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IMPLEMENTATION OF ENERGY STRATEGIES IN COMMUNITIES – RESULTS WITHIN THE CONTEXT OF IEA ANNEX 63

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Abstract:

Cities are responsible for more than 70 % of global greenhouse gas emissions. Thus, cities can play a major part within the CO_2 emission reduction goals of the Paris agreement. Lack of technical knowledge and solutions has often been seen as major challenge for energy efficiency implementation. However, findings of the International Energy Agency (IEA) Annex 51 – Case Studies & Guidelines for Energy Efficient Communities – showed that the primary challenges result from inefficient organizational processes and unsupportive framework for implementation. Thus, solutions have to be found how the energy and urban planning can act more efficiently to successfully support the implementation of energy strategies within urban areas. Within the IEA Energy in Buildings and Communities (EBC) Program, the Annex 63 – Implementation of Energy Strategies in Communities – aims at giving recommendations for an optimized energy and urban planning process to support decision makers as well as planners. Therefore, existing legal frameworks, processes and case studies within energy planning in communities were analysed. This paper shows first results of the Annex 63 to serve as orientation for decision makers and other interested persons in the field of urban energy planning.

Keywords:

IEA, EBC, Annex 63, communities, energy planning, urban planning

1. Introduction

Urbanization is leading to a growth of cities around the globe. According to the United Nations global report on human settlements more than 50 % of world population is living within cities [1]. With an increasing number of people living within urban areas the demands for housing, work, food and mobility are growing. Overall, these demands are increasing energy consumption within cities, with urban areas emitting more than 70 % of global greenhouse gas emissions [1]. In addition to this, the Intergovernmental Panel on Climate Change (IPCC) estimates that ongoing climatic change might cause irreversible, negative impacts on the world's ecosystems and economy [2]. To reduce the risk of these impacts, the increase in global, average temperature, compared to pre-industrial times, should not exceed 2 °C. This aim is the essential part of the Paris Agreement [3], which is the first agreement of 197 nations to undertake strong efforts to act against climatic change. As a major contributor to global emissions, urban areas must position themselves to play a central role within these efforts. Thus, strategies to increase energy efficiency and reduce emissions should be identified, developed and implemented within cities, globally.

Within the Annex 51 – Case Studies & Guidelines for Energy Efficient Communities – program of the International Energy Agency (IEA) ways to support the implementation of energy efficient strategies into cities have been developed and analyzed [4]. The Annex 51 approach focused holistically on the built environment at a city's district scale. This means that instead of single building scope, multiple buildings and their complex interaction with users and energy systems were considered. One of the main assumptions of Annex 51 was that technical barriers and lack of technical knowledge were major implementation challenges. However, findings of the Annex 51 also showed that an absence of process organization and coordination as well as weak supportive frameworks hindered the implementation of energy efficient strategies in communities. Moreover, Annex 51 demonstrated that energy and urban planning typically co-exist, but worked separately. On the one hand, this was a result of organizational structures within municipalities, where energy and urban planning often belonged to different departments. On the other hand, energy and urban planners were, in many cases, not aware of the processes and instruments of the other planning disciplines.

Considering that communities are understood as the smallest, functional unit of a municipality (see Figure 1) then the question arises on how to generate a framework that supports the implementation of these more holistic solutions.

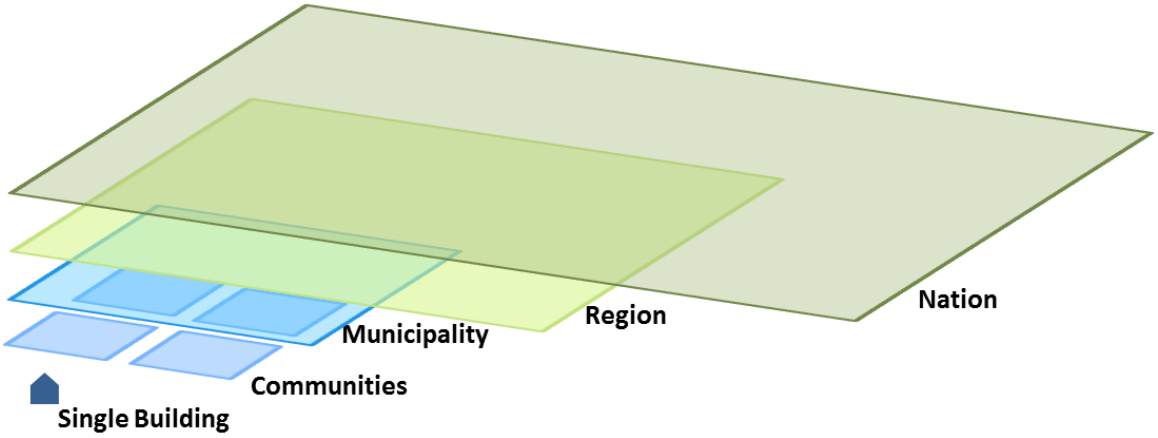

Fig. 1. Classification of terms building, community, municipality, region and nation

The IEA Annex 63 – Implementation of Energy Strategies in Communities – project aims to address this question (https://www.annex63.org/). It is part of the IEA Energy in Buildings and Communities (EBC) program, with the intention of international coordination of research activities and knowledge exchange between 19 organizations in 11 countries in the field of energy efficient buildings and cities. Their expertise ranges from urban planning, energy science, consulting, and housing to social science. The project working time is from 2014 to the end of 2017. The Annex 63 objective is to give recommendations on procedures for implementation of optimized energy strategies at the scale of the community. The main target groups for the recommendations are the municipalities, as well as energy and urban planners. Thus, the recommendations focus more on process organization and supportive frameworks so as to advance previously identified technical solutions. Special emphasis within these recommendations will be placed on the synergies between energy and urban planning. The conditions prevailing over both energy and urban planning often limit the prospects for energy efficient strategies within communities. Thus, Annex 63 aims at closing the gap between urban and energy planning.

Initial research in Annex 51 identified stakeholders as playing an important role for success or failure of energy projects in communities. The former's focus on technical solutions did not sufficiently involve stakeholders, which often resulted in public or political push-back during later project phases and a consequential lack of support for implementation. Thus, the Annex 63 additionally aims at identifying ways to successfully engage stakeholders into the planning process.

Moreover, the Annex 63 aims to use the stakeholder engagement as a means to closing the gap between urban and energy planning. Information and knowledge about energy strategies in communities should be made available for urban planners, municipalities and other interested persons and organizations. Finally, the Annex 63 should support the implementation of energy efficiency concepts within communities and foster emission reduction within cities.

This paper is meant to highlight initial Annex 63 ideas and results for municipalities, energy and urban planners, as well as other interested persons and organizations. The Annex 63 methodology and structure is shown at the beginning, followed by a results chapter. On the one hand, general results, including questionnaire responses of participating countries as well as important cluster themes, are listed. On the other hand, results of stakeholder involvement and organization clusters are discussed in more detail.

2. Methodology

Based on results of Annex 51, an international team of participants with different backgrounds was formed to cooperate within Annex 63. At the beginning, the team built consensus on the Annex aims and organizational structure, resulting in four subtasks, shown in Figure 2:

- Subtask A: Energy strategies for communities – methodology of implementation
- Subtask B: Planning Process
- Subtask C: Case studies
- Subtask D: Information exchange and dissemination

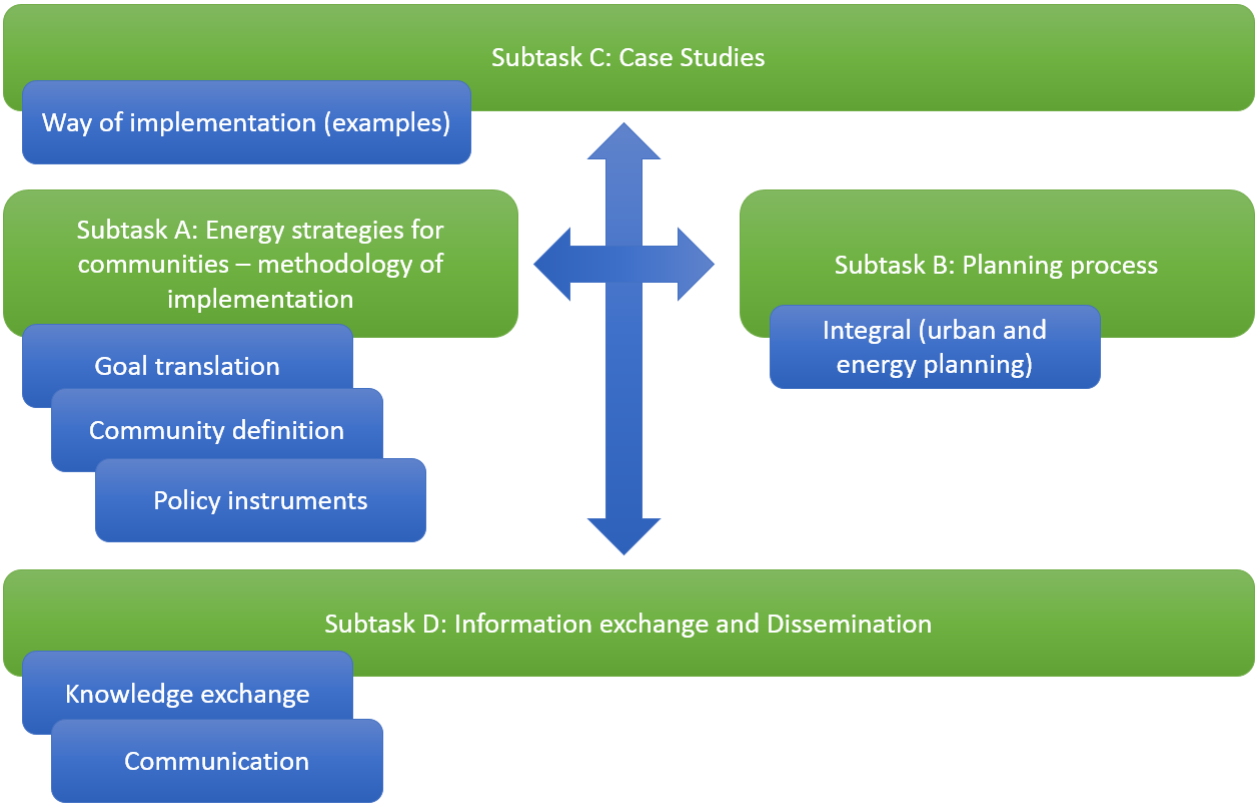

Fig. 2. Annex 63 subtasks and related themes

Subtask A dealt with the question of how cities can organize the process of implementation of energy efficient strategies in communities. Further research questions were developed: how a community should be defined, how national and regional goals can be "translated" to the community scale, which policy instruments should be used and how as well as how the communication and later evaluation should be organized. Subtask B focused on the question of how

to merge the disciplines of urban and energy planning, which was closely related to the implementation issues of Subtask A. Subtask C is focused on the practical implementation of energy-efficiency strategies in communities, and how local conditions, the applications of tools and other actions of the local planners enabled a successful implementation of energy-efficiency solutions. Subtask D is ongoing and focuses on the information exchange and communication of project outcomes with decision makers, planners and other interested persons and organizations.

At the outset and to gather information about national practices, instruments, processes, and case studies, questionnaires were prepared for participating countries and their municipalities. The aim was to achieve a view of the status quo in current energy and urban planning processes in different countries. Responses were analysed within Annex working groups and discussed with municipalities and planners to get a better understanding of their needs in the context of energy efficiency planning. Important measures were identified, which have been grouped within relevant clusters. Finally, initial best-practice examples were found and recommendations for planners and decision makers were formulated.

3. Results and Discussion

Ten participating countries (Austria, Canada, Denmark, France, Germany, Ireland, Japan, Netherlands, Switzerland, and the US) returned answers to the questionnaires.

Separation between energy and urban planning is typical, except from Denmark and Netherlands. For instance, in the Netherlands energy and urban planning are co-located in the same department. Both Netherlands and Denmark have developed strategies at governmental level that interconnect urban and energy planning. The separation of urban and energy planning within other countries is associated with divided responsibilities between the departments and lack of inter-departmental planning.

In most countries, while the government is responsible for environmental issues and target setting while it is the municipalities that are in charge of the implementation to support these targets. In many cases, governments define environmental targets and downscale them to community levels. However, this procedure often leaves communities in the situation of being responsible for meeting targets, which might be impractical for implementation due to specific community structure or due to not accounting for local interests and needs.

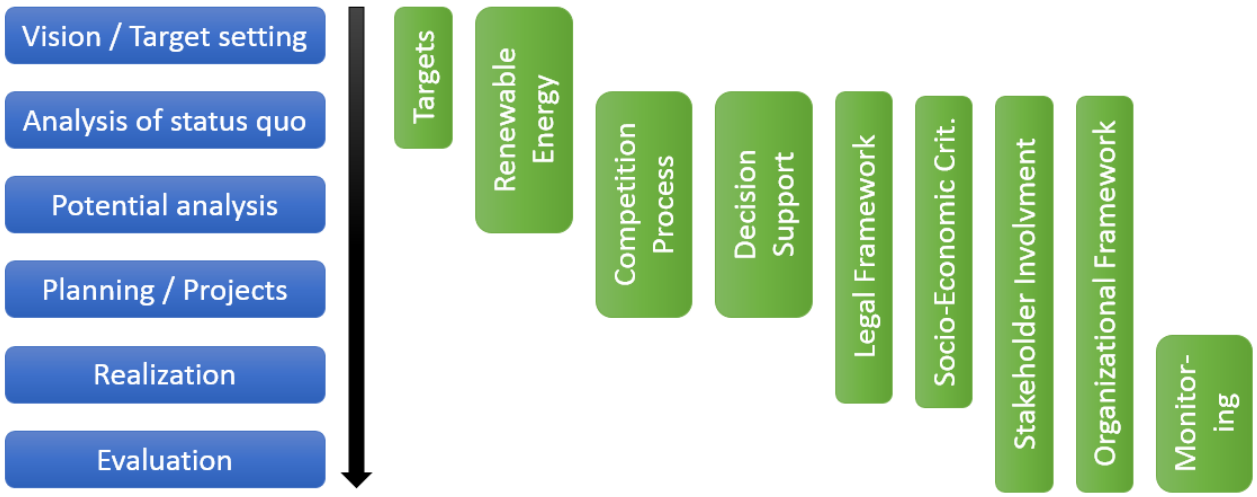

Fig. 3. Relevant clusters (right) with implementation phases (left)

Moreover, questionnaire responses show that the implementation phases often lack a monitoring and evaluation phase, which is able to quantify the progress and current achievements of single projects or the overall energy efficiency transition process. Thus, it is difficult to assess whether a

project has been a success. This causes uncertainty, which limits confidence and impedes further decisions or planning phases for energy efficiency implementation.

The analysis and comparison of relevant instruments and processes within the 10 participating countries led to identification of 88 relevant measures. In this case, we define a measure as any action or program that can influence the implementation process. The 2000-Watt site certification scheme is one example for a measure. The 2000-Watt Society idea is based on the concept, that around 2000 Watt constant primary energy power could be used per person on the globe, while still being sustainable [5]. The 2000-Watt certification is intended to trigger energy efficiency implementation within cities and raise the public awareness of sustainability.

The analysis of relevant measures showed, that single measures of different nations had similar aims and focus, such as the Swiss 2000-Watt Society or the German National Action Plan on Energy Efficiency (NAPE) [6]. Both aim at supporting energy efficiency actions as well as defining criteria for energy efficiency evaluation. Thus, all measures have been grouped within 9 clusters to extract relevant topics beyond national borders. Figure 3 shows the clusters and their entry points in time.

The clusters “Targets” and “Renewable Energy” have been identified as important for initiating a municipality’s transition to low carbon environment start. Both should define aims as well as the strategic path of implementation. The question of how to transform or translate national energy goals to community is of particular importance for the “Targets” cluster. One the one hand, these goals should be realistic, while, on the other hand, they should not undermine ambitions to implement a high level of energy efficient concepts. The “Renewable Energy Strategies” cluster aims at enabling the integration of large shares of renewable energy into communities. These strategies typically incorporate technical, social, economic and political issues and are developed in cooperation with local key stakeholders. Hence, Renewable Energy Strategies can also be seen as a guiding framework for the following implementation process of energy targets. Central to strategy is the organization and planning of the most appropriate and strategic measures on how to reach the energy targets. This includes the use of measures from all other clusters makes renewable energy strategies to a platform in which the other measures are anchored in. Moreover, the domains of energy efficiency and energy demand reduction are part of this cluster.

Special emphasis is put on the integration of local stakeholders and the municipality. The “Competition Processes” cluster should make suggestions on how to create and implement energy efficiency design programs and competitions for urban development projects. Furthermore, this cluster aims at defining the parameters by which to assess and benchmark energy efficiency concepts and their baseline conditions. The “Decision Support Systems” cluster focuses on the question of how to make decisions under conditions of uncertainty by integrating local knowledge, stakeholders and expertise into the decision process. Moreover, the role of supportive tools and data management strategies are explained. The “Legal Framework” cluster accounts for the separation of national regulations regarding energy and urban planning and suggests ways to efficiently function within existing legal constraints. Moreover, the “Socio-Economic Criteria” cluster deals with further parameters to monetise or incorporate the value of energy efficiency actions in decision making and for raising awareness in society and community stakeholders. The cluster focuses on criteria beyond conventional investment practices. “Stakeholder Involvement” is another important cluster within Annex 63. The cluster aims at strategies for identification of relevant stakeholder as well as approaches for engaging them in planning processes. The “Organizational Framework” cluster accounts for the question of how to combine the physical activities of urban and energy planning organisations. This question is relevant for nations and cities, where both disciplines work separately, often leading to sub-optimal processes and solutions. Finally, the “Implementation of Monitoring” cluster accounts for the question of how to integrate monitoring and evaluation concepts into energy efficiency implementation. Table 1 shows an overview of clusters, their content, conditions, and output. There is and should be strong interlinkages between the different cluster topics. The clusters should not be seen as standing alone. However, each cluster has a

different focus of importance for energy efficiency implementation and only the combination of all cluster themes enables sufficient implementation support. In the following part, results of the stakeholder involvement and the organization cluster are discussed.

Table 1. Clusters with conditions, content and output

Cluster name	**Compelling conditions**	**Content**	**Output**
Target Setting	National and/or municipal targets	"Translation" of targets to community scale	Methods, indicators
Renewable Energy Strategies	Renewable energy technology and potential	Enabling integration of renewable energy in communities	Guideline
Legal Frameworks	Existing legal frameworks	Regulative framework for energy and urban planning	Guideline
Competition Processes	Legal regulations for competitions for energy efficiency implementation	Competition program, focusing on sustainability issues, with transparent assessment	Assessment suggestions; Requirements for sustainability experts
Planning and Decision Support Systems	Data uncertainty; Different data knowledge and access per actor	Decision under uncertainty, supported by data and tools	Work flow for decision making
Implementation of Monitoring	Municipal monitoring strategy/concept	"Translation" of monitoring strategy to community scale	Guideline
Stakeholder Involvement	Different stakeholders; Identify relevant stakeholders and common interest	Efficient way to involve stakeholders	Guideline
Socio-economic Criteria	Stakeholders are willing to include other criteria than investment cost only	Analysis of best-practice examples; List of further criteria	Guideline (criteria and methods); SWOT analysis
Organizational Framework	Different organizational structures	Description of integrated planning	Recommendations for integrated planning

3.1. Stakeholder involvement

The stakeholder involvement cluster emphasizes the essential role that engaging key interests and experts could play in supporting urban development design, decision making and implementation. The integration of energy planning and urban planning is complex and necessarily requires an extensive scope of expertise and has impacts on a wide range of individuals and organizations. Engaging those who are impacted and who may have valuable knowledge will make planning efforts more effective and build a base of support for implementation [7]. The term, stakeholder, is often used to describe a party who has a personal or professional stake in the outcome of a process. Integrated energy and urban planning brings not only these interests, often representing multiple levels of decision making, but also stakeholders with economic, social, environmental, political, and technical interests effectively broadening the capability of the design team.

The act of stakeholder engagement has been typically pursued to meet legal requirements (in some local and national contexts), informing the public or enhancing understanding of problems. Its role in exploring potential solutions, producing higher quality plans and projects, and improving the quality of information informing decisions has often been downplayed by the challenge of identifying and accessing the key participants [8]. In the context of supporting implementation of technical solutions for energy efficiency, generating support for decisions and their implementation, especially across disciplines and organizations, requires structured approaches to identifying and selecting stakeholders for effective stakeholder participation and also ensuring greater inclusion of the range of potential interests [9]. For example, commonly used approaches generally account for those interested in a project or issue, as well as those with power or influence [10]. In order to account for differences in the distribution of potential impacts however, stakeholders for a project in the Netherlands were identified ant targeted based on socio-economic criteria. Another approach from the City of Guelph in Canada illustrated how stakeholders (e.g. utilities, NGOs, neighbours, chamber of commerce) were identified and then categorized based on their roles in the decision making process: as regulators, transactors, active interests, and audiences [11].

In terms of organizing stakeholder involvement, the general rule of "early and often" rule applies. The approach taken for identification and selection may vary depending on the goal of the organizer and for how stakeholder input might impact the overall decision. The International Association for Public Participation represents these goals on a spectrum that runs from lower levels of engagement via informing and consulting, to higher levels of engagement reflecting collaboration and empowerment [12]. Practical factors also influence the involvement of stakeholders: a planners' capacity to accommodate, stakeholders' personal or professional expectations, and local resources available. All may impact the scope and effect of the stakeholder inclusion effort. Examples from the Annex 63 cases suggest the need for stakeholders to be involved in setting expectations for their involvement and the goals that define the process. To establish this criteria, focus groups are a commonly used technique for engaging views and expectations from various stakeholders and advisory, steering, and technical committees can also be used to structure strategic stakeholder engagement. Any facilitation that helps advance deliberation can also be particularly helpful when bringing together diverse stakeholder who may have conflicting perspectives but need to work toward consensus around implementation. To augment the "early and often" rule however is the need for continued stakeholder involvement; from initial concept discussions through more details planning and design. Most importantly though, case studies have shown that stakeholders need to be consulted on a continuous basis.

3.2. Organisation and Planning Processes

The energy transition within cities seems to require new organisational frameworks to support the planning process for all stakeholders. Cajot et al. analysed urban planning processes and identified contradictory objectives and uncertainty in process design as major challenges [13]. New kinds of organisational frameworks can serve as solution by enabling an efficient exchange between all relevant actors and create transparency in communication.

Current organisational frameworks are often based on top-down approaches, mainly expressed by zoning or master planning for energy concepts. However, resulting actions of top-down planning have an impact on local actors, which might lead to lack of participation and missing integration of local expertise or, even worse, to resistance against the actions of the top-down planning and project failure. Moreover, local stakeholders often show interest in direct participation, which can be interpreted as interest in bottom-up approaches. Heyder et al. proposed to integrate both, top-down and bottom-up, approaches [14]. For instance, this could be achieved by adding stakeholder interests and objectives into top-down planning instruments, such as certification schemes. Thus, the Annex 63 is analysing both concepts, top-down and bottom-up, as shown in Table 2.

Table 2: Steps in top-down and bottom-up local energy planning processes

Concept oriented top-down approach from district concept to pilot project	**Project oriented bottom-up approach from pilot project to district concept**
1. Set up of a local project team	1. Set up of a local project team
2. Clarify local institutional framework	2. Define energy objectives of local pilot project
3. Physical analysis and potentials	3. Technical and financial feasibility study for the pilot project
4. Involvement of local key actors	4. Detailed definition of the pilot project
5. Develop of a common vision for long-term energy goals	5. Public tender / competition
6. Derivation of specific objectives and sub goals	6. Involvement of local key actors (stakeholder analysis)
7. Define of indicators to measure success	7. Implement local pilot project
8. Define action plan: ranking and time frame for measures	8. Documentation, valuation and dissemination of results
9. Discussion of energy concept by the local government	9. Conceptual design for development of a district concept

Communication and networking are core issues to link both approaches together. An administrative body should provide the process management. It should be aware of the different needs and interests of the diverse stakeholders and of potential conflicts arising during the ongoing process. A local team in the administration or a public institution (such as local energy agency) can form that administrative body. It is important, that participating actors agree on the administrative body, respectively that it is trustworthy. Moreover, it should be able to handle all administrative procedures related to the planning process. In case of limited capacity, this can be done by delegation. However, the central coordination is important to support the planning process. As one example from the case studies, the development and urban planning agency of Strasbourg - Agence de Développement et d'Urbanisme de Strasbourg (ADEUS) initialized an exchange platform to support local energy transition by providing a platform where different actors could meet and exchange ideas and information. Another example is the foundation of the InnovationCity Management GmbH (ICM) within the city of Bottrop, Germany. The ICM is a management company to coordinate the transition process with multiple projects within the InnovationCity of Bottrop.

4. Conclusion

First analyses of the Annex 63 results identified a lack of integral urban and energy planning for most participating countries. Implementation of energy strategies does not occur solely through technical energy planning. Implementation posits practical action, implying that the strategy needs

to become embedded in actual processes of development in local communities. As a result, the interaction between energy strategy making and urban planning and development is crucial for implementation. Thus, to increase the chance of successful energy efficiency implementations in communities, strategies to enable both energy and urban planning as an integral concept have to be found.

Case studies showed new organizational structures within planning, which were supportive for the overall planning process. One common approach was to form a central coordination unit or a central platform for exchange of all actors. These central entities could serve as administrative bodies for integral planning.

Energy planners alone cannot enable implementation. In order for the written plans to become alive in the real world, other stakeholders need to take action on the plans. Collaboration stands out as one of the most crucial outcomes of this report. Without collaboration between different stakeholders implementation represents a utopia. So championing – understood as the act of bringing forth a course of action for others – represents an important endeavour in implementation practices. Thus, the following steps for stakeholder involvement are recommended:

- Identify the lead persons and/or organisations: Who holds what responsibility under which authority? Is there a critical technical or political champion, which should be engaged?
- Translate national, regional or municipal goals to community scale: What are the principles and goals in terms of energy/emission-related benefits for the community?
- Determine local stakeholders: What stakeholders share project territory, have interest, expertise and/or power to influence the implementation process?
- Identify stakeholder impacts and benefits: What impact or benefit could the project bring to each stakeholder and what are the contact points?
- Seek for local support: In what ways can stakeholder contribute local expertise and resources to support the project process?
- Determine stakeholder roles: What role can the stakeholder play within the project? What are options to interact with the stakeholder? When should this interaction begin?
- Information exchange and documentation: When and how should ongoing interactions and results be documented and shared?

The transition in processes, instruments and framework conditions of existing urban and energy planning will take some efforts. However, an efficient interaction between energy and urban planning, combined with a strategy for stakeholder involvement, has the potential to boost implementation processes and actively support carbon emission reduction actions in communities.

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