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IEA EBC annex 63–implementation of energy strategies in communities

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ABSTRACT

Technological improvements of HVAC-systems, buildings and other energy consuming products can support a reduction of CO_2 emissions. The implementation of energy efficient technology is important to reach the climatic goals of the Paris agreement. As cities are the main contributors of greenhouse gas emissions, they offer great potential for implementation of energy efficiency measures and emission reduction. Thus, the question arises on how to support the implementation process. The main challenge is not only the implementation and usage of technologies, but also the optimisation of existing local instruments, processes and frameworks to efficiently support the implementation of energy strategies in communities. This paper summarises results of the Annex 63 – Implementation of Energy Strategies in Communities – within the Energy in Buildings and Communities Program (EBC) of the International Energy Agency (IEA). It includes procedures and best-practice examples to implement optimized energy strategies in communities. The implementation strategies deals with visions and targets, renewable energy strategies, legal frameworks, design of urban competition processes, tools supporting the decision making process, monitoring, stakeholder engagement, socio-economic criteria and organisation structures. For all of these strategic measures, specific guidelines were elaborated together with a worldwide network consisting of representatives from cities, urban and energy planners, consultants, universities and many other stakeholder groups.

1. Introduction

Cities are growing fast: By 2030, more than 60 % of all people worldwide will live in urban areas. To reach climatic goals, sustainable urban development is of great importance [28]. Moreover, cities are responsible for more than 70 % of the global CO_2 emissions and consume more than two-thirds of the global energy [8]. Therefore, cities can play a key role in energy efficiency implementation to reach the Paris Agreement climatic goals, which aim at a large reduction of greenhouse gas emissions by 2050 [29]. To achieve a major reduction of emissions within cities, urban and energy planning are important. However, in most municipalities urban and energy planning work separated. Thus, ways to combine urban and energy planning have to be found. Within the International Energy Agency (IEA) – Energy in Buildings and Communities Program (EBC), 19 organisations from 11 countries worldwide are involved in Annex 63 – Implementation of Energy Strategies in Communities – to give recommendations on procedures for implementation of optimized energy strategies relative to urban development at the scale of communities [12]. This paper presents a summary of the elaborated strategic measures (Reports Volume 1 and 2; [9,11]). These description of strategic measures are completed by a municipality self-assessment-tool, description of necessary capacities and skills for implementation champions, description of suitable workshop formats and procedures for the stakeholder involvement, information slides for presentations, education materials for teaching this new discipline (Volume 4) and examples for the application of this strategic measures (Volume 3 and 5). All this materials should support cities to start the necessary transition management process and to manage all relevant issues like variety of stakeholders, variety of topics and many other issues like for example different targets, long project durations and market dynamics.

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2. Background

Different energy sources, conversion technologies and the demand patterns influence the CO_2 emissions of communities. Buildings and transportation within the communities are currently main consumers of energy and, therefore, major emitters of CO_2 emissions. In many cases, standardised planning processes do not sufficiently support energy efficiency implementation. However, smart ways of integrating these efficiency measures into planning processes can support CO_2 emission minimization. A previous IEA-EBC project, Annex 51 (Energy Efficient Communities), found that in many countries energy issues are missing in urban planning processes and energy planning is often performed without accounting for urban planning issues [14]. We state, that successful urban energy planning is only possible if energy planning is integrated in the entire urban planning process. Integrated planning has to deal with the increased complexity that comes from addressing multiple issues, diverse stakeholder-groups, conflicting interests and lack of instruments to support implementation. Therefore, innovation is not only required in technologies but also in the implementation processes. While urban planning is a major task in each city, its contribution in energy transition is not fully clear due to lack of knowledge and instruments [9]. Better integration of energy and urban planning requires the development of a "common language" and new tools, as well as better usage of existing instruments. The Annex 63 project offers essential insights on planning processes and stakeholder involvement that are necessary to set a framework for integrated energy and urban planning. In this context, "community" is understood as a functioning part of a city; it can be a municipality or a smaller sub-area such as a neighbourhood or district. Based on this research, this article offers recommendations on procedures for implementation of optimized energy strategies on the scale of cities, districts and local projects and their urban development. The application of the strategic measures depends mainly on the local framework conditions. Urban decision makers and urban and energy planners, as well as researchers working at the intersection of urban and energy issues are the target group.

3. Content

In the first step, a structured local and worldwide network was build up to integrate different expertise of different stakeholders into the project. The network consists of 29 cities (Salzburg, Vienna, Burlington, Guelph, London (Ontario), Toronto, Egedal, Middelfart, Roskilde, Skive, Lille, Strasbourg, Aachen, Ludwigsburg, Karlsruhe, Kitakyushu, Yokohama, Maastricht, Oslo, Bergen, Basel, Minneapolis, Graz, Ottawa, Pickering, Bottrop, Amsterdam, Parkstad and Zürich), local stakeholder groups (e.g. local utilities), 19 organisations from 11 countries (Austria, Canada, Denmark, France, Germany, Ireland, Japan, the Netherlands, Norway, Switzerland, the United States of America), 31 network partners (e.g. city associations) and eight IEA programs/projects (EBC, ECES, HPC, SHC, DSM program management; Annex 56, Annex 64, Task 51). In the second step, relevant information of existing national legal frameworks, planning procedures, processes and measures in the fields of urban and energy planning has been gathered from different countries and cities via questionnaires. A measure is understood as an action or program that enables, engages or enforces the implementation process. 86 national and international meetings with 573 participants were carried out to analyse the collected information. The analyses led to a deeper understanding on the variety of framework conditions, planning procedures and the role of instruments. Based on this knowledge, generalized strategic measures were developed in nine specialised working groups consisting from project partners and external experts. Success factors and relevant aspects were identified and grouped for each strategic measure [9]. After that, 57 national and international expert workshops with an overall number of 1821 participants were performed. The feedback of municipalities and experts was integrated into the ongoing Annex work. Parallel to this development process, 27 case studies in the field of urban and energy planning from all over the world were analysed via questionnaires. The case study analysis led to the identification of important factors for successful implementation of energy efficiency measures. After that, the case studies were contextualized. Finally, all elaborated results were integrated into reports and presentations for different target groups. To prepare suitable stakeholder support materials, an analysis was carried out to identify the most important requirements of cities. The diagram of method is visualised in Fig. 1.

4. Results

One major outcome of Annex 63 is the description of legal frameworks, planning procedures, processes and measures in the fields of urban and energy planning from several countries (Austria, Canada, Denmark, France, Germany, Ireland, Japan, Netherlands, Norway, Switzerland and the United States of America). The analysis of these elements showed the status quo of energy planning and land-use planning in different planning cultures and legal frameworks. In general, the legal frameworks differ from country to country. Therefore, not all recommendations are suitable for all countries. However, the 22 analysed urban and energy planning processes were clustered to the following general planning phases: Target setting, analysis of situation, potential analysis, project planning, realisation and monitoring. The analysis of all 89 collected measures from all over the world showed that in each country similar measures exist. The analysed measures were grouped in nine strategic measures: Visions and targets, renewable energy strategies, legal frameworks, design of urban competition processes, tools supporting the decision making process, monitoring, stakeholder engagement, socio-economic criteria and organisation structures. For the implementation of optimised energy strategies in communities, these strategic measures are seen as core elements for the optimisation of local instruments, processes and framework conditions. The barriers and the recommendations for overcoming these barriers will be described in the following sections for each strategic measure (source: [9,15]). The description of the project specific communication concept, the contextualisation of the case studies and the description of the elaborated stakeholder support materials are not part of this paper. However, the first Annex 63 deliverables are planned to be published in October 2017.

4.1. Set vision and targets

Local authorities are moving more and more from a strictly regulatory role to a service provision role [6]. To make this change possible, a local transition process is necessary [22]. Visions and targets are central elements of a successful transition management process [11]. Thereby, visions help to create a common understanding between different stakeholder groups. To come to concrete measures and actions, the definition of targets is necessary. Therefore, both, vision and targets are of great importance to start the transition process and to go in the same direction. Without a vision, a list of confusing and incompatible projects within communities could arise [20] and without targets, the vision might be hard to realize. Thus, the definition of visions and targets and the inclusion of all relevant stakeholders into the development process are of great importance. Role models and different methods (SMART targets) support this process. In many communities vision and target setting the first step to start the transition process.

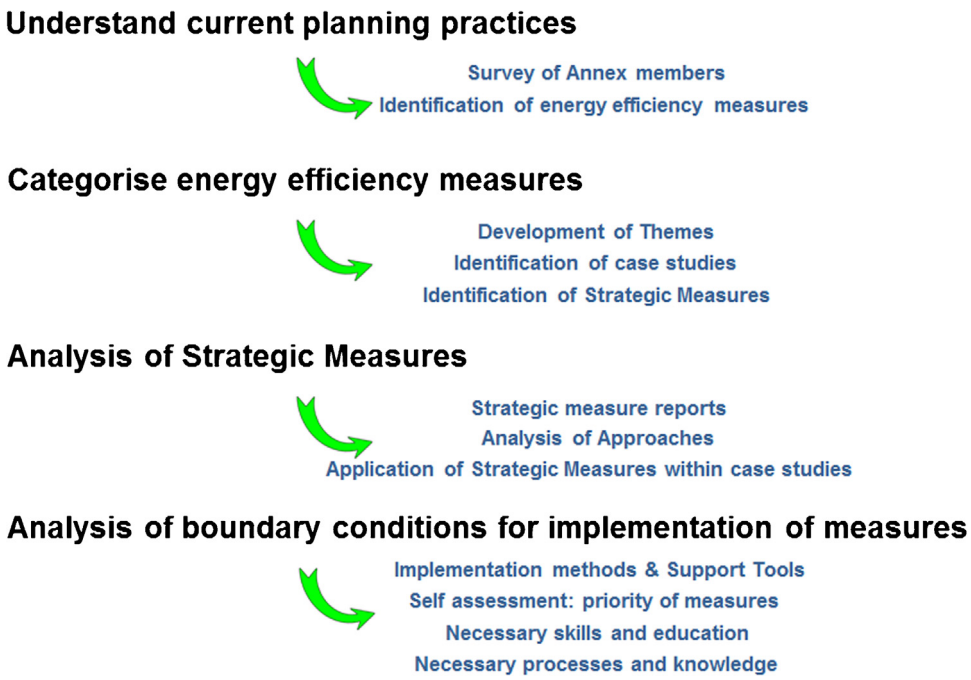

Fig. 1. Research Methodology (NRCan, 2017).

4.2. Develop renewable energy strategies

The development of renewable energy strategies deals with the systematic organization of actions around community goals [3] and might include the following domains [15]:

- Increase energy efficiency in energy production,
- Decrease energy demand to achieve energy savings in the existing building stock,
- Design new buildings with low-energy or zero-energy performance, and
- Shift the energy supply system toward the exclusive use of renewable energy.

These measures are represented across the various community cases included in the Annex 63 research and relate to both the energy demand and energy supply [15]. In some countries (e.g. Denmark, France, Ireland, Netherlands, Switzerland), national level renewable energy strategies offer an initial basis for community-scale renewable energy strategy development. However, communities are a relevant scale for strategic energy planning, including the development of goals and specification of local actions to advance plan implementation. The plan should integrate the needs and aspirations of the community, but should also account for the community's capacity to take action. Renewable energy targets are a typical part of community energy plans, along with responsibilities and timelines for key actions. Strategic energy plans can relate to all components of energy systems, including production, conversion, delivery, and use of energy [13], as well as all scales from communities to single buildings and building components [10]. At the national scale, plans are often more visionary in character, often setting GHG reduction targets and accounting for energy systems at the national and cross-national scales. Community-scale renewable energy strategies are typically more focused on spatial implications of energy demand and community energy infrastructure. Plans typically focus on public and sector activities, including urban development and rely on local

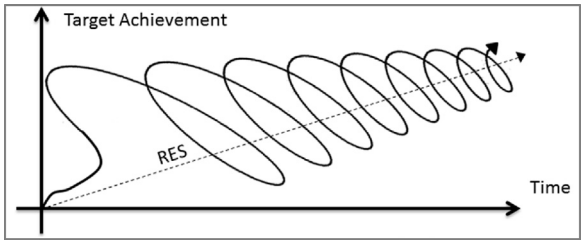

Fig. 2. Develop of a renewable energy strategy as spiral movement towards energy targets through an iterative process. (Source: [15] – DTU, 2016).

tools (e.g. regulations, incentives, public-private partnerships) for implementation. Local stakeholders and political considerations are relevant and play an important role in advancing or hindering implementation [1]. Monitoring of implementation is also essential in assessing fulfilment of goals and addressing barriers that may emerge [3,26,27]. Ultimately, as represented in Fig. 2, developing a renewable energy strategy should be considered as an iterative process, where ongoing assessment allows to response to changing conditions.

This kind of iterative process, with ongoing stakeholder engagement, facilitates strategic learning to further enhance the plan and support implementation [3,16]. Informed by [3] "Strategy Change Cycle", a four-step process for developing a renewable energy strategy is proposed: (1) develop targets, (2) explore technical scenarios for reaching energy targets and identifying barriers to implementation, (3) identify measures/tools to overcome barriers, and (4) establish a monitoring plan to assess whether actions are contributing to implementation and meeting targets [15].

4.3. Make full use of legal frameworks

The analyses of legal frameworks in Switzerland, Denmark, Germany, Austria and Norway have shown that the legal frameworks differ from country to country regarding the different territorial levels, the regulations of topics and targets. Generally,

legal frameworks for energy planning – that also take into account the urban development – have the following characteristics [15]:

Regulations on a regional or national level (as for example implemented in Switzerland and Denmark) support a much broader approach of implementation as a legal duty to municipalities.

Coherent regulations (as for example implemented in Switzerland) increase the planning security for investors and building owners and ensure the optimal usage of synergies.

Contracts are a flexible alternative to regulate energy planning. Examples from Germany show that the success of this instrument depends on market conditions.

In several workshops with national and international experts, operational recommendations were elaborated. These recommendations describe the way how communities can make full use of legal frameworks for the implementation of energy strategies on site. Generally, the following three success features were identified [15]:

1) Ask the right questions: Questions help to create a common understanding and a common language. This is of great importance, if representatives from different territorial levels and therefore different planning cultures and legal frameworks want to discuss. Relevant questions are: Is energy planning named in your constitution? Is energy planning integrated in energy or climate-related laws? Is energy planning integrated in spatial laws? Is something missing, to make full use of the existing instrument?
2) Ask the right persons: The answering of the questions need a deep understanding of urban planning, energy planning and legislation. Therefore, the questions should be discussed with an interdisciplinary expert group.
3) Make the possibilities visible: As the content of laws, secondary regulations and formal guidelines is not easy to understand in many cases, the elaborated possibilities should be presented to the relevant stakeholders in a simple language.

4.4. Design of urban competition processes

Urban competition processes are instruments to find the most suitable building/settlement concept by taking into account basic statutory provisions, planning frameworks and higher-ranking overall targets. The analysis of several urban competition processes within the framework of Annex 63 showed that carbon and energy aspects are missing in many times in the different competition types [15]. Therefore, success factors were identified based on a typical Swiss urban competition process. As visualised in Fig. 3, the election of the jury members, the definition of the competition program and the evaluation by the jury and experts are central phases, where carbon and energy aspects should be included to have better solutions at the end.

Possible ways to include carbon and energy aspects are [15]: The investor generally plans, organises and runs the design process together with an adviser. Therefore, the adviser has a central role in such urban competition processes. To ensure a sustainable result, the adviser must be independent or capable of objectively approaching a competition and combine design quality with sustainability, especially if the investor has no experience in this field. Therefore, the role of the jury members is one central success factor. Moreover, the selection of the competition program is of great importance. The competition program should include sustainability elements as visualised in Fig. 3 (e.g. energy sustainability, mobility), because the earlier in the project phases the sustainability requirements are given, the less effort it is to comply with them. Finally, yet importantly, the jury members must also have the competence in at least one of the listed fields. The specific understanding helps in picking a winner that take into account all sustainable criteria in an optimal way. The expertise and the evaluation mode are therefore the third identified success feature.

4.5. Make use of tools supporting the decision making process

Urban complexity is rising with an increasing number of buildings, infrastructure elements and relevant stakeholders. This complexity challenges planners in making decisions for urban and energy planning. Within the project, three main challenges for decision-making were identified [15]: Data uncertainty, legal and organizational boundaries as well as public acceptance. All three factors hold the risk of leading to bad decisions or project failure. Data uncertainty is primarily based on a lack of specific data or low data quality. Moreover, missing local expertise and involvement could generate uncertainty within planning processes. Even if specific data are available, e.g. in single departments of municipalities, it might be hard to combine these different data sets of different format and sources to get an integral analysis. Decision support is often seen as non-transparent or it lacks the integration of relevant stakeholders. Thus, a lack of public acceptance related to the decision and its outcomes might be the result. Furthermore, urban and energy planning are often separated disciplines, leading to making decisions based on limited views and responsibilities. Therefore, this strategic measure focuses on ways to support urban and energy planning by Planning and Decision Support Systems (PDSS). PDSS aim to integrate spatial, technical and local information to guide and support the decision making process. The following relevant aspects of PDSS have been identified within discussions with municipalities and experts: A central data management with simple access, usage of tools to support the planning process, integration of local expertise and the combination of urban and energy planning. In many municipalities, every department has its own data pool and data management concept. Datasets are often stored in different structures and formats, which results in higher effort of exchanging or merging data. This data management structure might delay sufficient data access or even make an integral analysis with data from different departments impossible. In comparison, Fig. 4 demonstrates the central entity data management concept of the city of Bottrop, Germany.

In this case, every department is still responsible for its own data gathering and data management. However, specific shares of datasets are automatically synchronized with a central database to enable an easy data access to a large data pool. Moreover, citizens and other external partners can be granted with different access levels. Basic levels, such as the InnovationCity Ruhr Information System (ICRis: http://gis.bottrop.de/ICRis/), are accessible via open-access. Central departments for data management are often only seen as cost driver. However, projects in urban and energy planning might benefit from simple data access and analysis. Moreover, processes of data gathering and exchange are simplified, which have the potential to reduce cost and effort in the overall municipal structure. Structured data management is one option to reduce uncertainty in decision-making processes. Moreover, tools can be used to process and analyse data. For a broader usage, this might be simple tools, such as GIS-tools with online access. On the other hand, expert tools can be used for detailed planning and analysis. Tool usage in early planning phases for scenario generation and visualization might save time and money in later project phases. Next to data management and tool usage, integration of local expertise can be an important element for decision support. First, different perspectives and local knowledge is brought into the decision making process. Second, stakeholder involvement within the decision making process strengthens the

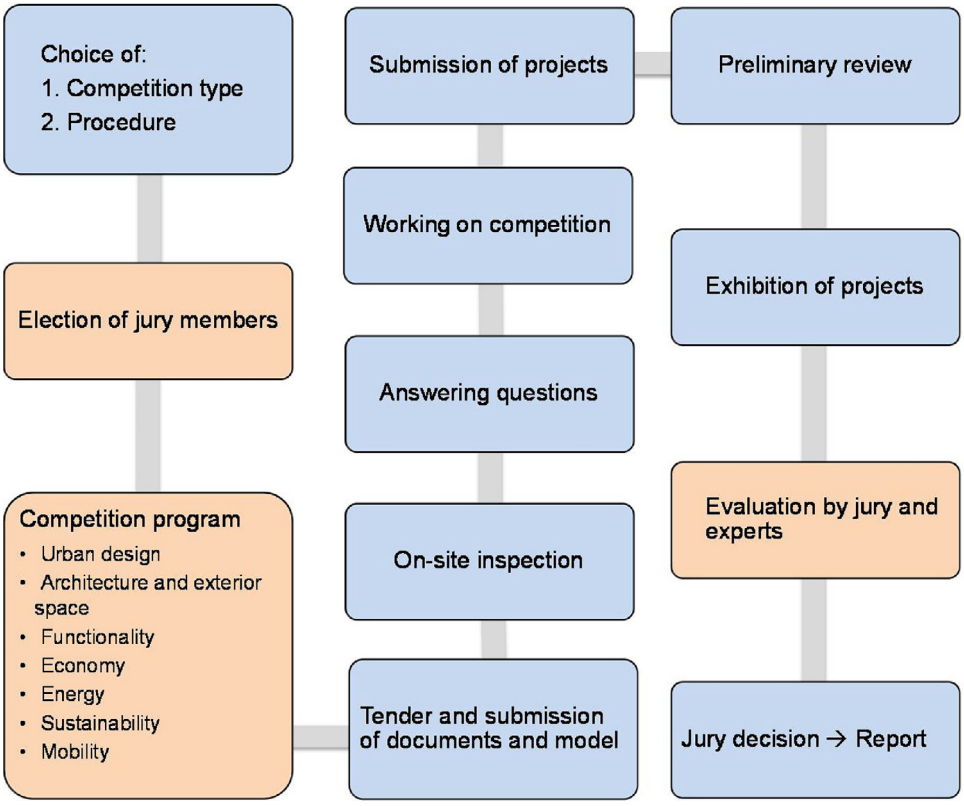

Fig. 3. Competition process and sustainability-relevant entry points in the Swiss context (Source: [15] – Intep GmbH, 2016).

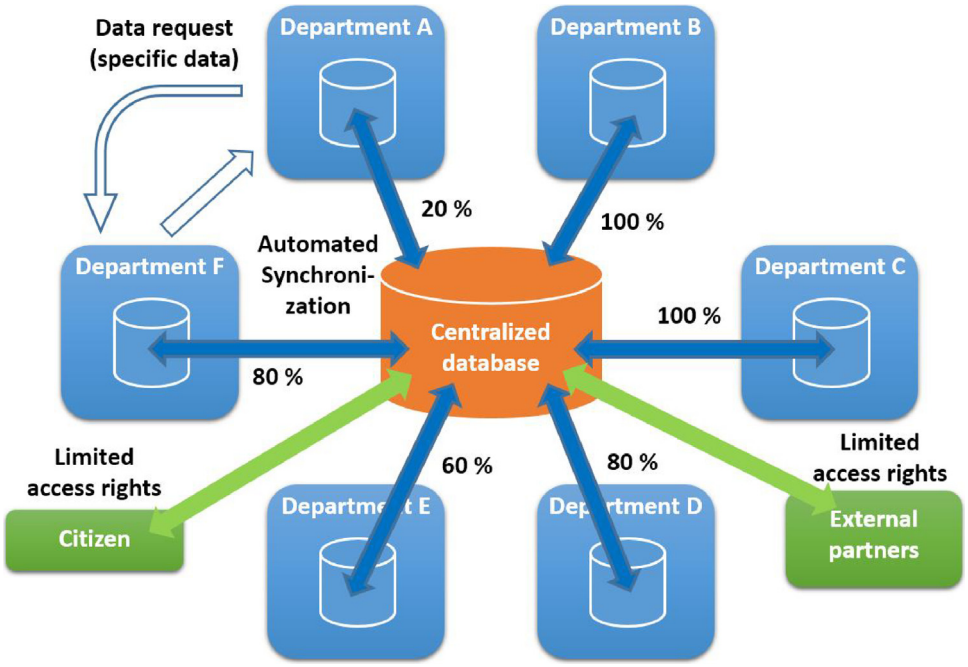

Fig. 4. Central entity data management structure; percentage: examples for share of synchronized data (Source: [15] – RWTH Aachen University, 2016).

linkage between local stakeholders and the decision made. Moreover, municipalities should try to bring the disciplines of urban and energy planning together, not only form the software point of view, but also their organizational structures. This enables interdisciplinary decision-making, which holds the potential to better account for important aspects of urban and energy planning.

4.6. Implement monitoring of energy consumption and GHG emissions

In the context of Annex 63, monitoring was understood as the task of evaluating the extent to which the realised implementation of a given project corresponds to initial goals. Therefore, a funda-

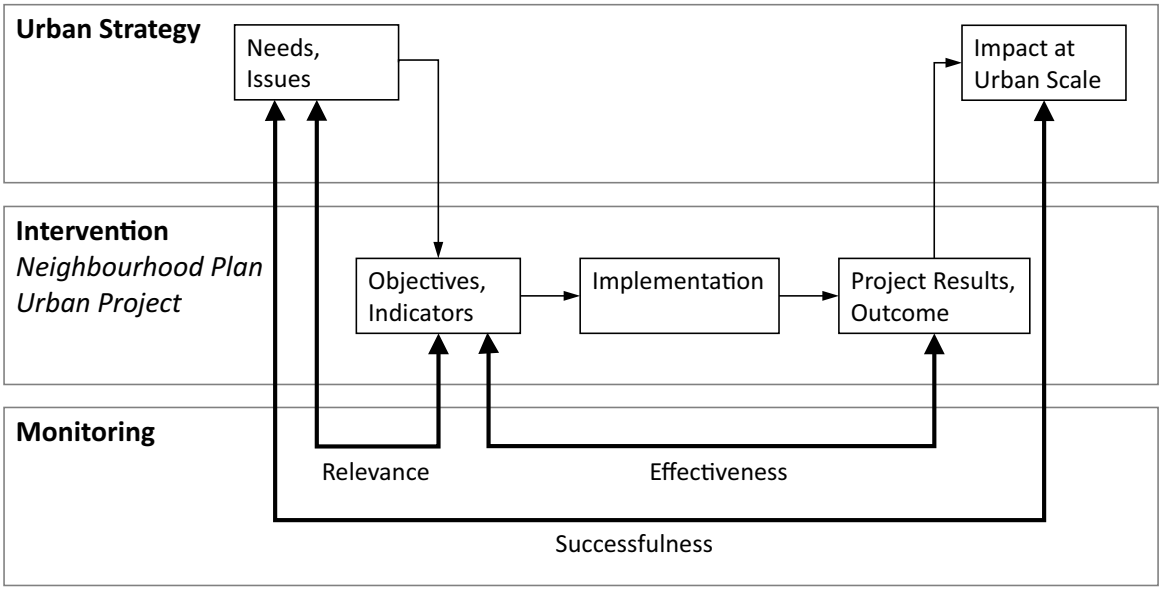

Fig. 5. Evaluation of Urban Strategies (Illustration adapted from [17], [30]).

mental and important task is to translate visions and societal goals as well as subsequent objectives into measurable targets and specific actions. Monitoring of these measurable targets is a crucial task in any municipal strategy. Yet after the evaluation of a number of international case studies, it can be stated that the importance of monitoring at municipal level is often underestimated and not pursued with adequate means. Main reasons for this can be seen in a lack of resources or a lack of strategy. Eventually, little can be said about the success of any urban development project, in terms of its effectiveness, efficiency and overall sustainability unless the implementation steps are continuously tracked. When looking at individual measures or development projects without the link to the broader context of a city, the focus is often put on the system's effectiveness, which means that the objectives of a given project are compared to the outcome. While this is an important step in any monitoring strategy, the overall success of an urban strategy must be measured by comparing initial goals (i.e. societal challenges) with the final impacts of an intervention (Fig. 5).

As proposed by [30] this can be reached by agreeing on common objectives which are directly derived from the municipal vision or strategy. The agreed objectives should be linked to measurable indicators in connection with realistic target values or benchmarks. While the relation between the addressed needs and the objectives describes the relevance of the intervention, the comparison against the measured outcomes relates to a measure's effectiveness (Fig. 5). The added benefit of monitoring both the process and results lies in the possibility to assess the level of target achievement of the project as well as to identify challenges that were encountered at different project phases. Such an evaluation provides valuable information for the conceptual design of future projects. Ideally, planners can avoid past mistakes and repeat successful strategies. As mentioned before, a specific issue linked to the relatively long timescale of urban development projects is a lack of responsibility in ensuring long-term monitoring and data assessment. The time span from development to implementation often spans over a decade [18]. Therefore, it seems necessary to "start processing data as soon as the data is provided [and] not wait before all data is available because it might be too late to do sufficient analysis or make any corrections" [14]. Another important challenge in the implementation of a successful monitoring strategy is linked to data security and data privacy. Beyond the technical challenges,

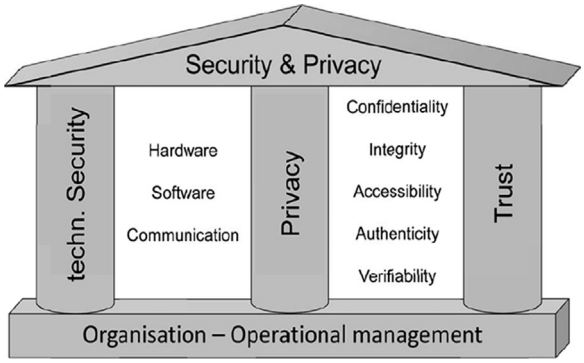

Fig. 6. The Security & Privacy building in the smart grid (Source: [25]).

the organisation of the monitoring process and thus the data management (including clarification of the ownership from data) needs to be conducted in relation with citizens, organisations, developers and not least the municipal government. All stakeholders have inherent needs related to data security and privacy. In the Smart Grid Salzburg project, three main pillars were identified that provide the basis of these important concerns illustrated in Fig. 6.

First, technical security refers to the security of the technical components such as smart meters, IP networks, etc. As the second pillar, privacy is addressed in the form of the legal framework, which defines the conditions under which data collection and data analysis is carried out. Finally, trust refers to the stakeholders' acceptance of the implemented monitoring scheme. In this latter aspect, the role of culture but also local governance is not to be underestimated. Based on the various international case studies that have been evaluated [9], some specific conclusions can be drawn with regard to the implementation of a monitoring strategy. Successful strategies often included the active participation of a wide range of actors from various sectors such as utilities, local government, universities, ICT companies, and many others. In recent projects, the increasing degree of digitalisation of many sectors of the economy results in new opportunities to implement monitoring strategies at affordable costs based on standardised and often already existing infrastructure. This leads to conclude that with a further increase of the diffusion of installed sensors and connected infrastructures a bottom-up approach will be easier and more pre-

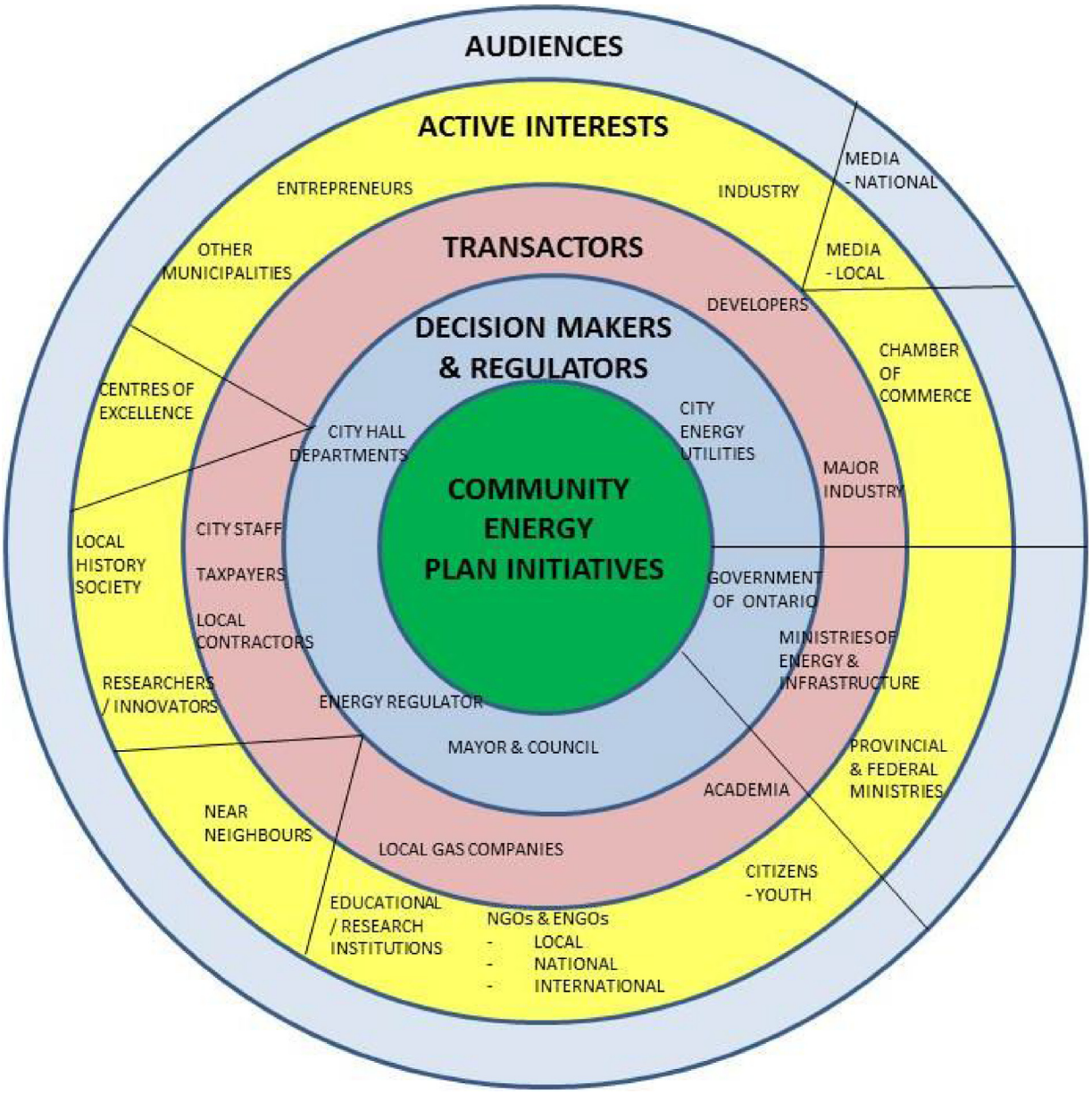

Fig. 7. Stakeholder identification based on roles (Source: City of Guelph Community Energy Plan: Strategic Plan and Critical Path, 2009).

cise to implement compared to classic top-down approaches when it comes to monitoring the electricity consumption at all levels. A major challenge remains the stakeholder acceptance of the monitoring, which is clearly related to the question of data security and privacy but also to a clear communication of possible benefits.

4.7. Stakeholder engagement & involvement

Integrated energy and urban planning requires changes in urban development patterns, plans, and policies in order to achieve reductions in energy use. Working at the intersection of energy and urban planning naturally expands the range of experts and organizations involved in decision-making. In addition, decisions about urban development can generate a range of perspectives, including from those living in the community. In order to engage these perspectives, and to address potential conflicts among them, broad engagement of stakeholders (both internal and external to energy and urban planning organizations) and the general public is essential. The cases and measures addressed in Annex 63 point to the significance of proactive engagement in integrated energy and planning processes [9]. Those interested in being engaged and who may have relevant feedback that should be sought include but are not limited to those involved in energy planning and urban planning, staff from other municipal departments (e.g. transportation, public health, sustainability), public and business interest groups, and persons living near a proposed project. The term "stakeholder" is often used to describe individuals and organizations like those noted above – those with a personal or professional stake in the outcome of a process or the decisions of an organization like a city [4]. Efforts to engage stakeholders, as well as the broader public, must be carefully designed to fit the context, the problem to be addressed, and the purpose of the engagement [5]. Engaging stakeholders can accomplish multiple purposes, as summarized in [5] *Designing Public Participation Processes* article:

- Meeting local requirements;
- Embodying the ideals of democratic participation and inclusion;
- Advancing social justice;

Table 1
3-step Targeted Approach to Stakeholder Selection in Integrated Energy and Urban Planning (Source: [15] – Natural Resources Canada and University of Minnesota, 2016).

Step 1: First, define the impact that change in energy delivery or technology is hoped to bring and hence describe the stakeholder group that will be affected by that change. Sometimes no group or association is immediately evident and it becomes necessary to seek out individuals who are willing to participate on behalf of themselves or others.
Step 2: Second, determine who in any group or association is most impacted by the change and/or has expertise or insight to offer a planning or project decision-making process. Without an intentional effort to identify and recruit stakeholders for participation, it is common to find engagement processes populated by those already comfortable and experienced with such processes – often termed "the usual suspects" and not the full range of those impacted by an issue or process. While it can be expeditious to engage just those who show up, doing so many not produce the best long-term results.
Step 3: Third, in the case of broad industry associations, business groups or similar organisations with a broad spectrum of membership, it is important to identify local representatives. It is often difficult for those representing a broad membership of an organisation to directly address site or community specific issues and thus it is advisable to identify and include individuals whose activities or locations are more directly related to a project, technology, plan, etc. to provide input that is more specific.

Acknowledging that it can often be difficult to persuade priority stakeholders to share their time, expertise and input, another stakeholder identification approach focuses on roles. In the example in Fig. 7 from a city-wide community energy planning project in the City of Guelph, stakeholder groups were identified and then classified as decision makers, transactors, active interests, and audiences, so that targeted communication and engagement strategies could be developed for each class of interests.

- Informing the public;
- Enhancing understanding of public problems and exploring and generating possible solutions;
- Producing higher quality policies, plans, and projects;
- Generating support for decisions and their implementation;
- Managing uncertainty, such as through building trust and improving the quality of information informing decisions; and
- Creating and sustaining adaptive capacity for ongoing problem solving and resilience.

The cases highlighted stakeholder engagement efforts that emphasize a two-way exchange of information, as opposed to efforts to simply inform stakeholders about a project or plan. Stakeholder engagement that is early, often, and ongoing, is recommended [31]. It is well recognized that meaningfully engaging stakeholders can help to build consensus, improve the outcomes of planning efforts and build support for implementation [2,7,24]. There is a variety of ways to select stakeholders, but the literature and cases suggest that a targeted approach will be most effective. Table 1 below offers a three-step targeted approach that can be used to identify key interests [15].

Another stakeholder identification approach focuses on skills and expertise that stakeholders possess. This type of approach emphasizes that stakeholders have important knowledge that they can contribute to a project or planning process. As with the example in Fig. 8 above, this approach is visual and applying it could be collaborative, with initial project leads identifying key skill/expertise areas and then brainstorming about potential organizations and/or individuals aligned with each.

Once stakeholders are identified, it is essential that they be engaged early, giving them more time to understand key issues, become invested in a process, and position them to contribute more meaningfully. Stakeholder engagement processes that move beyond legally mandated participation toward inclusion are able to better integrate diverse perspectives, address conflict, and account for power differences [5,23]. It is acknowledged that planning styles and expectations for engagement will vary from community to community. However, the presence of diverse interests in energy and urban planning and the need for dialogue and communication are pervasive and call for some consistency in approach. Based on the cases examined in the Annex 63, the steps identified in Table 2 below offer some key questions that can be used by energy and/or urban planners as they begin to plan for the design and facilitation of an engagement effort [15].

4.8. Include socio economic criteria

From the consumer's perspective, the transition challenge represents a change in value systems from one that priced development at its lowest cost to one that is more holistic and identifies a product's value by its impact on the environment. Investments in energy efficiency can provide many different benefits to many different stakeholders that are often overlooked. Since multiple stakeholders have the potential to experience multiple benefits, a stronger business case that engages public and private interests can be created. The inclusion of these benefits creates the true impact or value of an action and can significantly affect any comparison process. However, the techniques for monetisation of these benefits are progressively more complex and therefore increasing in uncertainty. Within the project, different approaches in several IEA-countries were analysed to derive recommendations. The benefits are identified in the fields of economic impact, social impact and environmental impact. With respect to the implementation process, four steps were recognised [15]:

1. Inventory of possible co-benefits
2. Trying to value and monetise the co-benefits and broadening the business-case
3. Involvement of the stakeholders, including the inhabitants, in the selection of the co-benefits for a specific district
4. Commitment of relevant stakeholders and investors to the broad business-case, including the added values of the co-benefits.

In many IEA-countries the value creation of the co-benefits are derived by using several impact models. Like impact assessments in Germany and input-output models in Switzerland. In the United States, the National Environmental Policy Act (NEPA) obliges an environmental impact assessment. In the Netherlands, the true values were monetised for four realised energy efficient renovation projects (Haarlem, Breda, Kerkrade, Nijmegen) by housing companies (more information about this study: [19]). This calculation is based on three different business-cases (small business, medium business and social & environmental impacts; see Fig. 9), including step by step more co-benefits (three co-benefits in small business; six co-benefits in medium business and five co-benefits in social & environmental impacts; more details see [19]). The results out from this study are visualised in Fig. 9.

The results show that when all relevant social and environmental effects will be included into the calculations, the business case will become positive for all stakeholders (see social & environmental impacts).

In Japan, one finds similar results and one has been able to include uncertainties to estimates the risks of the investments for the individual stakeholders [21]. Fig. 9 shows the visualisation of such kind of results.

From an analysis of the countries, participating in Annex 63, the importance can be seen of the coordination in organizing the case for public-private business partnership. The coordinator of this

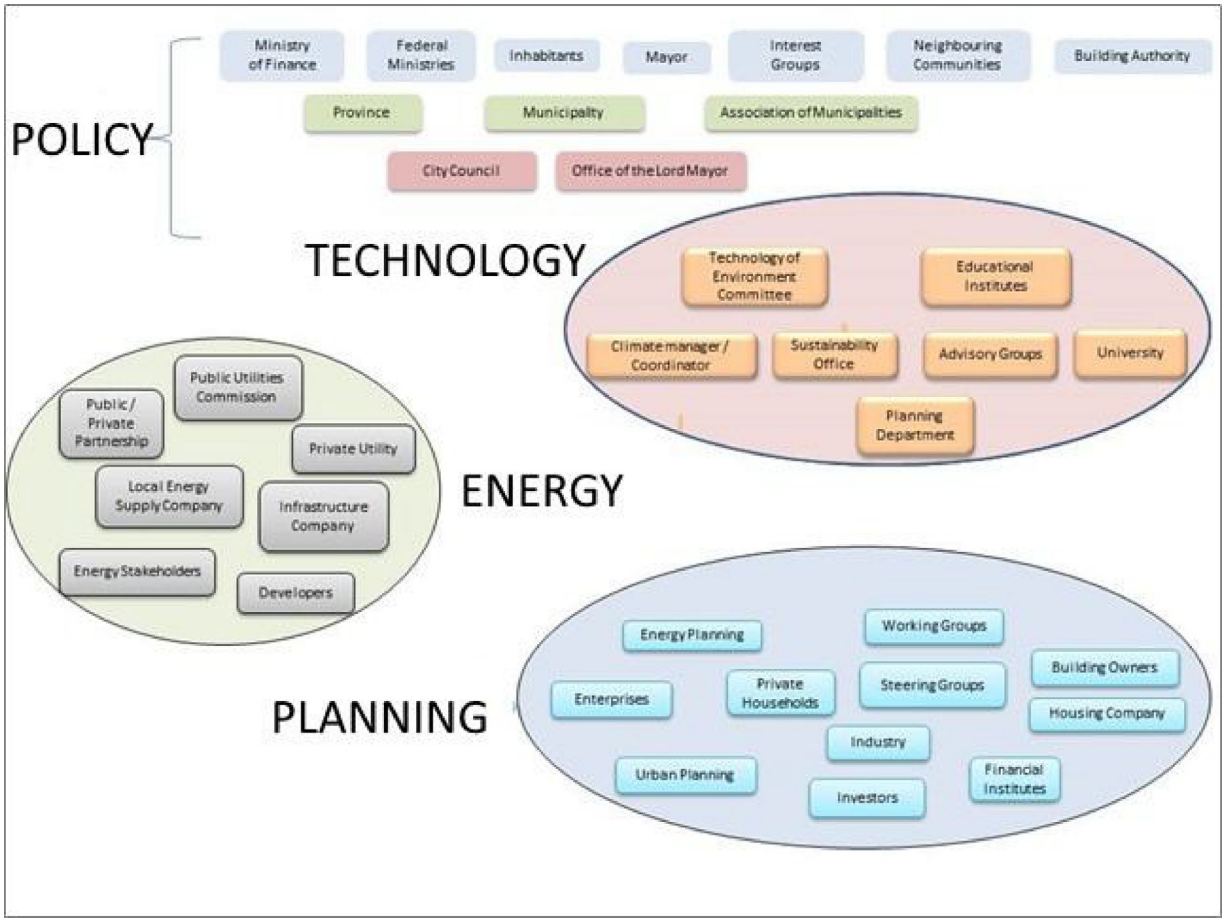

Fig. 8. Stakeholder identification based on skills and expertise. (Source: Personal Communications with Jacques Kimman, Lector Nieuwe Energie, Zuyd Hogeschool, Netherlands).

Table 2
Questions for Consideration by Energy and Urban Planners in Preparing for Stakeholder Engagement (Source: [15] – Natural Resources Canada and University of Minnesota, 2016).

Q1. Identify the lead person/organisation for the plan or project initiative – who is responsible and under what authority does that lead person operate? Is there a similar role in the energy delivery sector? Is there a critical technical or political champion that should be engaged?
Q2. What are the driving principles and goals of the plan or project in terms of energy/emission-related benefits for the community?
Q3. What stakeholders share the project territory, have related expertise, have interests, and/or power that can influence the outcomes of the project or plan?
Q4. What impact could the product bring to each of the stakeholder groups and where are the contact points?
Q5. In what ways can stakeholders and the public contribute expertise, knowledge of the local context, and resources that can help to enhance the plan or project?
Q6. What role will the stakeholders play in your project? What are the possible ways to interact with them and when should that interaction begin?
Q7. How and when should ongoing interactions and results be documented and shared?

effort must have a broad overview of both (or all) partners' aims and positions and present a more or less independent position. This role is most of the time played by governmental organisations and/or municipalities. The success of the venture will very much depend on the trust that the stakeholders have in each other and how solid the business case is defined. It is probably a matter of the culture in each country, which determines the willingness for companies to cooperate with each other, as with governmental agencies and municipalities. In Japan for example, large companies feel strongly committed to social challenges, like sustainability and climate change [15].

4.9. Implement effective and efficient organizational processes

Formal urban and energy planning processes are given in each country. Because there is an increasing number of actors involved in the field of urban and energy planning, the effective and efficient organisation and process design is becoming more important. Within the framework of Annex 63, innovative governance instruments, organisational frameworks and methods were analysed and structured. Based on these analyses, the following topics were identified as success features to set up sufficient organisational frameworks worldwide [15].

1. **Strong ties to existing municipal structures:** There are two ways to integrate sustainability into the existing structures: As project with limited duration with the aim to raise awareness and to create network. The second option is the creation of a new municipal structure that is integrated in the existing structures. In both cases, the municipality must be visible as a central actor that is interested in creating real impact.
2. **Secured financing:** Networking and coordination need a lot of time and resources. Therefore, new solutions can only be implemented on an optimal way, if there is enough budget reserved

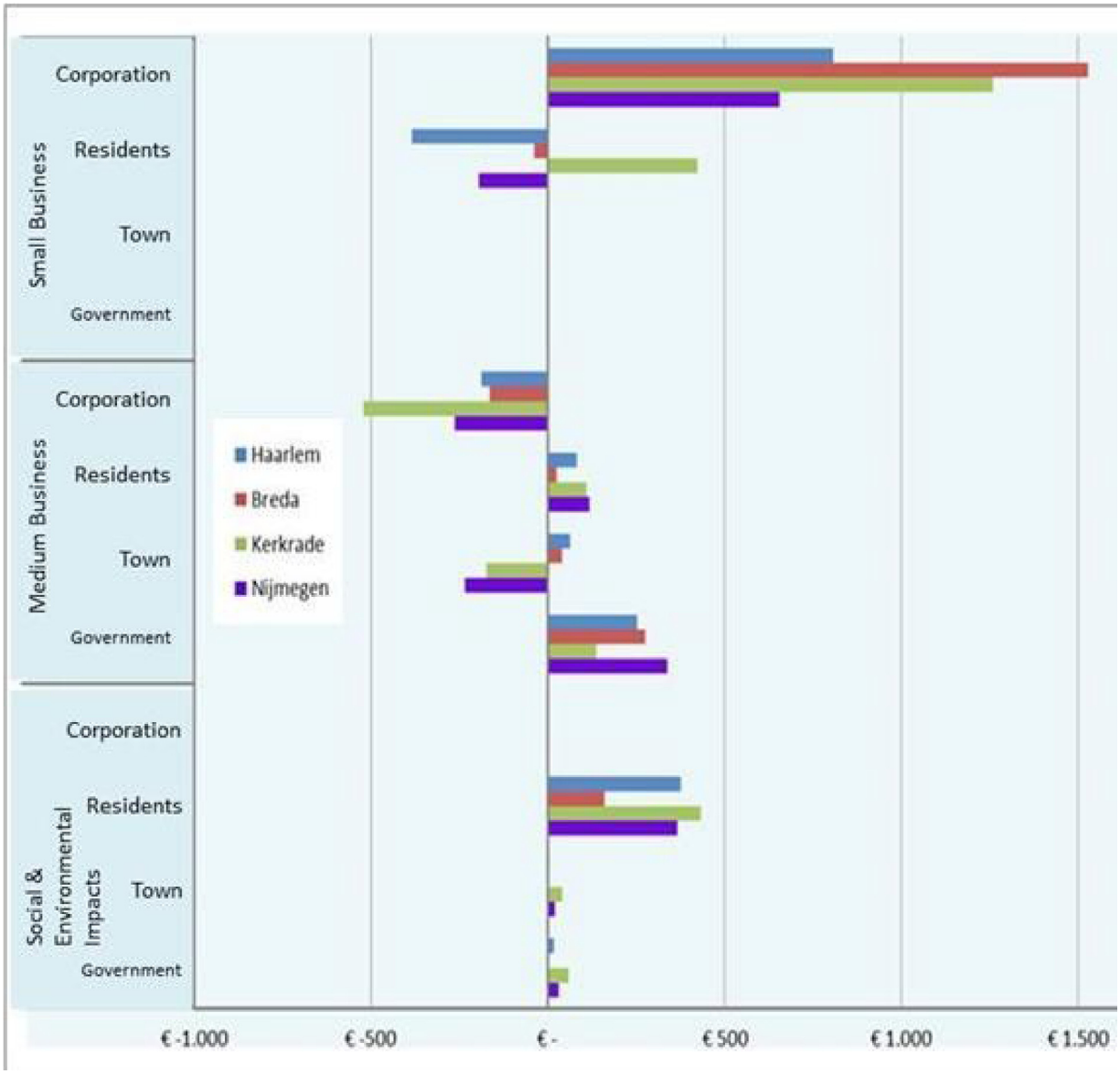

Fig. 9. Evaluation of Broader Business Case Options for four Dutch projects on a district level (Source: [19]).

for the exchange of information, networking and development. The carried out analysis in Annex 63 showed, that in some cases the municipal or governmental funding is topped up by financial commitments from the local businesses, the local energy providers or network operators.

3. **Involvement of energy suppliers and network providers:** In all analysed countries, the energy suppliers and network providers take an active role in the existing organisation structure. This is of great importance, because the implementation of line-based solutions, need a commitment of several stakeholders on an early stage.
4. **Monitoring process and cyclical thinking:** All analysed organisation structures had installed a monitoring instrument. Typical instruments were steering committees and committees of higher administrative authorities.
5. **Strong local involvement and impulse:** The ProjectZeo in Sønderborg showed, that local businesses could be a starting point for the creation of a new management structures. The Norwegian best practice example showed that local initiatives must be taken into account, because they are the basis for new and innovative structures that will suitably approach their possible clients.
6. **Governmental requirements:** The analysed examples have shown that many countries have created the incentives or legal basis for municipalities to become an active role in urban and energy planning. This happened by give to the municipalities more responsibilities or by given to the cities the legal right to take over more liability in working on urban and energy planning.
7. **Create exchange of knowledge:** The exchange of knowledge is the most important topic, if you want to implement energy strategies in communities. Therefore, networking and frequent exchange process should be focused and be an integral part of all processes. In addition, participatory processes become more and more important (Fig. 10).

5. Discussion

The analysis of 22 planning processes within Annex 63 showed that the sequence of planning processes is more or less the same:

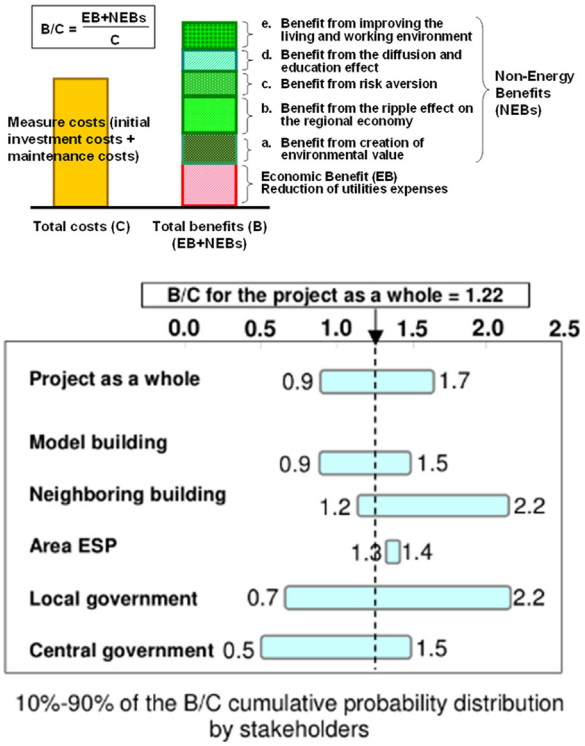

Fig. 10. The Cost-Benefit Ratio (B/C) Evaluation in a Japanese Region including a sensitivity analyses (Source: [21]).

Target setting, analysis of situation, potential analysis, project planning, realisation and monitoring. The analysis of 89 measures within Annex 63 showed that each national action or program could be grouped in the following nine strategic measures: Set visions and targets, develop renewable energy strategies, make full use of legal frameworks, design of urban competition processes, make use of tools supporting the decision making process, implement monitoring of energy consumption and GHG emissions, stakeholder engagement & involvement, include socio economic criteria and implement effective and efficient organizational processes. Each of these strategic measures serves different stakeholders and planning stages. The entry point of each action field in a generalised planning process can be assigned as visualised in Fig. 11.

However, in practice, the implementation of one or several strategic measures depends on the framework conditions of the community. Therefore, within the framework of Annex 63, a self-assessment guide for interested communities has been developed. Output of this self-assessment is an overview about the strengths and weaknesses of the community regarding the implementation of energy strategies on a local level. To transform weaknesses into strengths, additional stakeholder support material has been elaborated. These materials deal with the topics capacity building and skills, workshop formats and procedures, informational slides for presentations and education materials and support the development of individual implementation strategies. These materials will be available on www.annex63.org with beginning of March 2018.

6. Conclusion

The project aims at contributing to effective transition of urban systems regarding buildings, energy and mobility when considering in early planning phase with availability of most options. Changes in the later planning phase are typically known to be more expensive. Therefore, the optimisation of urban planning processes has a significant effect regarding the cost effective reduction of CO_2 emissions and the energy use in cities. In general, Annex 63 wants to enhance cities significant role in transition of energy systems and achieving of CO_2 targets. A key factor is the necessary communication between all relevant actors. It is of great importance to include all relevant stakeholders as soon as possible and specify their contributions. Because the better usage of existing or development of new instruments, processes and framework conditions will lead to a restructuring of existing (urban and/or energy) planning practices. For the implementation of energy strategies in communities, cities need to understand that they are a key player for the implementation of the energy transition. Cities and other organizational bodies have to start an internal transition management process. Leading cities, that were part of Annex 63, report, that the transition process is complicated, because of the variety of stakeholder groups, variety of topics and many other aspects as for example different targets, long project durations and market dynamics. Annex 63 results and recommendations can be se as a guideline to start the necessary transition management process

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This paper summarizes and highlights main research activities, outcomes and findings from Annex 63, drawing content from Annex 63's final reports and related publications. The authors appreciate strong leadership and technical contribution of subtask

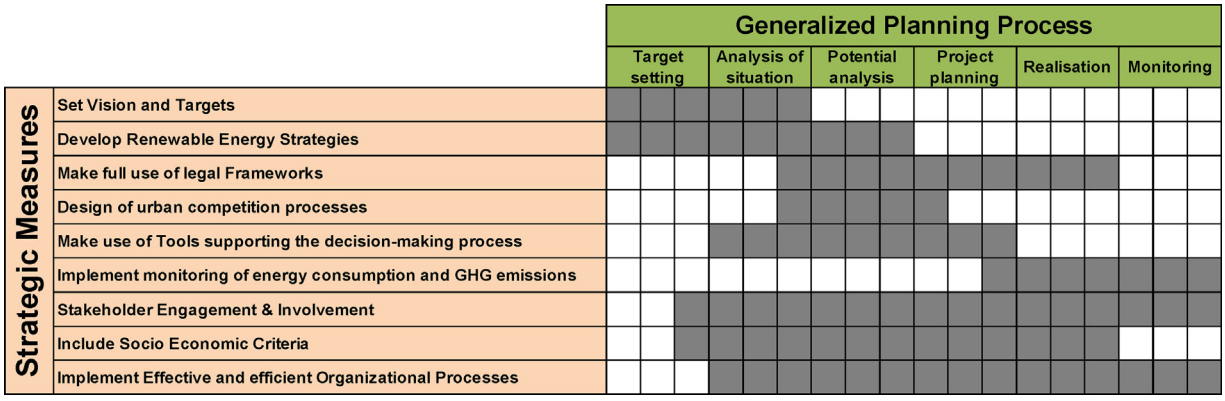

Fig. 11. Entry points of different action fields (Source: [15] – SIR, 2016).

leaders, as well as contributions from all participants of Annex 63. The IEA (International Energy Agency)'s Energy in Buildings and Communities (EBC) Programme (iea-ebc.org) carries out research and development activities toward near-zero energy and carbon emissions in the built environment. These joint research projects are directed at energy saving technologies and activities that support technology application in practice. Results are also used in the formulation of international and national energy conservation policies and standards. Name, the operating agent of Annex 63, appreciated the strong support from IEA EBC's Chair, Secretary, and the executive committee.

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