contribution to reach this goal. The *Act Now!* project aims to foster a new approach across decision makers focused on housing and public buildings.

Act Now! was initiated and coordinated by "Klimastadtbüro"- the climate city office of Bremerhaven, Germany. It was launched in February 2018 and continued with 17 partners in the Baltic Sea area to improve the energy efficiency.

actnow-baltic.eu

The report can be downloaded at actnow-baltic.eu/learning.

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EMS	Energy Managent System
GHG	Greenhouse Gas
LED	Light Emmitting Diode
LEEG	Local Energy Efficiency Group
SEAP	Sustainable Energy Action Plan
SECAP	Sustainable Energy and Climate Action Plan

1 | Introduction

1.1 | The *Act Now!* approach

Buildings are Europe's biggest energy resource. They make up more than 40 % of the final energy consumption in the European Union (EU). Using energy more efficiently in the building stock is therefore a key objective for polices of different fields and levels.

Municipalities are the key players for improving energy efficiency at the local level. As building owners they operate a considerable amount of residential and non-residential buildings. They are the responsible authority for local building regulations, depending on the legislative framework, and can provide information and advice relevant for building issues, also to private building owners. They can go forward with good example, making the benefits of energy efficient buildings more visible and tangible for the local society.

While the demand for energy efficiency in the municipal building stock is clear, the actual implementation is lagging behind. However, this is not because of non-available technologies. Material, appliances and solutions, such as insulation, building automation, efficient heating and LED lighting are technically mature and widely available. Instead, the project *Act Now!* – Action for Energy Efficiency in Baltic Cities[1] focuses on **internal resources for putting energy efficiency into action**. Although ideas and even elaborate action plans already exist, many municipalities lack the capacities to implement them.

Over the course of three years (2018 – 2020), the municipalities surrounding the Baltic Sea participating in the *Act Now!* project have acquired know-how and built the organisational structures necessary to develop and implement energy efficiency projects by their own. Following the principle of **help for self-help**, the *Act Now!* approach provides the knowledge and tools to identify and fill the gaps in the local energy efficiency capacities, as well as to build the organisational structures necessary. This **customised capacity building** ultimately helps municipalities to accumulate lasting know-how among those who are best acquainted with the local situation, instead of delegating the task to externals.

This guideline is part of a larger set of material making the *Act Now!* approach (Figure 1) available to those not directly involved in the *Act Now!* project. While the actual capacity building is explained in the Manual "From SEAP to Investment" this guideline provides assistance to identify the most effective energy efficiency measure that shall be implemented as a first project.

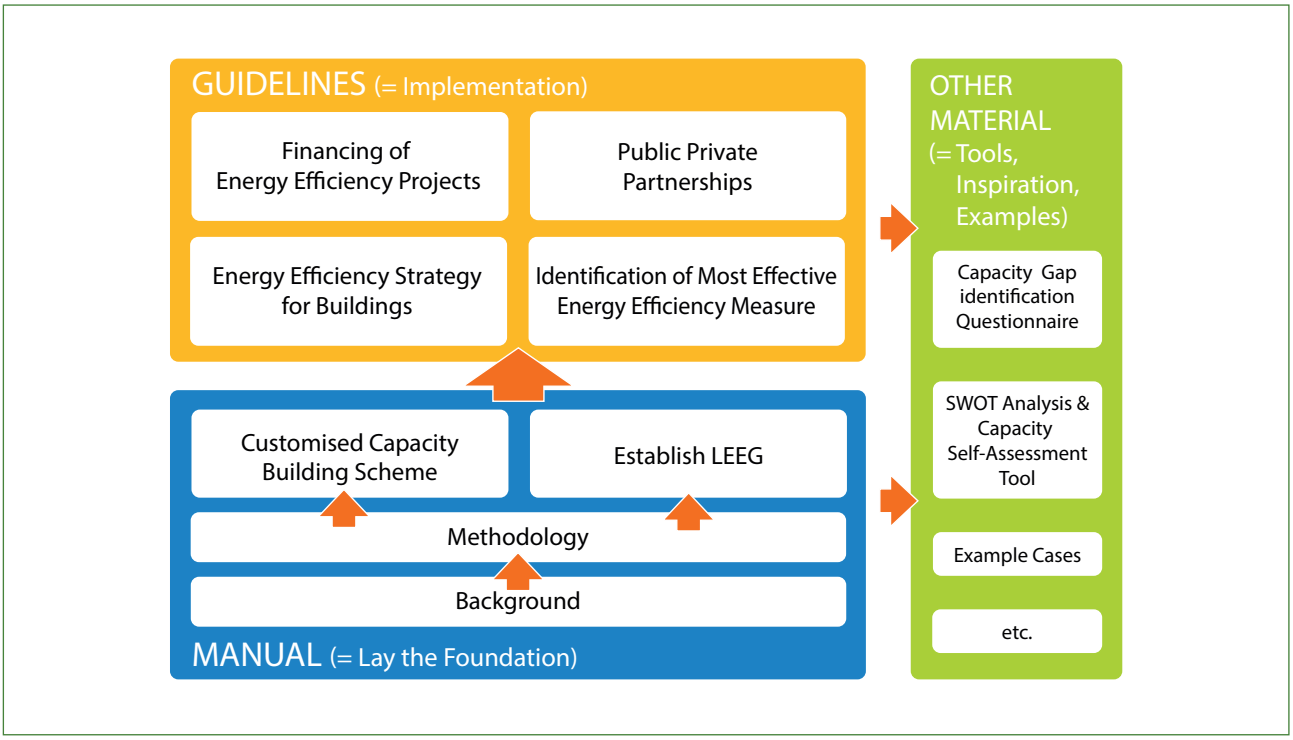

Figure 1: Relationship between this guideline, the Manual and other material from the ActNow! project.

[1] Further information on the project: https://actnow-baltic.eu/

1.2 | Who is this guideline for?

This guideline addresses anyone who seeks to kickstart energy efficiency in the building stock of his or her municipality. Most notably these are:

- members of **municipality staf**f who are directly involved in activities related to energy issues inside their administration (urban planners, staff of construction departments, collaborators from property management and financial departments, energy management and local development).
- **staff of cooperating institutions or private companies** dealing with energy efficiency (housing companies, utilities, energy service companies, engineering companies).

More specifically, this guideline is written with the following situation in mind:

- There is already a Sustainable Energy Action Plan (SEAP), Sustainable Energy and Climate Action Plan (SECAP), an energy strategy or equivalent document in place in your municipality.
- However, you struggle to decide, which of the described measures shall be implemented first. The action plan or strategy at your hands does not provide enough information.

1.3 | What does this guideline do?

Energy Efficiency in the municipal building stock is a vast field with many different opportunities for action. Energy consumption can be reduced at numerous points in public buildings, and at different scales. Room lighting could be exchanged with LED at a moderate technical, financial and administrative effort, while the comprehensive refurbishment of building blocks with energy monitoring and building automation requires far more resources. Depending on the municipality's size and energy-related activity, a large number of possible measures can already be on the table. Therefore, the question is not whether energy can be used more efficiently, but where, and where first.

However, choosing the right options for your municipality is anything but trivial. Although almost any technical energy efficiency measure might help to reduce the absolute amount of energy consumed, its effectivity in relation to factors like the resources invested, GHG emission reduction, and whatever is addressed in your municipality may differ largely between options.

The motivation to invest into energy efficiency differs from municipality to municipality, and from building to building. Climate protection and energy cost savings are only the most common reasons, but by no means the only ones. Citizen and employee health and public welfare are other, often declared motivations.

Regardless of the motivation and targets, public authorities are obliged to pursue their plans in the most (cost-) effective way possible. They are accountable for why public money was spent for a specific measure.

This guideline provides assistance to identify the most effective energy efficiency measure to be tackled in your municipality as a first step:

- It helps you to get better acquainted with the given action plan and know its targets, the measures and the blind spots.
- It helps you identify missing information for a judgement whether a measure can be implemented or not.
- It helps you to know the priorities and decision criteria necessary for a proper decision.

This ultimately will help you to make a reasonable, accountable and well-documented decision. In the perfect world this is all information that is already described in a SEAP or SECAP. Without a universal definition for these action plans and strategies, the quality is very different from case to case. Thus, this guideline assumes quite the contrary: your action plan describes different energy efficiency measures, but this information is incomplete and without prioritisation.

1.4 | What do you need before using this guideline?

This guideline is written assuming that you are applying the *Act Now!* approach (Chapter 1.1) in order to build energy efficiency capacities in your municipality. Before using this guideline, there is some previous work and resources required:

- There is already a SEAP/SECAP, an energy strategy or equivalent document in place in your municipality (see also the *Act Now!* Guideline "Energy Efficiency Strategy for Municipal Buildings").
- A customised capacity building scheme already in place (see the *Act Now!* Manual "From SEAP to Investment", Chapter 4)
- A Local Energy Efficiency Group (LEEG) already established (see the *Act Now!* Manual "From SEAP to Investment", Chapter 5)

2 | What are your options? – A critical review of the action plan

When seeking for energy efficiency measures to implement, you will most likely find your options described in your municipality's SEAP/SECAP or equivalent strategy document. In the best case, the action plan is well elaborated, describing each of the measures in detail, assessing their feasibility and priority, already including budget, timeline and responsibility. Furthermore, the implementation process may also be described and neatly fit into the municipal management structures.

There is, however, no universal definition of what a SEAP/SECAP must include[2], and it is (given this guideline's target group) rather unlikely that an action plan ticks all the boxes mentioned above and contains all information to instantly get you started with your energy efficiency measures. The experience in the *Act Now!* project suggests quite the opposite: Regardless of an existing action plan, many municipalities struggle to translate their plan into concrete action. The challenge is obviously not to find energy efficiency measures, but rather to decide which one is to be tackled first.

The *Act Now!* approach addresses the capacity lacks that hinder municipalities to take this very step. For this sake, this Guideline provides assistance with the decision, which of the measures described in your existing action plan shall be implemented first. As a first step, we suggest to have a critical review of the energy efficiency measures described in your existing action plan (SEAP/SECAP or equivalent).

Being the key strategy document for municipal action on the field of sustainable energy and climate protection and adaptation, it is the most obvious source to obtain potentially effective energy efficiency measures. Containing not only an action plan, but also municipal targets and goals, it should serve as the main source and backdrop when identifying energy efficiency measures to implement. Therefore, it is critical to examine the entire action plan for any useful information for the decision-making process.

At the same time, it is necessary to be aware of missing, outdated or even wrong information. Measures described in the action plan can be rather generic and unspecific, or may be built on outdated or not reliable data. Thus, we suggest starting the identification process of the most effective energy efficiency measure with a critical review of the existing action plan.

2.1 | Overall targets, goals and strategy

The critical review should start with overall features of the strategy or action plan, such as current status of the strategy and the goals and targets it sets. This helps you become better acquainted with the overall conditions of the entire strategy before looking closer at each measure or activity in the action plan. Knowing the targets and the significance of the strategy itself will provide you the information necessary to later evaluate how important a specific measure is and how likely a successful implementation is.

In the following tables you will find questions, which we suggest to discuss in your LEEG. These lists are by no means exhaustive, so feel free to add any other topic fitting to a category.

[2] The Covenant of Mayors provides helpful guidance for the preparation of an action plan: https://www.covenantofmayors.eu/support/faq.html#answer-3499 (retrieved 12 May 2020)

Table 1: Navigating through the world of finance and investment - structure of the guidelines.

Overall Targets and strategy	
What are the strategic and quantitative targets of sustainable energy and climate action in your municipality?	Any municipal action must be accountable regarding the purposes it serves. Therefore, it is critical to know, which targets an energy efficiency measure should contribute to, in order to proof its legitimation. These targets are also the backdrop to which all potential energy efficiency measures need to be evaluated during the decision-making process: How effective is each of the measures in regard of which target? → Scan the action plan / strategy document for qualitative and quantitative targets of the strategy. Pay attention, if the targets and goals are prioritized in some order.
Are the targets in the SEAP/ SECAP exhaustive? Or are there relevant targets on other fields of policy?	While the SEAP/SECAP is (or should be) the central strategy for energy-related policy in the municipality, energy efficiency measures may potentially contribute to purposes on other fields of local policy, such as citizen health, social welfare, local economy and others. Knowing these targets does not only help evaluating different energy efficiency measures, but can also be highly beneficial in order to gain political and public approval for the decision eventually made. → Determine, if the municipality has adopted any other policy, the implementation of energy efficiency might contribute to. What are the targets and goals, these policies pursue?
Is the strategy document approved by the municipality's top management (e.g. mayor or municipal council)?	The political legitimation of any target and measure in the strategy/ action plan depends crucially on whether it is approved by the top management in the municipality. Without approval, the strategy's legitimation base is significantly weaker and it might be difficult to receive appropriate commitment and resources across different administrative departments and other public sector stakeholders. → Check the status of approval of the strategy document in the municipal administration. Determine, which level of commitment and support you can expect with it.
Is the strategy document valid for at least the next three years? Is there a plan for revision and/or update?	In many cases, a SEAP/SEACAP or equivalent document intends an update and/or review in regular cycles. This ensures that both, strategy and action plan keep up with the latest developments in the municipality, technological advancements and other factors. An outdated or soon to be outdated strategy document does not only serve you with less political legitimation, but also may be built upon obsolete data and/or technical opportunities. Therefore, estimations about how effective a given energy efficiency measure will be should be taken with at least a pinch of salt. → Check the validity of the strategy document. As a result, some measures might be postponed to the period after review/update.
Does the strategy document consider the private sector in the municipality, or is it solely focusing on the public sector?	Although a municipality usually has only limited influence on private investments in energy efficiency, cooperating with the private sector (local businesses, companies and home owners) could be beneficial for all. In case the strategy document does not include such measures, it is highly recommended to discuss these options in the LEEG. → If necessary and/or desired, consider amending the action plan with measures addressing the private sector. (The *Act Now!* Guideline "Public Private Partnerships" provides useful suggestions for successfully cooperating).

2.2 | Benefits

Now, let us look at the individual measures described in the action plan. Ultimately, the judgement whether an energy efficiency measure should be implemented or not is the result of an assessment of cost and benefits (Table 2). While the cost (and risk) will be the focus of Chapter 0, the benefit side of any measure needs to be characterized with two attributes:

- Knowing the targets (Chapter 2.1) it will contribute to helps evaluating the measure's general significance in regard to the strategy.
- Not only naming but rating the expected impact of the measures on a comparable scale helps ranking different options on a transparent basis.

2.3 | Cost and risk

Assessing costs and risks of an activity puts the effort necessary in relation to the municipality's resources. Is the implementation of the measure feasible, or is it beyond the capabilities? It is critically important to estimate costs and risks as realistically as possible. Especially when significant investments are planned, the damage in case of failure could potentially put the entire strategy at stake (Table 3).

In order to bear the costs, an initial exploration of financing opportunities is also recommended.

Table 2: Critical review questions regarding the benefits.

Benefit	
Which targets are addressed by this activity?	When evaluating an activity, it is critical to know which of the targets set by the action plan and other policies it addresses. Depending on whether it addresses a more or less important target, the activity may be treated with more or less priority. → For each of the activities you want to consider implementing, name all of the targets identified above that are addressed by it.
What are the benefits this activity will bring, when successful? How large will the impact be?	Benefits may be of quantitative and qualitative nature. Quantitative benefits could be GHG reduction, energy cost savings or other numeric indicators. Provided a proper estimation methodology, they are easy to compare among competing activities and a well-accepted basis for argumentation. Technical activities will usually have to prove their effectivity on a quantitative basis. Qualitative benefits are non-numerical results, such as increased public awareness for energy efficiency, or a positive, "green" image of the municipality. While these might be just a side-effect of technical measures, others may focus exactly on them (e.g. public awareness campaigns, light-bulb exchange events). In order to be able to compare different measures, you should apply a qualitative rating scale and translate it to a numeric scale, if necessary (e.g. 0= no effect / 1=very low / 2= low / 3= intermediate / 4= high / 5= very high). → For each activity, specify the expected benefit of implementation using a quantitative and/or qualitative scale that makes comparison possible.

Table 3: Critical review questions regarding cost and risks..

Cost and risk	
How much is the cost of implementing this measure?	Is there a realistic cost estimation available for this activity? It should be based on recent market prices, since some technologies may develop fast in just a few years, causing significant price changes. Including extra cost as safety margin in order to be prepared for unexpected cost increases might seem rational, at the first glance. However, this will increase the measure's cost and decrease its profitability. Especially with many politicians looking at investment volumes, artificially inflating the cost will not be helpful. You will find detailed information about how to appraise your investment in the *Act Now!* Guideline "Financing of Energy Efficiency Projects". Nonetheless, the risk of increasing cost should be addressed during the risk-assessment (see below). → Determine, whether the measure is described with reasonably recent market prices. If this is not the case, try to get a realistic estimation.
Is there a realistic financing opportunity for this activity?	With most municipal budgets being notoriously tight, it is unlikely that energy efficiency measures of significant scale can be financed by the municipality alone. Therefore, it is necessary to consider financing instruments that limit the amount of money the municipality must spend from its budget. Depending on the type of activity and your region, there is a whole variety of funding programmes, low interest loans and contracting service providers available. → Identify a suitable financing option for each measure. The *Act Now!* Guideline "Financing of Energy Efficiency Projects" will help you doing so. Without a realistic financing option visible, the activity may be postponed, for the moment.
What are the risks when implementing this measure?	Any decision to carry out an energy efficiency measure comes at a risk of failure or not reaching the expected results. Hence, the decision needs to be based on an estimation of this risk: How likely is the failure, and what would be the damage? How can they be mitigated? The risks to consider can be of different nature[3]: ■ Project-related risks: cost and time overruns, poor contract management, contractual disputes, delays in tendering and selection procedures, poor communication between project parties… ■ Government-related risks: inadequate approved project budgets, delays in obtaining permissions, changes in Government regulations and laws, lack of project controls, administrative interference… ■ Technical risks: inadequate design or technical specifications, technical failures, poorer than expected performance, higher than expected operation costs… ■ Contractor-related risks: inadequate estimates, financial difficulties, delays, lack of experience, poor management, difficult in controlling nominated subcontractors, poor communication with other project parties, etc. ■ Market-related risks: pay cuts, increase in wages, shortages of technical personnel, materials inflation, shortage of materials or equipment, and variations in the price of the various energy carriers… → Identify and quantify (if possible) different risks associated with the measure. Consider ways to mitigate these risks (e.g. quality management procedures) and estimate the remaining risk. Eventually decide, whether to accept or reject taking the remaining risk.

[3] Cf. Bertoldi P. (ed.), Guidebook ‚How to develop a Sustainable Energy and Climate Action Plan (SECAP) – Part 1 - The SECAP process, step-by-step towards low carbon and climate resilient cities by 2030, EUR 29412 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-96847-1, doi:10.2760/223399, JRC112986. P.55.

2.4 | Priority, timing and scope of measures

While it is the objective of this guideline to assist you selecting and prioritising the many energy efficiency measures in your given action plan, the action plan itself will already include at least some information serving this purpose. Looking at priorities, timing and the relationship between different measures, the following questions will help you making an early selection of measures to proceed with (Table 4).

Table 4: Critical review questions regarding priority, timing and scope of measures.

Timing and scope of activity	
Is this measure earmarked as a key action?	Some action plans already have some level of prioritisation of the activities in place. A number of measures may be earmarked as key action, because they are highly important for the success of the entire strategy. Although they do not necessarily need to be implemented right away, they should at least be included in your further considerations, as a first step. → Identify high-priority measures that are critical for the success of the energy efficiency strategy in your municipality.
Is the time of implementation already planned for this activity? Is it planned to be completed in the long- or the short-term?	In most cases, a rather short-term activity is more likely to be suitable as a first step, due to its limited project duration. Is the implementation of this activity tied to a particular window of opportunity (e.g. a dedicated funding programme, synergy with other activities, availability of resources etc.)? A currently open window could be a reason to prioritise this activity. → Determine, whether the activity will be carried out in the long- or short-term. Also consider windows of opportunity.
Does the measure address an individual building/facility?	Some of the measures in the SEAP/SECAP may be of rather generic nature, describing an abstract class of action (e.g. “lowering heat consumption in the building stock”) which requires further decisions in order to derive more specific activities on individual buildings or facilities (e.g. “Insulate heating pipes in town hall”). → In case a measure is only described in a rather generic way, break it down to specific activities on individual buildings or facilities.
Will this activity be implemented only in specific scenarios?	Often, the action plan describes two or more scenarios for the future development of the municipality. Most likely, they differentiate between GHG reduction paths (e.g. aiming at 40 % / 60 % / 80 % below baseline), resulting in a different set of activities each. An activity tied to a preferred scenario may have higher priority, correspondingly. Also, an individual activity might be compulsory, regardless of the scenario selected. On the other hand, measures belonging to different scenarios might be mutually exclusive. → Determine, whether there is a priority ranking between scenarios. Can you identify scenario-independent high-priority measures?
Does this activity profit from synergies with other activities and vice versa?	When judging the priority of an energy efficiency measure, its relation to other potential activities should be kept in mind. For example, different technical facilities may be installed at once, in order to save cost. Building insulation measures may be more effective when implemented jointly. Contracting might be applied to multiple buildings in the municipality. Also, financing opportunities often prefer more comprehensive approaches. Therefore, it is helpful to consider implementing multiple connected activities at the same time, or postpone an activity until the synergy can be tapped. → Identify potential synergies to other activities. Consider to pre- or postpone activities in order to tap the synergies.

2.5 | Parties involved

Finally, the aspect of the parties involved in each of the measures needs attention. Clear responsibilities and commitment are critical for any smooth project implementation. In return this means, that without having appropriate personnel and partners on board, the activity is seriously at stake (Table 5).

Table 5: Critical review questions regarding the parties involved.

Parties involved	
What are the municipal bodies responsible for the implementation of this activity?	In order to assure smooth implementation and avoid cost and time overruns, a clear distribution of responsibilities is critical. Is already specified, which department(s) and/or organisation(s) in the municipal administration are responsible? Who is in the lead, and what are the roles of each of the involved parties? Does each of the bodies have enough resources to implement this activity? Have they already announced their commitment? → Identify the departments responsible for the implementation of this measure. Do the responsible bodies have the necessary resources?
Will external stakeholders be involved in the implementation?	The *Act Now!* approach encourages you to tackle energy efficiency not only within your municipal administration, but in a broader network of local stakeholders, whenever possible. The diversity of perspectives helps building a more robust and effective concept, revealing blind spots and synergies. Most obviously, stakeholders from the public sector should be considered: e.g. schools and kindergartens, housing companies, libraries, swimming pools, public transport operators and many others. However, the private sector shall not be ruled out. Although the municipal administration may not have direct grip onto their activities, the energy efficiency potential to unlock in the private sector is even larger. For example, private home owners and housing companies represent a large volume of heat consumed, while local industry could provide waste heat. → Consider including stakeholders outside the municipal administration in the activity. In order to successfully cooperate with the private sector, consult the dedicated *Act Now!* Guideline “Public Private Partnerships”.

3 | Exploring the decision parameters

In the public sector, taking decisions is tied to high standards of transparency and accountability. The usage of public money on behalf of the voters and taxpayers must be well-reasoned and well-documented. Also, with many different options for energy efficiency measures, a decision by "just looking closely" is almost impossible.

This chapter introduces parameters that will serve to make your decision transparent, accountable and well-structured. It provides an overview on different decision criteria that can be applied to evaluate each energy efficiency measure individually. Selecting from this overview (and probably adding to it), you will eventually create an evaluation scheme in Chapter 4.

3.1 | Ranking the Goals and Targets

Any decision-making process depends on the targets it is working towards. These may differ from case to case due to the local circumstances. The strategy document, action plan and other policies in your municipality will most likely describe a number of goals and targets (compare Chapter 2.1).

However, these goals and targets are not always equally important. Achieving one goal may have priority to others, some targets may be rather of optional nature ("nice to have"), and some others may be absolutely critical to achieve. In the best case, this kind of priorities are already described in the given action plan or strategy. If not, it becomes a matter of interpretation and therefore subject to the discussion in the LEEG. There, the group should carefully study the relevant documents, read between the lines, and collectively agree on a rating scheme that will ultimately help you picking your energy efficiency measure to implement.

In order to do so, the rating scheme for the targets and goals should not be too complex, but rather simple and straight forward, leaving very little grey zones or ambiguities behind. The *Act Now! project has worked with the following rating scheme (Table 6):*

3.2 | Decision criteria

Decision-making and the evaluation, how effective a particular energy-efficiency measure is, requires a set of criteria. As with the targets, these will be different from case to case, depending on the local circumstances. In order to make a robust, accountable and transparent decision, the LEEG first needs to develop this municipality-specific set of criteria. It is particularly important to do this in a collective effort, because the coordination of different interests in the municipality needs to be factored in.

Following is a list of possible criteria (Table 7). It is neither exhaustive, nor is it necessary to use all of them. In terms of practicability, you may pick as few criteria as possible and as many as necessary.

Table 6: Rating scheme for targets.

Rating	Description
Primary targets	Achieving these targets is **critical** for the success of the entire strategy. Measures and activities that address these targets have priority over others. Since this guideline works towards selecting a first-step measure, it should at least address one of them.
Secondary targets	Some targets may be mentioned in the strategy or action plan, but only be **desirable** and not critical for the success. Whether a measure addresses a secondary target or not could help resolving par situations. Often, these secondary targets are related to cross-cutting benefits that are side-effects of energy efficiency measures (see page 17).
Non-targets (optional)	In order to avoid misunderstandings during the discussion process in the LEEG, it can be helpful to actively rule out a specific target. This could e.g. be the case when group members or the public expects something that is not intended in the strategy. This can help you staying focussed on the subject and save you some frustration.

Table 7: List of decision criteria.

Category of criteria	Description
Priority	This may sound tautologic, but the priority attributed to a measure is an important criterion to evaluate its, well, priority. As described in Chapter 2.4, an action plan may include information, how important or urgent a measure is. The priority needs to be determined (if not already done) keeping different factors in mind: ■ relevance for other measures (e.g. synergies ad dependencies) ■ windows of opportunity (e.g. availability of funding, current political approval) ■ etc.
Ecologic impact	With SEAPs and SECAPs being primarily instruments of the local environmental policy, the ecologic impact of the measures is the most obvious category of criteria to look for. Examples are: ■ Greenhouse gas (GHG) emission reduction during a given period ■ air quality improvement ■ noise emission reduction ■ healthy housing conditions The **GHG emission reduction** is by far the most important factor in this category, and therefore requires special attention[4]: ■ Keep in mind that the **quality of estimation** can differ from case to case, depending on how each measure effects the GHG emission. Especially the effects of indirect, non-technical measures aiming at long-term change of behaviour (e.g. awareness campaigns), are difficult to quantify. ■ In order to determine each measure's impact on the overall strategy, you may quantify the GHG reduction effect in **percent of the overall reduction** target rather than using absolute figures. ■ It is also important to note, that the GHG emission reduction of multiple measures **will not simply add up**. Overlapping areas of effect may lead to a smaller total effect than summing up the individual effects. On the other hand, synergies between measures may cause a larger total GHG reduction than counted individually.
Economy	For municipalities the economic dimension of its activities is important for multiple reasons. First and foremost, responsible and efficient usage of money is a key principle of any activity in the public sector. However, the experience in the *Act Now!* project suggests that saving public expenses for energy supply is a very strong argument to engage in energy efficiency activities. Some examples of economic criteria are: ■ GHG avoidance costs ■ initial costs ■ profitability of investment ■ annual energy cost savings ■ availability of financing opportunities ■ impact on local economy (e.g. employment effects and value added) Here, **GHG avoidance costs** are the most significant indicator. It puts the ecologic effect in relation to the financial effort, making different measures comparable. The smaller the cost for avoiding one tonne of GHG emissions is, the more effective is the measure. Note that there are different methodologies to calculate GHG avoidance costs: The budget-based approach only includes costs and incomes effective for the municipal budget, while other methodologies may factor in economic effects within the entire municipality and even external costs such as environmental damage.

Economy

The economic **profitability** of the measure can be expressed with different metrics: The amortisation period represents the payoff time of investment, while return on investment (ROI) and internal rate of return (IRR) quantify the profit itself. For further information about the financial dimension of energy efficiency measures, consult the *Act Now!* Guideline "Financing of Energy Efficiency Projects".

Generally speaking, small volume technical investments (e.g. LED lighting) tend to be more profitable, but have a rather limited total volume of energy saved. Large-scale undertakings (e.g. insulation of building envelope) on the other hand, have smaller return rates at higher saving volumes.

Box 1: Example for maximising energy savings and stay profitable

The ***Total Concept*** method provides a toolkit to design a package of energy saving measures in non-residential buildings. It helps combine measures of different profitability in order to maximise the saving effects while still maintaining the total profitability of the package. (Further information and the toolkit are available at http://totalconcept.se/)

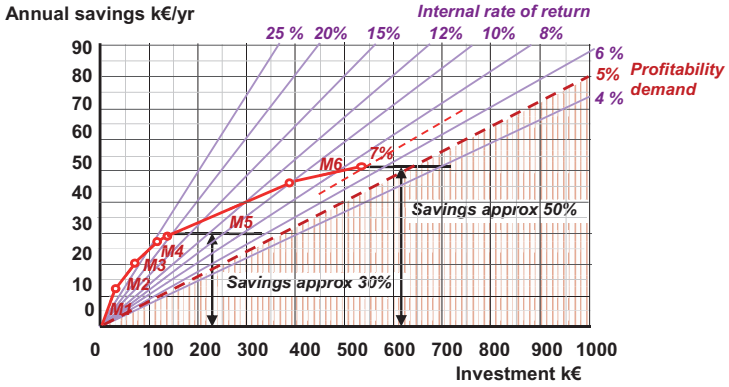

Figure 2: The Total Concept method combines measures of different profitability (M1-M6), maximising energy cost savings within the margins of profitability. Source: totalconcept.se

Technical criteria

Although the availability of technical instruments and tools are mostly not the bottleneck for the implementation of energy efficiency measures, technical criteria can be compared when deciding between different products and solutions to the same task.

Examples of technical criteria are:

- reliability
- applicability to building stock
- innovation level

Cross-cutting benefits

Energy efficiency measures may largely be focussed on environmental and economic benefits, but they often have positive side-effects on different fields of society. Examples of such cross-cutting benefits are:

- positive "green and innovative" image of municipality
- improved comfort and quality of life
- improved townscape
- improved environmental awareness in population
- social security

Usually, these cross-cutting benefits will not be primary decision criteria. They can however be strong and convincing arguments to publicly justify a particular measure or even the entire strategy. While environmental benefits or benefits for the public budget can be rather abstract for the general public at times, side-effects that are more tangible in everyday life can help bolstering the **public approval** for energy efficiency and the local policy in general.

Depth of impact

A rather abstract and qualitative criterion when assessing the effectivity of a measure is its depth of impact[4]:

Measures with deep impact typically aim at changes at the structural level of the municipality and long-term behaviour change (e.g. awareness campaigns, introduction of energy planning capacities). Capacity building with the *Act Now!* approach would also qualify as a deep impact measure.

Individual technical measures that do not trigger change of behaviour (e.g. boiler replacement) have a rather shallow impact, although they may contribute a large volume of GHG emission reduction.

It is important to note that a deep impact is not necessarily better or more effective than a shallow impact. Deep and shallow impact measures should rather complement each other. Especially at an early stage of implementation, harvesting "low-hanging fruits" with a rather shallow impact might even be desirable.

Scope of municipal action

If the intended measures are not limited to the municipal building stock, but also include the private sector, the limits of municipal action could be factored into the evaluation. While the municipality generally has good grip on the public sector, its courses of action are rather limited, when it comes to the private sector, while the level of influence also depends on the type of measure.

Therefore, some measures may be more effective than others (compare example in Box 2).

Box 2: Example for rating the scope of municipal action

Table 78 is a (rather elaborated) example for a rating matrix that helps identifying the level of influence, the municipality has on different targets with different types of measure. Depending on the legal framework in your country (this particular example is for Germany), municipalities have direct access to the public sector, while the private sector can only be addressed indirectly via information and support activities.

	Regulation	Financial aid	Supportive activities (e.g. networking)	Information and campaigning	Technical measures
Local administration	4	5	5	5	5
Municipal facilities	4	5	5	5	5
Households	2	3	4	4	1
Business	2	3	4	4	1
Industry	3	3	3	3	1
Construction & refurbishment	3	3	4	5	1
Energy supply	4	4	5	5	4

Legend: 1 (no significant influence) 2 3 4 5 (good influence)

Table 8: This matrix represents the municipality's level of influence on different target groups depending on the type of measure. The ratings in this particular matrix are made for Germany. It may vary in your country.

Source: Difu et al. (ed.) Klimaschutz in Kommunen. Praxisleitfaden. Berlin: 2018. https://repository.difu.de/jspui/handle/difu/248422.

[4] Cf. Difu et al. (ed.) Klimaschutz in Kommunen. Praxisleitfaden. Berlin: 2018. https://repository.difu.de/jspui/handle/difu/248422. Pp. 278-279

4 | Making the decision

With all potential energy efficiency measures reviewed, and some questions cleared, you may already have postponed or eliminated some measures, while others rose higher on your priority list. As stated above, the critical review can be seen as the first of multiple iterations of the identification process. Now, with the decision criteria on the table, it is time to put your judgements and evaluations on paper, making it accountable, and ready for decision, documentation and communication. In order to do so, you need to develop an evaluation scheme that you apply equally on all energy efficiency measures that are still in the game.

4.1 | Pick your criteria

First, you need a transparent set of decision criteria. Among the criteria described in Chapter 3.2 (and others you may have developed in your LEEG), you now need to pick a selection. However, during the critical review and looking at the multitude of possible decision criteria, it becomes evident, how many factors may influence the effectivity, feasibility, risk and other aspects of an energy efficiency measure. This may even make you feel lost in details, unable to cope with the sheer complexity of matters.

In order to narrow down the criteria to consider, we suggest the following:

- **Do not select too many criteria.**
  It is not necessary to factor in every criterion possible into your decision. Quite the contrary, a good evaluation scheme must successfully reduce the overall complexity. While many aspects shall be kept in mind at the time of implementation, not every detail is decisive for the selection process. As a rule of thumb, five to seven criteria are sufficient to create a workable evaluation scheme.
- **Select criteria that are independent to each other.**
  Since the number of criteria is limited, it is necessary to make efficient use of them. Criteria shall not address factors that are mutually dependent. For instance, you may rather not select multiple criteria from the same category in Chapter 3.2. One ecologic and economic criterion each are enough. However, you may also opt for GHG reduction cost. This is a criterion connecting ecologic and economic aspects, which could make it the only criterion necessary for both categories.
- **All criteria must be consistent with the targets.**
  It may be obvious, but it is still important noting that all criteria must be consistent with the targets the municipality is pursuing. It does not help to evaluate aspects that do not contribute to the overall strategy. In Chapter 3.1, we have prioritised the targets into primary and secondary targets. Generally, the selected criteria should address primary targets.

4.2 | Weight the criteria

The criteria selected may not always be of the same importance. Some may have more weight than others, depending on the goals and targets of the overall strategy. In this case, this should also be represented in your evaluation scheme, weighting the criteria differently.

You may choose between (or combine) absolute and relative weighting:

- **Absolute weighting** prioritises one criterion above all others, regardless of how they score. For example, you may decide that “economy always wins”. In this case, the measure with the highest economic performance will always have priority, although it may be not as effective in ecologic terms.
- **Relative weighting** assigns different weighting factors to each of the criteria in the evaluation scheme. For example, important criteria may count double or triple, while less important ones only count single or even less. This allows less important criteria to still outperform important ones due to high scores. Keep in mind that all criteria should follow the same rating scale (five steps in the example in Table 9).

4.3 | Rating scales

Lastly, you need to decide, in how many increments the criteria picked (and weighted) can be evaluated. Also here, keeping it simple helps reducing complexity and prevents you from getting lost in the details. As a general rule of thumb, a **five-step rating scale** should give you a well-workable base with most criteria (see example in Table 9).

The rating scale can be applied not only to qualitative criteria, but also to **quantitative criteria**. Determine the numeric range that different values of the criterion can reach (e.g. investments can be between a few thousand and a few hundred thousand Euro), partition it into appropriate steps and assign a qualitative characterisation to each step (e.g. very low / low / intermediate / high / very high). You may argue that this translation is a loss of information, since precise numeric values are subsumed in rough categories. But at this stage, you will only have rough estimations (of cost, GHG reduction etc.) anyway. Thus, looking at exact numbers may distract you from priorities.

The **increments between each of the rating steps** should be defined in relation to criteria relevant to the decision-making body. For example, the criterion “pay-

Table 9: Example of an evaluation matrix with five weighted criteria and a five-step rating scale. In this example, the first four criteria are weighted relatively and contribute to the overall score that represents the effectivity of the measure.

Criterion	Minimum score (1 point)	→ (2 points)	→ (3 points)	→ (4 points)	Maximum score (5 points)	Weighting factor
1) Priority	**Long-term** Implement until 2050	**Mid-term** Implement in 5-10 years	**Mid-term** Implement in 2-5 years	**Short-term** Start in 1 year	**Urgent** Start as soon as possible	x3
2) GHG saving potential (in % of overall reduction target)	**Very low** > 0.01 %	**Low** > 0.1 %	**Medium** > 0.2 %	**High** > 0.4 %	**Very high** > 0.6 %	x2
3) Payoff time	**Very long** >15 years	**Long** 10-15 years	**Medium** 6-9 years	**Short** 2-5 years	**Very short** > 2 years	x2
4) Cross-cutting benefits	**Very low**	**Low**	**Medium**	**High**	**Very high**	x1
5) Investment volume*	**Very low** < € 5,000	**Low** € 5,000 -15,000	**Medium** € 15,000 -50,000	**High** € 50,000-100,000	**Very high** > 100,000 €	-

(Range of overall effectivity score: 8-40 points)

off time" in Table 9 has increments selected with typical municipal election periods in mind: Investments with "short" and "very short" payoff times can amortise within a single election cycle, while "medium" reflects roughly two cycles. For mayors and other local politicians, being able to harvest the fruits of their action while still in office can help securing their re-election. Therefore, amortisation within the "short" or "very short" category might be a decisive factor during the decision-making process.

4.4 | Finding a good mix of measures

The system of decision criteria suggested here provides a relatively simple instrument to compare energy efficiency measures of very different nature. It condenses complex issues into a single metric, reducing the overall complexity of the decision to a manageable level.

It is, however, important to keep in mind what is being obscured by the process: It will not provide a good, healthy mix of measures. Using the effectivity score calculated with this system as the only basis of decision may result in comparing apples with oranges. The example matrix in Table 99 will likely result in a bias towards urgent activities with short payoff times, because they will score higher. Meanwhile, long-term activities addressing behaviour change will score far weaker, although they are essential for a successful strategy and must complement the short-term activities. Thus, it is strongly recommended to define categories of energy efficiency measures that are comparable with each other, beforehand. The evaluation scheme will then help you to determine the most effective ones from each category.

Relying only on the effectivity score also obscures other attributes, that are desirable to be well mixed in your strategy. E.g. social benefits may complement energy cost savings, and measures with low investment volume may be accompanied with activities ensuring some volume of GHG reduction. In order to maintain a healthy balance, visualising the criteria with a spider web diagram may help (Figure 3):

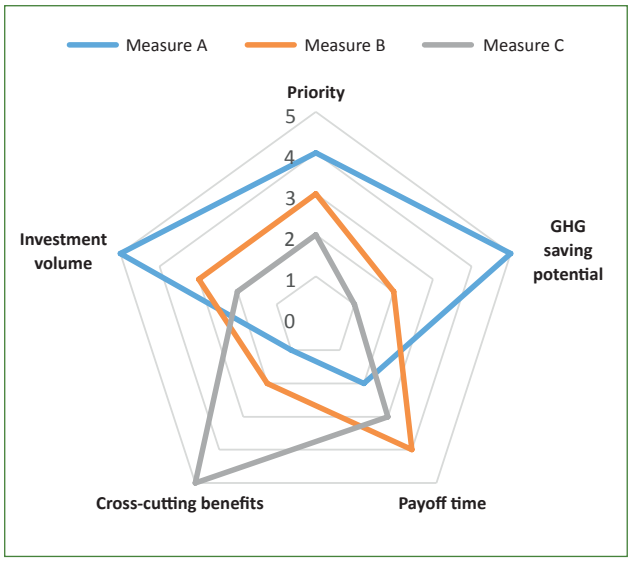

Figure 3: Example of a spider web diagram comparing three different energy efficiency measures using five decision criteria (unweighted). It visualizes the balance in the mix of measures.

5 | Decide and document – a few remarks

Finally, you have gathered all the information necessary for a decision:

- all potential energy efficiency measures including their details
- all targets the measures should address
- a system of decision criteria reflecting the targets.

This information will help you greatly to make a robust and accountable decision that reflects the strategy, the municipal capabilities, and the needs of all stakeholders involved.

As much as this information will help you, as important is the process to gather, discuss and complete them in order to eventually come to a decision. However, there is no blueprint how this process should actually look. The experience in the *Act Now!* project tells us that the question when to discuss/decide what, when and with whom greatly depends on the management structure of the municipality and the work mode of the LEEG. Also, the authority to make a decision is in different hands, depending on each individual case. Thus, there is very little that can be generalised to anyone using this guideline, except a few remarks regarding the general working principle:

- **Your criteria, your decision**
  The system of decision criteria suggested in this guideline provides you a metric to compare the effectivity of different energy efficiency measures. However, the effectivity is by no means an objective fact claiming universal validity. The result of the process strongly depends on how you shape the evaluation scheme: especially the criteria you select, their weighting and the choice of rating scale. Thus, it is critical to thoroughly discuss each of these aspects from multiple perspectives in your LEEG. By doing so, the evaluation scheme shall reflect the targets, the municipality and all other involved parties are pursuing. Using this approach will not exempt you from taking responsibility for the decision, but will help you to make a robust and accountable decision including as many perspectives as possible, which you will be able to defend against criticism.

- **Use your LEEG!**
  The *Act Now!* approach centres around the discussion work in the LEEG. Depending on its participants, a LEEG gathers people with various tasks and backgrounds, who would otherwise not or only rarely work together. A LEEG could be composed of civil servants of different departments (e.g. building, environment, finance, health) and members of different sectors of society (e.g. administration, public enterprises, local business, citizens). It seeks to harvest the strength of such a heterogeneous group: different perspectives upon energy efficiency.
  It is this diversity of perspectives that should also be mobilised in your decision-making process. A SEAP/SECAP or strategy document might be composed by a rather small group of experts, sometimes with very few feedbacks from local stakeholders or the citizens. Thus, the decision-making process is a valuable opportunity to include these voices, making the entire strategy more robust, more widely accepted and more effective. For further details about LEEGs, see Chapter 5 in the *Act Now!* Manual “From SEAP to Investment”.

- **Select your audience**
  It is however not necessary to include a broad audience throughout the entire decision-making process. Quite the contrary, the multitude of voices will likely become a cacophony which is unable to structure and meet a consensus. It can also prolong the process drastically. Good practice in the *Act Now!* project suggests that the circle of people involved in the process should be thoughtfully adjusted, depending on the topic to be discussed.
- **Document the process.**
  Once the decision-making process is under way, thorough documentation is key to maintain accountability. Lack of transparency might undermine trust of the involved parties and makes decisions contestable.
- **Seek official approval.**
  Just like any SEAP/SECAP or strategy document should be approved by the municipality's top management, also the decision made using this guideline should be approved by those formally responsible.

Box 3: Example for choosing the audience

In order to efficiently address different audiences while pursuing its energy efficiency strategy, the **Estonian municipality of Elva** runs its Local Energy Efficiency Workgroup (LEEG) in two levels (Figure 4):

- The LEEG core only consists of senior members of city administration as well as staff directly involved in project management. It develops ideas and conducts the municipality's activities.
- The actual LEEG is open to all local stakeholders ready to become involved. At time of the *Act Now!* project, there were about 15 members. With its multitude of perspectives, it provides feedback and expert input to the LEEG core. It also serves as interface to the general public, disseminating the work results and collecting public feedback.

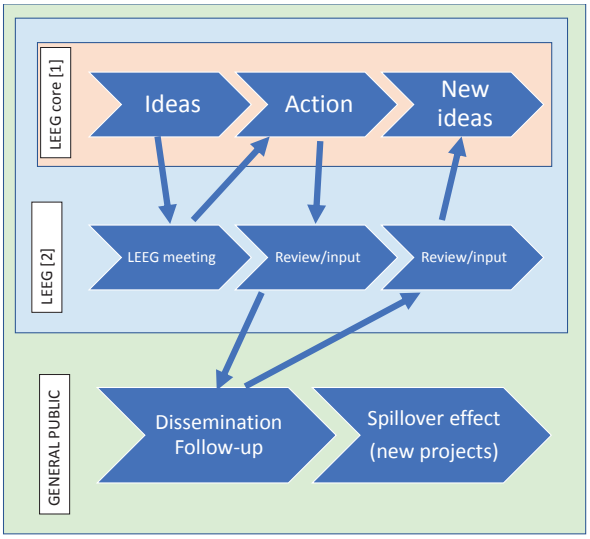

Figure 4: Two-level structure of the LEEG in Elva, Estonia (also see Manual Chapter 5.7).

6 | Next steps

With the identification of the most effective energy efficiency measure complete, it is time to clarify the financing opportunities for the measures selected. See the dedicated *Act Now! Guideline "Financing of Energy Efficiency Projects" for further information.*

References

Bertoldi P. (ed.), Guidebook 'How to develop a Sustainable Energy and Climate Action Plan (SECAP) – Part 1- The SECAP process, step-by-step towards low carbon and climate resilient cities by 2030, EUR 29412 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-96847-1, doi:10.2760/223399, JRC112986

Difu et al. (ed.), Klimaschutz in Kommunen. Praxisleitfaden. Berlin: 2018.
https://repository.difu.de/jspui/handle/difu/248422

CIT Energy Management AB, Total Concept [online]
http://totalconcept.se (retrieved 15 June 2020)

Further *Act Now!* Material:
'*Act Now!* Manual From SEAP to Investment'
'*Act Now!* Guideline Energy Efficiency Strategy for Municipal Buildings'
'*Act Now!* Guideline Identification of Most Effective Energy Efficiency Measures'
'*Act Now!* Guideline Public Private Partnership'

***Act Now!* project website:**
https://actnow-baltic.eu/

***Act Now!* online learning platform:**
The four guidelines helping you to set up and implement your energy efficiency strategy:
actnow-baltic.eu/learning
Further tools and helpful information (Questionnaire, SWOT analysis, Capacity Self-Assessment Tool etc.):
actnow-baltic.eu/learning/tools
Examples from the municipalities which improved their energy efficiency capacities in the *Act Now!* project (Municipality Reports, actual Capacity Building Schemes and Case Studies, Feasibil-ity Studies etc.):
actnow-baltic.eu/learning/municipalities


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