3encult

EFFICIENT ENERGY FOR EU CULTURAL HERITAGE

D 7.11

Report

On Integrated Planning Procedures For **Low Emission Concepts** In Urban Cultural Heritage Context

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0 Abstract

The *Leipzig Charter on Sustainable European Cities* emphasises the necessity of an integrated planning for a sustainable urban development and recommends the compilation of integrated urban (quarter) development concepts. The Charta also states that the broad understanding of "Baukultur"[1] is vital in this development. It includes in the context of this study the building of a sustainable city today and preserving the existing built cultural heritage, both of which determine a cities image and identity.

The historic quarters of the city are the focus of this paper. The term 'built urban cultural heritage' describes in this context the urban structures that have developed over time under a multitude of conditions and influences, representing the atmospheric, aesthetic and documentary values of the urban realm. Not all built structures in historic quarters might be listed; nevertheless any action taken for energetic refurbishment will possibly alter the substance and visual aspects of the urban environment to great extent. Solutions for the *energy-efficient urban restructuring*[2] of historic quarters are required that are not only reconcilable with cultural heritage values, but also safeguard and develop the attractiveness of these quarters for the future.

0.1 Intentions

It is the goal of this 3Encult project report (WP 7, D7.11) to provide an **additional perspective on the energy efficiency of the built cultural heritage from an urban point of view**. From such a broader perspective planning instruments for an *energy-efficient urban restructuring* will be derived. Such planning instruments will not only provide the basis for solutions that can verifiably increase the energy efficiency of an urban quarter, but will also help to facilitate a responsible treatment of the built cultural heritage values.

Starting point of this study was the question of how effective an integrated approach to the urban energy balance is compared to the energetic retrofit of individual buildings. As yet there are neither figures/data that provide an answer to this question, nor is there a systematic evaluation of practical experiences relevant in the 'historic city' context. For this reason a strategic approach based on the following questions is necessary: What type of integrated planning procedures can utilize impulses of an energy efficient urban restructuring, serve both the protection and the development of existing built urban heritage, and do so in a coordinated and effective manner?

0.2 Findings

Uncoordinated measures of energy efficient retrofit in the building stock are difficult to predict in their cumulative effect and synergies cannot be utilized. In the interest of the cultural heritage, piecemeal measures on individual buildings in the historical city quarters should be avoided. This is especially true if the built urban heritage is in danger of being significantly changed. An effective measure will relate to high efficiency and heritage values on urban level.

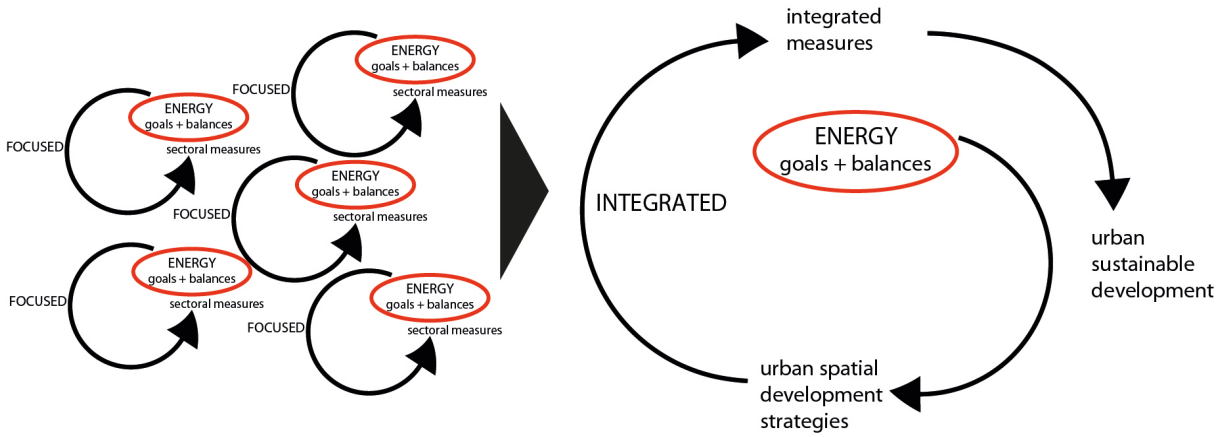
[1] "Baukultur is to be understood in the broadest sense of the word, as the sum of all the cultural, economic, technological, social and ecological aspects influencing the quality and process of planning and construction." (Leipzig-Charta 2007, p.3)

[2] Urban structural change with a view to energy efficiency and the turnaround in energy policy is covered here in the term of energy efficient urban restructuring (energetischer Stadtumbau). The term energy efficient urban renewal (energetische Stadterneuerung) is also in use and describes comparable challenges for the cities and their citizens.

At the moment the building laws offer only **limited possibilities to steer the change processes of an *energy-efficient urban restructuring*** in urban historic context. Superordinate and integrated strategies are necessary that consider the city as a whole and will work with informal instruments.

As of now there is **no linking of climate protection into Integrated Urban Development Concepts** as they are demanded for in the Leipzig Charter and applied in many German cities. The results of energy action plans should be assimilated into existing or potential Integrated Urban Development Concepts and not remain separate of them. At the moment these concepts exist in parallel, and a balancing of complementing and contradictory measures has not taken place yet.

The perspective on energy action in municipal planning needs adaptation: from integrating energy goals into sectoral planning schemes to integrating sectoral planning under set energy goals. **From this perspective energy goals can become an urban development driver.**



Integration will alleviate complexity.

0.3 Results

An integrated planning process on the urban level transcends the specific standards pertaining to individual buildings. A result of this study is a **proposal for such an integrated planning process** and the description of a **transparent and comprehensible methodology** for implementing it. One aspect of the proposed procedures is to examine aspects of both built cultural heritage and energy efficiency, and to consider them in equal measures on the level of the urban quarter.

Two methodological tools for integrating the functional and spatial level of energy-efficient urban restructuring into urban planning concepts are presented:

In Germany ***Integrated Urban Development Concepts*** as called for by the Leipzig Charter are required when applying for urban restructuring grants. These concepts are methodically underpinned here, with **the energy goals of a municipality serving as the basis for the strategic planning**. The *Integrated Urban Development Concepts* allow for an integration of communal planning by using city-wide strategic goals.

The tool of the ***Integrated Quarter Assessment*** strengthens the implementation of *Integrated Urban Development Concepts* on the level of the quarter and in the spatial integration of the strategic goals. In this tool the formative areas of **urban structure, built heritage and energy supply infrastructure**

are equally weighted for a sustainable urban development. The methodological approach of the *Integrated Quarter Assessment* can serve as an initiator of public and expert discussions and as a basis for pioneering political decisions in the *energy efficient urban restructuring*. To illustrate this method it was applied to the quarter “Südstadt” in Görlitz, Saxony.

Integrated **strategic goals can be derived on the base of experience and experts’ knowledge** and need not to await sound databases, but use existing simple methods to estimate and document baseline analysis. The methodologies proposed are based on tried and true tools from the areas of integrated planning, monument protection and energy supply engineering, and will allow for an *energy-efficient urban restructuring* in historic quarters that preserves their appearance and strengthens their values.

The methods describe actual procedures for the development of integrated concepts as well as for strategies that target **the communication and interaction of experts, politicians and the public**. The proposed tools allow for a simple spatial and functional integration of a complex planning condition:

- **The simple procedures** of the methodologies facilitate quick decision-making and political coordination by combining experience, expert knowledge and extensive data compilation.
- **The cooperative procedures** of the methodologies facilitate an integrated and strategic planning based on transparent coordination and binding decisions.
- **City-wide strategies** facilitate the spatial integration of the different planning topics, which then allow for adequate and effective measures on the district level.
- **A balanced valuation** of built urban heritage, energy efficient infrastructure and urban typologies facilitates the functional integration of the different planning perspectives.

1 Introduction – Efficient Energy for the European Cultural Heritage in the Urban Context

A historic centre and a built cultural heritage characterize most European cities. In these historic centres part of the building stock is often either listed as protected monuments, or considered worthy of preservation. But the term 'built urban cultural heritage' encompasses much more than the sum of the individual monuments. It describes the entirety of the urban structures that have developed over time under a multitude of conditions and influences, representing the atmospheric, aesthetic and documentary values of the urban realm. Axes and views, street aspects and facades, silhouettes and ensembles of residential, functional and representative buildings are the stage for the many different modes and stiles of everyday life in the city. Even with no current legal protection, these urban structures reflect the cities' history and thus may be viewed as candidates for future preservation.

The *Leipzig Charter on Sustainable European Cities* emphasises the necessity of an integrated planning for a sustainable urban development and recommends the compilation of integrated urban (quarter) development concepts. The Charter also states that the broad understanding of "Baukultur"[3] is vital in this development. This includes the building of a sustainable city today and preserving the existing built cultural heritage, both of which determine a cities image and identity.

The historic city quarters are the focus of this study on energy efficiency and the built cultural heritage. The energy efficiency of the building stock in e.g. Germany is strongly influenced by the fact that most buildings were erected prior to the first German Heat Insulation Ordinance of 1977. Only few of these buildings (appr. 3%) are protected monuments, so that measures to improve the energy efficiency may significantly change substance and appearance of the historic quarters. For this reason, solutions for the *energy-efficient urban restructuring*[4] of historic quarters are required that are not only reconcilable with cultural heritage values, but also safeguard and develop the attractiveness of these quarters for the future.

1.1 Intentions and Goals

It is the goal of this 3Encult project report (WP 7, D7.11) to provide an additional perspective on the energy efficiency of the built cultural heritage from an urban point of view. In historic quarters any measures of restructuring have to be considered not only under aspects of effective energy savings, but also under those of the cultural heritage. From such a broader perspective planning instruments for an *energy-efficient urban restructuring* will be derived, which can reduce the pressure on individual buildings to achieve the required energy standards. Such planning instruments will not only provide the basis for solutions that can verifiably increase the energy efficiency of an urban quarter, but will also help to facilitate a responsible treatment of the built cultural heritage values.

For the best possible results highly effective technical measures for individual buildings – as for instance those developed in the project 3Encult – have to be integrated into a superordinate urban context.

It is a fundamental assumption of this study that historic quarters provide an excellent basis for an energy efficient city. Resources are conserved through the (continuous) use of the existing building stock in the historic quarters, through the resulting efficient use of building materials and through the desirably high building densities that can be attained. Beside this the materials used are often easily recyclable. An urban structure and design perspective is also always a long-term one, and current developments have to take this fact into account.

[3] "Baukultur is to be understood in the broadest sense of the word, as the sum of all the cultural, economic, technological, social and ecological aspects influencing the quality and process of planning and construction." (*Leipzig Charter* 2007, p. 3)

[4] Urban structural change with a view to energy efficiency and the turnaround in energy policy is covered here in the term of *energy-efficient urban restructuring* (energetischer Stadtumbau). The term energy-efficient urban renewal (energetische Stadterneuerung) is also in use and describes comparable challenges for the cities and their citizens.

An integrated planning process on the urban level transcends the specific standards pertaining to individual buildings. A result of this study is a recommendation for such an integrated planning process and the description of a transparent and comprehensible methodology for implementing it. One aspect of the proposed procedures is to examine aspects of both built cultural heritage and energy efficiency, and to consider them in equal measures on the level of the urban quarter. The methodology is based on tried and true tools from the areas of integrated planning, monument protection and energy supply engineering, and will allow for an *energy-efficient urban restructuring* in historic quarters that preserves their appearance.

1.2 Background and Procedure

The *Görlitz Centre of Expertise in Urban Revitalisation* is a research institute of the TU Dresden focussing on revitalisation strategies for urban areas, urban cultural heritage, urban change processes and integrative planning instruments. Especially the experiences gained from the *Stadtumbau*[5] processes in East and later West Germany led to a thorough reflection of integrative planning methods, specifically the instrument of *Integrated Urban Development Concepts.* Based on these experiences the *energy-efficient urban restructuring* that municipalities are facing today is reflected in the study presented here.

Starting point of this study was the question of how effective an integrated approach to the urban energy balance is compared to the energetic retrofit of individual buildings. As yet there are neither figures/data that provide an answer to this question, nor is there a systematic evaluation of practical experiences relevant in the 'historic city' context. For this reason a strategic approach based on the following questions is necessary: What type of integrated planning procedures can a) utilize impulses for an *energy-efficient urban restructuring*, b) serve both the protection and the development of existing built urban heritage, c) and do so in a coordinated and effective manner?

Two different perspectives on the topic of *Efficient Energy for the European Cultural Heritage in the Urban Context* were considered: On the one hand the superordinate European and national climate protection goals that target the municipalities as principal protagonists, and on the other hand the communal goals and the practical planning tools that help attain them.

The results presented in this study are based on a literature search on goals, utilized planning methods, and experiences in *energy-efficient urban restructuring*. Also, different types of data analysis were performed to assess the importance of the historical building stock in the context of the energy goals. Interviews with selected East German municipalities were conducted to gain an insight into the actual practice of urban planning with regard to *energy-efficient urban restructuring*. Finally, the political expectations concerning the future energy efficiency were put into a relation to both the freedom of action municipalities have in this regard and to the practical tools currently at their disposal, with the main focus on the historical building stock.

[5] The term *Stadtumbau* (urban restructuring) is associated with the developments after 1990 in German cities, first for the new and then for the old federal states. In the early 1990ies the built cultural heritage of many East German cities was to great extent prevented from further decay, which decades of neglection had produced earlier, by federal and local initiatives and structural funding for the monument protection. Yet at the same time the cities were facing heavy structural changes due to deindustrialization and loss of inhabitants, which again induced public action, now, to save the housing market from collapsing, by reducing the number of dwellings. In order not to generate contradictory developments and to further protect the overall strategic goals of the cities, which encompass the protection of historic values, *Integrated Urban Development Concepts* had to be provided by the cities to obtain federal funding in the programme named *Urban Restructuring in the New Federal States* ("*Stadtumbau-Ost*"). Later also *Urban Restructuring in the Old Federal States* ("Stadtumbau-West") was initiated. (cp: Sulzer & Brandstetter 2010)

1.3 Structure and Content

In this chapter the intention of the study is given, and the background as well as the basic structure are described.

The following Chapter 2 – Energy Efficiency in the Context of the Built Environment – considers the topic with a view to the political goals on European and national levels, focussing on the Federal Republic of Germany. It describes the function of the municipalities in implementing the political goals and their areas of action as well as the political focus on the refurbishment of the building stock. The current planning practice is illustrated based on interviews conducted in five medium sized cities in Eastern Germany that have a significant historic building stock.

To what extent an integrated planning practice as recommended by the *Leipzig Charter* has been established in *energy-efficient urban restructuring* is topic of Chapter 3 – Energy-Efficient Urban Restructuring and Integrated Planning. It comments on the municipalities' areas of action and their integration into urban development and climate protection concepts. National guidelines and communal networks support the municipalities in planning and implementing local climate protection measures. In this chapter we also compare the functional integration[6] of planning in *Integrated Urban Development Concepts* and in climate / energy action plans, with a view to the role of both the urban built structures in general and the historic building stock in specific.

Based on the theoretical considerations described in the previous chapters, in Chapter 4 - Methodologies for Integrated Planning Procedures - two methodological tools for integrating the functional and spatial level of energy-efficient urban restructuring into urban planning concepts are presented. In Germany *Integrated Urban Development Concepts* as called for by the *Leipzig Charter* are required when applying for urban restructuring grants. These concepts are methodically underpinned here, with the energy goals of a municipality serving as the basis for the strategic planning. The *Integrated Urban Development Concepts* allow for an integration of communal planning by using city-wide strategic goals. The tool of the *Integrated Quarter Assessment* strengthens the implementation of *Integrated Urban Development Concepts* on the level of the quarter and in the spatial integration of the strategic goals. In this tool the formative areas of urban structure, built heritage and energy supply infrastructure are equally weighted for a sustainable urban development. The methodological approach of the *Integrated Quarter Assessment* can serve as an initiator of public and expert discussions and as a basis for pioneering political decisions in the *energy-efficient urban restructuring*. To illustrate this method it was applied to the quarter "Südstadt" in Görlitz, Saxony.

The conclusions of the study are summed up in the final Chapter 5, and an extrapolation on the necessity of future research is also given here.

[6] The term "functional integration" (translation for the German term "fachliche Integration") refers to planning procedures in which different departmental approaches (e.g. transport, finances, monument protection, building, urban development, environment) or topics (education, security, lighting, energy, air, noise, green) are combined in overlapping and intertwined schemes / strategies and resulting in cooperative projects.

2 Energy Efficiency and the Built Environment

More than half of the world's population lives in cities, and the high population densities lead to correspondingly high values of energy consumption and green house gas emission (cp: C40&ICLEI 2010).[7] This elicits a large need for action in terms of energy savings in cities, but cities as settlement types also have a high potential to enable this energy efficiency.

The European environmental policy, initiator for the majority of the national regulations for environmental protection (cp: BpB 2008), defined in 2007 the 20-20-20-goals as framework goals of the European climate and energy policy for the implementation of the Kyoto Protocol (cp: EC 2007). To attain these goals simultaneous approaches of saving energy, increasing the energy efficiency and using renewable energy sources are necessary. These diverse fields of activity find their expression in equally diverse political responsibilities on the national levels: in the Federal Republic of Germany, for instance, three federal ministries (environment, economy as well as transport, building and housing) are involved.

2.1 Levels of Action for Energy Efficiency – Municipal Planning

Urban areas have a central role in the implementation of the *EU Strategy for Sustainable Development (EC 2001).* Accordingly the *Thematic Strategy on the Urban Environment* was announced 2006 by the European Commission (EC 2006).[8] The local municipalities lead the way in the conception and implementation of corresponding measures for environmental protection (cp: Jörgensen 2008). Since the beginning of the 1990s an increasing number of initiatives that encourage climate protection on the level of the local municipalities has been launched and supported through programmes of the European Commission. The *Agenda 21 process* is of great importance here. It was initiated by the UN climate conference 1992 in Rio, where 172 states committed to promoting both globally and locally sustainable modes of life and subsistence strategies. This Agenda is also implemented on the level of the local municipalities, and a multitude of activities has arisen since then in the context of the *Local Agendas 21*.

Observing the development of climate relevant goals in Europe over time suggests a reciprocal influence between local municipalities and the European administration, with an important role for the local municipalities since the beginning. Many European municipalities have assumed positions with respect to climate change even before politically binding decisions regarding climate protection were made on the EU level (e.g. the *European Climate Change Programme* (ECCP) from 2000). And municipal networks, which follow clearly defined sustainability goals – such as the *Cities for Climate Protection Initiative* or the *Climate Alliance* – were established as early as 1990. This perception is underpinned by the development of the European environmental policy since 1974. With the *Environment Action Programmes* (EAP) it addresses implementation partners on the municipal level, as for instance in the 5thEAP (1993-2000) *Sustainable Cities*. Within this program the *European Sustainable Cities Campaign* (ESCTC) with the *Aalborg Charter* (*Aalborg Charter* 1994) has been initiated. Background is the continuing power increase on a European level concerning matters of environmental protection in the course of the ratification of the *Single European Act* (1987) and the *Maastricht Treaty* (1993).

2.2 Energy Retrofit of the Building Stock – Sectoral Planning

The fields of action on the municipal level can be roughly divided into adapting to climate changes (adaptation) and preventing climate changes through greenhouse gas reduction (mitigation). Within the following four sectors the strategies for greenhouse gas avoidance can be further specified: industry, transport, domestic households, as well as trade and services. According to the current edition of the German Energy Diagram (AGEB 2012) 35% of the primary energy is already consumed

[7] Notable is, that following Dodmann the per capita values of emissions in cities are not higher, even lower, than outside the city. This may be ascribed to synergies resulting from spatial density. (Dodman 2009)

[8] In the *6th Environment Action Program* (2002-2012) the thematic strategy for the urban environment with goals in the environmental sector for the urban areas is demanded.

by energy production and transport. The remaining 65% of the final energy are divided between the four sectors as follows: industry and transport consume about 30% each, domestic households about 25%, and trade and services about 15%.[9] Renewable energies currently contribute 11% to the consumed primary energy, so that no CO_2 emissions accrue for this energy fraction.

In the *German Energy Action Plan of 2010 for an Environmentally Sound, Reliable and Affordable Energy Supply*[10], the federal government focuses among other things on the energy efficient retrofit of existing buildings (BMWI & BMU 2010, p. 22). This assessment is based on the fact that around 40% of the final German energy consumption as well as roughly a third of the CO_2 emissions (BMWI&BMU 2010, p. 22)[11] are caused by the building stock.[12] The potential for energy savings is considered to be especially high as the most of the building stock was erected prior to the first *German Heat Insulation Ordinance*[13], in 1977. The targets in the *German Energy Action Plan* aim at a "reduction of the primary energy requirement in the order of 80%" (BMWI & BMU 2010, p. 22) for the existing building stock until 2050.

The European Commission puts its emphasis on comparable goals as expressed by the implementation of the *Energy Performance of Buildings Directive (EPBD)* rooted in the first *European Climate Change Program (ECCP)*. The EPBD is the foundation for the minimal energy efficiency requirements to be defined by the member states on a national level regarding both the construction of new buildings and the refurbishment of existing ones. Depending on national legislation, these standards are often based on the heat transmission coefficient of individual construction elements, which are to be reduced through insulation or other means. Exceptions are possible for protected buildings[14]; in the Federal Republic of Germany these are based on the existing laws for the protection of cultural heritage, which take precedence over the national *Energy Savings Ordinance (EnEV).*[15] For all other buildings the defined energy standards are expected to result in the estimated savings.

> *Exemplary calculation for the assessment of energy consumption of building stock based on age and typology of the buildings:*
>
> *The building stock in Germany requires about 38.5% of the available final energy, which for the building sector is comprised of heating, warm water and illumination (dena 2012, p. 15). Residential buildings use 65% of this building energy, non-residential buildings 35% (dena 2012, p. 14). In the residential buildings 85% of the energy is used for heating and 13% for warm water. Due to these facts and because there is less data available on non-residential buildings to date, the focus in the following considerations will be placed on residential buildings.*
>
> *In Germany there are 18.2 million residential buildings with 39.7 residential units and a total of 3.45 billion square meters of net dwelling area (status of 2011, dena 2012, p. 23). A further differentiation of theses reference parameters into two segment according to the building typologies of single family houses and terraced housing (SFH+TH) on the one hand and multi-*

[9] Comparable values can be found on the European level: transport 33%, industry 24%, domestic housholds 27% and commerce, services, and trade 15% (EC 2011b)

[10] Translation by the authors for „Energiekonzept für eine umweltschonende, zuverlässige und bezahlbare Energieversorgung"

[11] Other sources give a significantly lower percentage of CO_2 emissions, as for instance roughly 20% (DIfU 2011, S. 61)

[12] This encompasses the heat supply to great extent. The building stock encompasses both 18.2 million residential buildings and 1.8 million non-residential buildings. In terms of energy consumption this means: residential buildings need 65% and non-residential buildings 35% of the final energy requirement of the building stock (dena 2012, p. 22).

[13] Translation for "Wärmeschutzverordnung" by the authors

[14] Basically all buildings fall under the *Energy Performance of Buildings Directive* of the European Union (EU 2002 / EU 2010) and EPBD CEN Standards, with the possibility for each nation to exempt protected buildings from the directive (EU 2010, EPBD art. 4 para. 2 letter a). The EPBD is underpinned by each nation or region with specific requirements for the buildings. In the *Energy Savings Ordinance* (Energie Einsparverordnung, EnEV) of the Federal Republic of Germany it is possible to exempt protected buildings (ENEV 2009, §24,1). The *3Encult* project works on the relation of EPBD standards and historic buildings and on a proposal of their integration (WP 7).

[15] Translation for "Energieeinsparverordnung (EnEV)", by the authors. The ENEV 2002 replaces the older *Heat Insulation Ordinance* and the actual and effectual version of 2009 is under revision for a new version in 2014.

family houses and apartment blocks (MFH+AB) on the other hand results in the following distribution (figures of 2009, IWU 2011):

- *Residential buildings SFH+TH: 83% MFH+AB: 17%*
- *Net dwelling area SFH+TH:: 59% MFH+AB: 41%*
- *Residential units SFH+TH: 47% MFH+AB: 53%*

This shows that currently no unambiguous conclusion concerning the energy consumption of any segment (by age, type, positioning ...) of the building stock are possible on this data base, because they would show large deviations depending on the chosen reference parameter (buildings/units/area).

Based on the data of the German Energy Agency (dena), the building typologies can also be differentiated based on their final energy consumption for heating and warm water, 63% of the energy for heating and warm water are used by detached one- and two family houses (DH), 37% by multi-family houses (MFH, incl. apartment blocks) (dena 2012, p. 28). Due to the scarcity of other data, all further considerations are based on the assumption that this relation of energy consumption is not affected by building age. As mentioned above, the energy savings potential through refurbishment measures is considered to be greatest for buildings that were erected prior to 1979. In Germany these are about 13 million buildings, constituting roughly 70% of the total. This part of building stock shows the following percentages of building energy consumption (dena 2012, p. 28):

- *before 1919 15%*
- *1919 to 1948 14%*
- *1949 to 1978 46%*

With the assumption made above – that the relation of energy consumption between building types is not affected by building age – this results in the following percentages of final energy consumption for the building sector:

- *before 1919 DH: 9% MFH: 6%*
- *1919 to 1948 DH: 9% MFH: 5%*
- *1949 to 1978 DH: 29% MFH: 17%*

The consequence of this calculation based on rounded values is that the sum of the older building stock annually requires the following percentages of the entire final energy consumed per year in Germany:

- *before 1949 DH: <5% MFH: <3%*
- *1949 to 1978 DH: <8% MFH: <5%*

In summary it can be said that the building stock in Germany requires a significant percentage of energy (primary as well as final energy) and that this energy consumption is responsible for roughly a third of the CO_2 emission in Germany. The distribution of the consumption depends on building typology and age, so that sophisticated considerations are necessary to allow for targeted measures to achieve the highest energy savings possible. For example, the examined data in the German *Energy Agency's Building Report* (dena 2012) shows a high potential of energy efficiency measures for detached one- and two-family houses since their current energy efficiency is quite low, something a number of different studies have already pointed out (cp: Weiß & Dunkelberg 2010, Fraunhofer Institut 2004).

Based on available statistics such as the *Energy Agency's Building Report* (dena 2012) it is ultimately not yet possible to arrive at valid conclusions concerning what building stock requires what type of energy saving measures. This demands the inclusion of further criteria that have a high influence on the energy consumption of buildings. Among others these are the built-in or detached building positioning, the density of the settlement structures, regional differences due to building materials and techniques typical to the region as well as modifications resulting from former refurbishment measures.

How the goal fixed in the *Energy Action Plan* of the German government – to reduce the primary energy required by the building stock by 80% until 2050 – is to be attained will be further detailed in the announced *Roadmap to Refurbishment of the Building Stock*[16] (BMWI & BMU 2010, p. 22f.).

Type and extent of a reasonable energy efficient retrofit of individual buildings depends on a number of factors, among them the age of the building, construction technique and building materials, state of renovation, building positioning (determining the relation of volume to surface area). Apart from often encountered problems of building-physics there are numerous discussions and disputes concerning questions of cultural heritage and/or aesthetic values.[17] The measures commonly used at the moment to meet the energy goals for new buildings, especially for Passive- or Zero-emission buildings, offer a number of creative architectural and technical possibilities which often cannot be applied in equal measure to older buildings. There are plenty of (other) ways of energy retrofit that can be implemented in historic buildings, as shown in the *3Encult* project. Apart from the technical side of the energy retrofit for individual buildings, for the building stock there has to be a focus on planning this from an urban perspective, as individual measures on buildings may neither add up to the expected savings nor result in a reconcilable treatment of the urban historic building stock as an entity. The energy efficient refurbishment of the building stock as a central field of action for climate protection is only one among many in urban planning, and it is not solely in the responsibility of the municipal administrations. On the contrary, the municipalities have very little influence on the retrofit of the building stock as a whole.

2.3 Insights to the Municipal Planning Practice

The increasing pressure on local municipalities to take action in the fields of energy efficiency and climate protection influence the dynamics and the intensity of urban change. Affected are all aspects of urban planning in a city, such as supply infrastructure, traffic and transport, urban design and the planning regulations, housing and real estate market, trade and industry, public participation und consumer behaviour. This comprehensive perspective raises the question of how priorities are determined in urban planning practice. What are the central topics concerning the turnaround in energy policy, and how is climate policy anchored in the municipalities? How are energy issues integrated into the urban development planning, and how is this transferred into practical application?

After consulting with a selection of medium sized cities[18] it can be said that energy efficiency and climate protection are indeed topics of interest, but the intensity of the debate, the relevance in everyday planning and the fixation within the administration are very different. The interviewed cities are conscious that a need for action exists, but there is often little knowledge of the actual and current energy situation. This is due mainly to an insufficient data base. Even though their importance is growing, questions of energy efficiency seldom have a high priority in politics since they do not number among the municipal duties. Additionally, questions of energy efficiency are not readily tangible for many people and little knowledge on specific measures and effects exists. Characteristic for the efforts in energy efficiency and climate protection in the interviewed cities are multiple small measures instead of few larger projects.

[16] (transl. by author) Engl. for „Sanierungsfahrplan für Gebäude im Bestand"

[17] Grunewald and Will in a study for the Ministry of the Interior of the Free State of Saxony consider the compatibility of measures for energy efficiency and protected buildings. For specific *building typologies* of the region (applying the method to other areas appears to be very plausible) concrete measures pertaining to construction elements are juxtaposed with regard to their compatibility and their energy efficiency and are represented graphically in a comprehensible manner. (Grunewald& Will 2010)

[18] In the context of this study guideline-supported interviews were conducted in five medium sized cities in the German federal states of Saxony, Saxony-Anhalt and Thuringia. The cities were selected based on a successful participation in the *European Energy Award* certification process and / or a membership in the *Climate Alliance* as well as based on participation in the federal funding program for the *Protection of Urban Architectural Heritage* (Engl. for "Städtebaulicher Denkmalschutz", as translated by the BMVBS – Federal Ministry of Transport, Building and Urban Development, web 20.03.13) and according to their population (between 10.000 and 35.0000 inhabitants), meaning that these cities have probably already given thought to the topic of energy efficiency.

While in some of the interviewed cities concepts for climate protection[19] have existed for years and are being updated continuously, some have compiled these only recently or are planning to do so in the near future. Promotion of concept development and the associated possibility to call in and profit from external competences is of high relevance here, as the concept development within the administration is often not possible due to capacity constraints. Developing a climate concept or participating in a certification process such as the *European Energy Award* often were the first initiating step in dealing with climate and energy relevant aspects (certification processes have an advantage over membership in networks or initiatives as they initiate continuous processes, while a membership alone does not necessarily result in action). As already determined on the federal government level, energy efficiency and climate protection are interdepartmental cross-sectional tasks This is reflected in the different assignments within the administrative structure – contact persons for climate and energy can be found in the urban planning department, the environmental department, or in the building regulations department (division for communal property management). In the interviewed cities the leaders of the energy-teams or the person in charge of climate issues (mitigation, adaptation measures), respectively, have no separate budget and no authority to give directives.

Some of the interviewed cities developed their own goals out of local *Agenda 21* processes, or substantiated them on the basis of energy-balances, baseline emissions inventories, or analyses of savings potentials in the context of developing climate concepts or participating in the *European Energy Award*. The goals always refer to the city as a whole, and an uneven division of the attainable between different areas of the city is considered to be normal. The limitations due to the building environment and built cultural heritage of the cities - for instance constraints with respect to the applicability of common insulation measures - do not necessarily lead to an adapting the energy goals. One reason may be that, especially in cities in Eastern Germany, the specifications of the German federal government regarding the required CO_2 reduction until 2020 are well attainable already in most cases. It is an advantage of East German cities that these goals are set against the reference year 1990, this means that the required CO_2 reductions have already been partially achieved through renovation of the building stock and the elimination of the once widely used coal fires as well as through deindustrialisation and demographic shrinking processes. Goals that extend beyond 2020 usually do not exist and will be taken up only within an update of the climate protection concepts.

The interviewed cities concur with the opinion of the EU and the government of the Federal Republic of Germany that there is a high potential for energy savings in the building stock, but they can only act with regard to municipal buildings. For the remaining building stock they have to depend on the initiatives of private owners. In this context it has to be pointed out that there are no instruments in place to enforce the implementation of such measures, and neither is there any amount of control over the plans of the private owners. Also, the refurbishment of a large part of the building stock has taken place within the last 20 years, and this is seen as a restriction for a further increase in energy efficiency – on a strictly calculatory basis it may be possible, but economically it is hardly feasibly. For this reason and because they have no adequate method to identify those quarters with the greatest need for energy saving measures, the building stock is not a focus of the interviewed cities.

Where the interviewed cities do have the possibilities to take action is in the field of energy supply, especially when they are the largest shareholder of the local energy supply company, as these are central partners for energy savings and energy efficiency measures. One urban efficiency strategy is the use of district heating. This has a significantly lower CO_2 emission than other energy sources in densely built quarters, but despite this an increase in the district heating network is not a topic in the interviewed cities. The reasons are higher operating costs, no legal possibility to enforce a compulsory connection, as well as neglected upkeep or expansion of the network during road rehabilitation. As a consequence the primary task at the moment is the upkeep of the existing network and its improvement.

Apart from such technical and systemic measures the interviewed cities see their tasks mainly in increasing the awareness of house owners and inhabitants, a process that was described as slow and continuing. Some of the cities in question clearly function as role models in energy aspects by

[19] In Germany the climate concepts (Engl. for “Klimaschutzkonzepte”, by author) are to certain extent equal to *Sustainable Energy Action Plans* (SEAP). Beside this there are energy concepts (Engl. for “Energiekonzepte”, by author) and for a larger context the environmental concepts (Engl. for “Umweltkonzepte”, by author), but both differ in subject and goals.

enforcing the energy efficient refurbishment and use of green electricity for municipal buildings and establishments, by taking part in state initiatives such as the drafting of an information booklet for real-estate owners (Saena 2013)[20] or by granting monetary advantages if especially energy efficient household appliances are bought. Influencing the consumer habits, for instance through public energy consultancy offices, is also thought to have a high potential in terms of energy savings.

If the municipalities can perform energy efficient refurbishments only in their own building stock as described above, then the private house owners are primarily called upon to implement the standards that have been defined on the national level. Accordingly the existing governmental financial support for energy retrofit is usually given directly to the property owner (e.g. loans of the KfW bankgroup in Germany). A drawback of this process is that municipal planning is only informed of such interventions into the building stock of the city through potentially necessary application for building permits, or for protected buildings indirectly through the monument protection office. In very sensitive areas this only leaves the possibility to act through prohibitions on the basis of urban design or preservation statutes. Constructive master plans on what can be done where on a city-wide level are not being conceptualised.

As of now there is still no linking of climate protection into *Integrated Urban Development Concepts*, which is due to the fact that energy and climate relevant questions did not take an important place in conceptualisation or updates of *Integrated Urban Development Concepts*. If the city has an environmental concept the climate concepts and energy action plans currently being drafted are sometimes seen as its updates. The results should be assimilated into existing or potential *Integrated Urban Development Concept* and not remain separate of it. At the moment these concepts exist in parallel, and a balancing of complementing and contradictory measures has not taken place yet.

In the interest of the cultural heritage, piecemeal measures on individual buildings in the historical city quarters should be avoided. This is especially true if the built urban heritage (which encompasses much more than just the buildings protected by law) is in danger of being significantly changed through measures for energy efficient refurbishment. It also makes sense to avoid dispersed, uncoordinated measures of energy efficient retrofit in the building stock, since they are difficult to predict in their cumulative effect and synergies cannot be utilized. As European cities are both important fields of action for measures to attain the 20-20-20 goals and represent the public interest with regard to the cultural heritage, tools and methodologies have to be developed that allow the municipalities to initiate measures that fulfil the requirements for an energy efficient refurbishment of the building stock. At the moment the building laws offers only limited possibilities to steer these processes, for which reason superordinate and integrated strategies are necessary that consider the city as a whole and can work with informal instruments.

[20] The information booklet for real-estate owners *(Engl. for "Bauherrenmappe", by author) is a funded initiative by the Free State of Saxony.*

3 Energy-Efficient Urban Restructuring[21] and Integrated Urban Development Planning

The implementation of climate protection and energy efficiency projects is a prioritized municipal task. The high complexity and the multiple cross sectional tasks with other departments make an integrated approach advisable, especially since most municipalities will have to meet the current and future challenges with very limited financial and personnel resources. For this reason coordinated and interdepartmental strategies for dealing with climate change (adaption/mitigation) are absolutely necessary. Possible strategies for efficiency, sufficiency and consistency have to be implemented that ensure a future energy supply that is environmentally sound, reliable and affordable (BMWI & BMU 2010).

The *Leipzig Charter on Sustainable European Cities* from 2007 calls for an increase in holistic strategies and interdepartmentally coordinated actions for the process of integrated urban development *(Leipzig Charter 2007, p. 2)*. It underlines the central goals of ensuring and continuing the quality of the built cultural heritage of European cities, with the built cultural heritage being a part of a broadly understood *Baukultur.*[22] Concerning climate protection it is considered necessary to integrate measures to improve the energy efficiency in the building stock into a long-term development concept (*Leipzig Charter* 2007, p. 4). Such long-term development concepts exist in the form of *Integrated Urban Development Concepts* (INSEK/IUDC)[23] in many German municipalities. Several other European countries promote an integrated urban (quarter) development through equivalent programs on a national level, while others limit themselves to national guidelines or to programs on regional and municipal levels (cp. BMVBS 2012c, p.87).

In Germany the integrated urban development planning as an informal tool for an interdepartmental mode of governance has been experiencing a renaissance over the last 10 years (cp. Bodammer & Brandstetter 2009). Primarily it developed in the context of programs initiated by the federal government and the states that promote urban restructuring: *Social City* (*Soziale Stadt)* and *Urban Restructuring in the New Federal States* (*Stadtumbau-Ost)*.[24] Meanwhile *Integrated Urban Development Concepts* are recognized instruments for urban development in many cities (BMVBS 2012d, p. 23f). The modification from 2012 of the administrative agreements of the federal government and the states has made the *Integrated Urban Development Concept* a prerequisite for participation in

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[21] Urban change with a view to energy efficiency and the turnaround in energy policy is covered here in the term of *energy-efficient urban restructuring* (energetischer *Stadtumbau*). The term *energy-efficient urban renewal* (energetische *Stadterneuerung*) is also in use and describes comparable challenges for the cities and their citizens, but in Germany it is connected more closely with the development of the cities in West Germany from 1970 to 1990. Urban restructuring (*Stadtumbau*) is associated with the developments after 1990 in Germany, first for the new and then for the old federal states. Today it encompasses in a more general sense the process-oriented urban change through incremental measures and with participation of many protagonists under strategic goals. It is not to be confused with the urban restructuring that took place around the end of the 18th century in many large European cities, where massive changes took place in the building stock through large-scale planning as for instance by Haussmann in Paris. (Sulzer & Brandstetter 2010)

[22] "Baukultur is to be understood in the broadest sense of the word, as the sum of all the cultural, economic, technological, social and ecological aspects influencing the quality and process of planning and construction". (*Leipzig Charter* 2007, p. 3)

[23] The acronym INSEK or ISEK is widely used in Germany for "Integrierte Stadtentwicklungskonzepte", the acronym IUDC for *Integrated Urban Development Concepts* is being established in international context.

[24] With the recognition of the high structural housing vacancies at the end of the 1990s, the debate concerning the current and projected demographic development became a key topic of urban development planning in East Germany. According to the recommendations of the Commission for Structural Change of the Housing Market in the New Federal States (Engl. for „Kommission Wohnungswirtschaftlicher Strukturwandel in den neuen Bundesländern", by author) the demolition of dwellings became subject to the federal funding program *Urban Restructuring in the New Federal States* (*Stadtumbau-Ost*). To prevent contradictory developments and to further protect the overall strategic goals of the cities, which encompass the protection of historic values, *Integrated Urban Development Concept*s had to be provided by the cities to obtain funding in the program.

all *urban restructuring funding schemes*[25] (VWV 2012). The Memorandum *Urban Energies – Urban Challenges* of the Federal Ministry of Transport, Building and Urban Development, Germany from 2012 is based on the *Leipzig Charter* and calls for sectorally, temporally and spatially integrated strategies for dealing with climate and energy issues in Germany. Based on the stipulation that energy efficiency begins with the individual building but that the total efficiency of the quarter or region is the deciding factor, it considers a new direction to be necessary in urban development concepts (BMVBS 2012b, p. 7). Prior to this the German Conference of the Ministers of Constructions in 2008 also recommended using integrated concepts for linking municipal politics and actions in the areas climate protection and energy. It is assumed that the municipalities need adequate help for the development of climate protection concepts and their integration into the urban development concepts (BMK 2008, p. 16f).

3.1 Support for an Energy-Efficient Urban Restructuring

To support local activities in environmental protection – and today increasingly in climate protection – a number of international municipal networks, initiatives and projects[26] have come into being over the last 20 years. They offer both a possibility to link the local experiences of the municipalities and to promote a continuity of local activities. Some of these international platforms such as the *Climate Alliance, ICLEI-Local Governments of European Cities* and *EnergyCities* exist since 1990, but up to now only a small percentage of all European cities participates in one or more of these networks – there are over 100 000 municipalities in Europe, but the members of the five largest networks and initiatives number only several thousand.

The spectrum of offers and tools in these networks is similar, but there are differences in the respective focus as well as in the use the municipalities make of them. Some networks primarily promote the exchange of best-practice knowledge, some provide tools for target/actual analysis, and some provide recommendations for public communications or the implementation of measures. It should be mentioned that there are multiple overlaps in the networks and in what they offer. ICLEI, *ClimateAlliance* and *EnergyCities* for instance are responsible for the organization and management of the *Covenant of Mayors*. The recommended valuation methods and control tools for directing implementation processes are sometimes identical, too – the Toolbox of the Methodologies Climate and Energy is developed in cooperation with ICLEI and the *Covenant of Mayors*, and the valuation software *EcoSpeed* is recommended both by the *ClimateAlliance* and in the context of the *European Energy Award*.

The activities of the networks try to encompass all levels of urban planning and give corresponding recommendations for planning and implementation of energy efficiency measures, with the main focus on municipal actions for climate protection, as a matter of course. This becomes obvious for instance in the *Sustainable Energy Action Plan* (SEAP) as demanded by the *Covenant of Mayors* and its extensive instructions, which state that a sustainable energy management is to be integrated in all resorts of the municipal administration (EC 2010b, e.g. on p.26).

In the guides for climate protection concepts supported in Germany by the *Municipal Climate Protection Initiative*[27] since 2008, only few indications of an integrative approach can be found. The reason for this lies in the current practice of developing climate protection concepts: Generally the

25 (transl. by author) Engl. for “Städtebauförderungsprogramme”

26 The European Commission assesses in the context of URBACT to which extent a summarised overview of the communal networks, initiatives and projects on a large variety of topics is feasible, and how it can be made accessible through a web based portal (EUKN - *European Urban Knowledge Network*). Lists with programs, projects and initiatives that deal with questions of energy efficiency in Europe can also be found on the website of the *Covenant of Mayors* and of the Concerto Premium Project. For the existing initiatives, their aims and projects, or the „good practice“ examples (e.g. one the site of the *Covenant of Mayors*), there is no independent evaluation and no assessment with regard to successful strategies, is the conclusion of the EU Commission in its communication concerning the *Thematic Strategy on the Urban Environment* (EC 2006, p.7 para. 5.3.2.).

27 (transl. by author) Engl. for “Kommunale Klimaschutzinitiative”

draft of climate protection concepts is done by external (engineering) firms where technological and economical considerations take precedence in the identification of the reduction potential of climate relevant emissions. Although there is a *Guideline for the Draft of Climate Protection Concepts*[28] (BMU 2012) which stresses the strategic character of climate concepts, the necessity of integrating the results in integrated urban development planning is not mentioned in the guideline. As central parts of a climate concept the guideline names a description of the initial situation by way of energy and CO_2 balances, an analysis of the potential for energy savings and efficiency, and a list of possible measures (BMU 2012, S. 5). There is only a short reference to the *Practical Guideline to Climate Protection in Municipalities*[29] (Difu 2011) of the German Institute of Urban Affairs (DIfU), and though the necessity of integrating climate protection into urban development planning is mentioned here, it gives no advice on the actual implementation (DIfU 2011, p. 29f.).

3.2 Municipal Fields of Action – Functional Integration

The areas of action for *energy-efficient urban restructuring* can be found in all departments in the municipalities and coincide with the classical task of urban planning. Additionally, there are overlaps with a large number of private protagonists as well as personal challenges that include every single citizen. Among other things this applies to planning an energy supply through renewable sources, transportation by non-public providers, individual consumer behaviour and life style of citizens, the agricultural economy, retail, private industries and property owners. Basically every aspect of life is directly or indirectly connected with climate protection and thus with the turnaround in energy policy. As a consequence the spectrum of possible measures in the different municipal areas of action is equally extensive and versatile.

The concept of the *2000-Watt-Society*, Switzerland tries to do justice to this all-encompassing approach in naming five areas of action: housing, mobility, diet, consumption and infrastructure.[30] The concept makes concrete references to per capita goals and addresses different protagonists with respect to energy consumption: countries, cities, corporations, and citizens. The notable acceptance of the concept is also a result of the Swiss understanding of democracy, through which the implementation of the *2000-Watt-Society* in a municipality or canton has a solid political base in a citizens' vote/ referendum.[31]

Energy action plans for municipalities are limited with respect to the fields of action. The guideline for the SEAP preparation for instance names the following topics as superordinate areas of communal action: building sector, transport, renewable energies and decentralised energy supply, public procurement, urban and spatial planning, and finally information and communication technology. As a result of this and comparable guidelines, the municipal concepts for energy efficiency do not show an integrated approach, even though they refer to all sectors of planning (Birwirth & Schüle 2012, p. 17). A sole focus on energy relevant aspects ultimately results in limitations, which cannot do justice to the cross-sectional tasks of urban development and energy efficiency. In this context the recommendation of the Federal Ministry of the Environment, Nature Conservation and Nuclear Security, Germany – to prepare a concrete catalogue of measures already in the climate concept – also does not appear to be logical. The strengthening of climate concepts as called for in the professional discourse, for instance as "tools in establishing integrated thought processes"[32] (Bläser 2012, p. 8), cannot be related to either

[28] (transl. by author) Engl. for "Merkblatt Erstellung von Klimaschutzkonzepten"

[29] (transl. by author) Engl. for "Praxisleitfaden Klimaschutz in Kommunen"

[30] The concept of the 2000-Watt-Society is based on the vision of limiting the global energy consumption to 2000 Watt continuous power per person (about 17500 kWh per year/ person) to achieve an equal distribution of use and consumption of energy. The reference of energy consumption encompasses not only final energy use, but also grey energy used outside the city / country. For the industrialized countries this means a drastic reduction from the current value of over 6000 Watt p/P. (Energieschweiz 2012)

[31] Specific projects of the pilot regions of the 2000-Watt-Society – Geneva, Zurich and Bale, which serve the approach of this report could not be identified in the process of the study. Therefore the focus of this report shifted from transferring projects to the city of Görlitz to a more procedural approach of integrated planning methods for historic quarters.

[32] (transl. by author) Engl. for „Instrument der Etablierung einer integrierten Denkweise" (Bläser 2012, p. 8)

as parallel planning in similar sectors cannot be prevented in this manner. Instead a stronger integration of climate and energy specific knowledge into existing urban development plans is desirable. In many cities comprehensive strategies already exist in the form of *Integrated Urban Development Concepts* which can be reflected with a view to their energy related consequences, and modified in this respect.[33] A proposal as to the manner of such a modification exists for instance with the G*uide to Energy-Efficient Urban Renewal*[34] (BMVBS 2011). This guideline suggests an energy optimised *Integrated Urban Development Concept* ($INSEK_e$). Such a concept would form the basis for an assessment of the plausibility of energy goals and measures in a feedback loop with the administrative and professional authorities.

To fulfil the leading role that the municipalities have been assigned in European climate protection schemes, and to meet the ambitious energy goals of state and federal government as well as the EU, there is no alternative to an interdepartmental (functionally) integrated approach in order to deal with the interdisciplinary topic of energy and its multiple fields of action.

3.3 Existing Urban Structures – Spatial Integration

In addition to a functional integration, a spatial integration is also mandatory. Urban architecture (Städtebau) – the built cultural heritage – is the basis of resource-saving and identity forming development. It is often significantly influenced or altered by almost all measures of the *energy-efficient urban restructuring*. Although this is widely recognized, many of the guides and planning aids do not separately address the urban structure or the urban built heritage, nor do they suggest adapted procedures for areas historically and artistically worthy of protection. Despite the fact that many measures for a sustainable urban development of the existing urban built structure are possible that not only result in no immediate changes of the historic building stock, but also can indirectly protect it and upgrade it. An additional benefit of a focus that moves away from the individual buildings towards quarters or entire cities is that this allows for considering the total energy efficiency, so that measures can be taken where they elicit the largest possible effect.

Certification processes for the reduction of energy consumption and CO_2 emission such as the *European Energy Award*[35] assign concrete roles only to historical quarters and urban architecture that are owned by the municipality. The process for the *EnergyCity-Label*[36]*,* Switzerland[37] for existing buildings also only recommends determining energy efficiency potentials of the building stock and factoring-in and asserting energy efficiency standards in the planning stage whenever possible.[38] A separate proceeding for handling buildings that are historically, culturally or aesthetically worthy of protection is not suggested. The instructions for preparing the SEAP specifically mention historic buildings (EC 2010b, p.137, para. 1.1.4) in Part III (technical measures) and recommend the retrofit of existing buildings after extensive planning (energy audit). But they do not go into any detail about how the recommended adequate balance between the protection of the historical building substance and the improvement of the total energy efficiency of the building stock is to be achieved (EC 2010b, p. 137). It is emphasised that there are no 'ideal solutions' and that a 'mix of flexibility and creativity' is

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[33] The Practical Guideline to Climate Protection in Municipalities (Klimaschutz in Kommunen) of the DIfU gives a comparable recommendation that points out the necessity of integrating the sectoral climate concepts into the urban development planning (DIfU 2011, p. 30).

[34] (transl. by author) Engl. for "Handlungsleitfaden zur energetischen Stadterneuerung"

[35] The *European Energy Award* certification process was developed in the context of the EU projects *Communal Label*s and EURENA that were funded by the 5th research program and by the SAVE II program of the EU.

[36] (transl. by author) Engl. for "Energiestadt-Label"

[37] The label *EnergyCity* is part of the implementation strategy of the *2000-Watt-Society*. It assesses and certifies concrete measures and plans in the cities for the reduction of energy consumption. The label *EnergyCity* also inspired the later *European Energy Award* and corresponds to the *European Energy Award* in silver (cp. Energiestadt)

[38] Concerning the treatment of monuments, the *EnergyCity* label and the SEAP guideline refer to a paper of the Swiss Ministry for Energy (Bundesamt für Energie) that describes the special role of monuments and their treatment in the case of an energy efficient refurbishment (BfE 2009).

necessary in the municipalities to reach the 'optimal compromises' (EC 2010b, p. 137, para. 1.1.4). The *Practical Guideline to Climate Protection in Municipalities*[39] of the DIfU remains similarly vague in its explanations concerning the energy efficient retrofitting of the historic building stock and only refers to the fact that 'intelligent adapted solutions' are necessary to preserve the appearance and the cultural heritage in the historic districts (DIfU 2011, S. 65).

The available assistance that has been acquired and prepared by the international communal networks and initiatives focuses primarily on questions of organisation, communication and implementation of energy efficiency measures. An interface between climate strategies and a superordinate and integrated urban development strategy is not substantiated, although the relevance is not questioned, either. Beyond this they do not dwell on how to deal with historical buildings and urban built structures worthy of protection. These tasks thus fall to the municipalities themselves.

To arrive at intelligent solutions, a well-founded overview over the existing urban structures and their architectural and cultural values is an essential basis in the development of energy relevant strategies for the building stock. One possibility to realize this is using survey methods like those applied in the areas of urban architectural heritage protection schemes, or more specifically the method suggested by the Save / InterSave projects (Denmark)[40]. The necessary analytical basis can additionally be derived from the combined consideration of the urban development schemes and supply engineering framework on the level of the entire city. Optimal supply systems can not only reduce CO_2 emission, but also protect urban architectural heritage from identity changing measures. Here, too, methodologies for identifying a need for action are in place. One instance is based on the foundation of *settlement structure typologies* developed by Roth et al (BMRBS 1980)[41], which in combination with *building typologies* of the TABULA project[42] (IWU 2012) were modified for a rough evaluation of the initial energy position of a quarter[43] by Koziol et al. (BMVBS 2011).

39 (transl. by author) Engl. for "Praxisleitfaden Klimaschutz in Kommunen"

40 The *SAVE – Survey of Architectural Values in the Environment* project was initiated in Denmark 1990 as a reaction to the Granada Declaration from 1985 that for the first time included "groups of buildings" and the urban context for the representation of monuments worthy of protection (Granada Convention 1985; Article 1). The SAVE method has been in use since in the 1990s in Denmark to survey the monuments worthy of protection (MEE DK 1997, S.3). InterSAVE-project was initiated 1995 as a supplement to SAVE. In it the analytical method of SAVE for the documentation of heritage values of a) the urban situation (developed structure) and b) of individual buildings are transported to the international context (MEE DK 1997)

41 The Federal Ministry of Spatial Planning, Building and Urban Development, Germany (BMRBS - Bundesministerium für Raumordnung Bauwesen und Städtebau) commissioned the study by ROTH et al, *Interdependencies between settlement structure and heat supply systems* (Engl. for "Wechselwirkungen zwischen Siedlungsstruktur und Wärmeversorgungs-systemen", transl. by author) (BMRBS 1980). This study formed a foundation for the assessment of settlement structures and their energy efficiency and showed among other things the mutually dependent factors heating supply and insulation of buildings. According to Roth there are 9 settlement structure typologies: ST1 –detached houses, semi-detached housing (one and more families) of low density / ST2 – village centre and detached houses, semi-detached housing of high density / ST3 – terraced houses (town houses) / ST4 – row housing, linear building structure of low density / ST5 – row housing, linear and high rise building structure of high density / ST6 – block building structure / ST7 – inner city block building structure (19th century, Wilhelminian) / ST8 – medieval city structure, and ST9 – industrial and warehouse buildings. (BMRBS 1980, pp.49, 97)

42 The international project TABULA expanded the *building typologies* as determined by the IWU for Germany for the European context.

43 Koziol presents a plausibility check of energy/heat supply systems for different types of settlement and building structure (BMVBS 2011, p.115ff.).

4 Methodologies for Integrated Planning Procedures in Energy-Efficient Urban Restructuring

Municipalities are always subject to an enforced change, be it due to the exigencies of an economic, demographic or – as today – of an energy related nature. To actively manage this change the municipalities need planning methodologies that give simple yet plausible findings, serving as a basis for political decisions while simultaneously relieving the burden on the administration.

There are calls for integrating climate protection into the practical application of urban planning, as demonstrated in the prior chapter. The political pressure associated with climate protection goals generates an imbalance between the ensuing priority for energy related measures on the one hand and the planning practice in the municipalities on the other hand, whose integrative goals in urban development remain the deciding ones. The task of climate protection should smoothly blend into the existing integrated planning structures, and not be added as an afterthought.

It is all about a fine difference in perspective: instead of enforcing the integration of energy efficiency goals by means of a catalogue of measures in all areas of sectoral planning, it would be possible to promote an integration of the action fields of urban planning under the heading of energy efficiency. This could turn the topic of energy efficiency into a driver for integrated urban planning.

In the following a procedure for the preparation or modification, respectively, of *Integrated Urban Development Concepts* is proposed that takes energy aspects into account from the start.[44] Within this procedure another methodological step is introduced – the *Integrated Quarter Assessment* – which substantiates an integrated approach to the topics of built urban heritage, urban structure and supply infrastructure. Both methodological tools are suitable for a detailed integrated planning of energy efficiency in culturally significant building stock.

4.1 Methodology – The Integrated Urban Development Concept

Prevailing aim of an *Integrated Urban Development Concept* is the conclusiveness of development strategies, their high relation to reality and a perceivable prioritisation of the strategies to be implemented. The deciding criterion for effective *Integrated Urban Development Concepts* is not completeness as in compiling all planning projects in one paper. Ideally it results in a focus onto strategies that complement each other and thus enable synergistic effects between the planning sectors in the city.

The method presented here was designed as a tool for strategic urban planning in the municipalities, and it underpins the energy goals within the *Integrated Urban Development Concepts*. Climate concepts or energy action plans, as currently prepared in many municipalities, are to be considered as sectoral plans. Energy goals derived from these plans are incorporated into the *Integrated Urban Development Concepts*, and measures taken to attain the goals will be developed based on the concepts integrated strategies.

4.1.1 Process

An *Integrated Urban Development Concept* is either realized by the city planning department itself or on its behalf by an urban planning office. The responsible planning entity also has the function of a moderator and assumes the responsibility for public participation and the documentation of the development process. The participation of the different departments as well as the communication with politics and citizens is essential for the acceptance of the concept. The basics of the concept and pertaining decisions have to be worked out in politically backed task forces that are guided by participatory processes. Compositions of the task forces differ for each municipality and depend on the

[44] The suggestion takes up considerations of a project for the modification *of a Guideline for Integrated Urban Development Concepts in the Free State of Saxony* from 2008/09 (Görlitz Kompetenzzentrum 2009).

organisational structure and the size of the city. A decided procedure for the development of the concept and the public participation has to be conceptualised and transparently documented accordingly.

4.1.2 Structure

An *Integrated Urban Development Concept* according to this method is organised into four parts: A – formative prerequisites, B – integrated concept, C – implementation strategies D – summary and appendix.

A – Formative prerequisites

1. **Information on the municipality** comprising short statements concerning location, size, area, function and regional classification as well as organisational structure of the city and participation in the preparation of the *Integrated Urban Development Concept*.
2. **Description of the city-wide situation** using a tabulated SWOT analysis (strengths – weaknesses – opportunities – threats) and an **existing vision** for the future development of the municipality (Leitbild)
3. **Information regarding the demographic development** using appropriate graphic representations of the demographic development to date, future demographic developments as well as foreseeable shifts of age structure, together with short descriptions of possible consequences (preferably based on existing local, regional or national data)
4. **Information regarding energy and CO_2 balancing, the future development potential and the goals derived from this with respect to energy efficiency and climate protection** using appropriate graphic representations together with short descriptions of possible consequences

B – Integrated concept

1. **Combining the contributions of the different city departments** (sectoral plans) and other important assets (local and regional engagements) on the basis of abstracts of sectoral plans from the departments and / or using *thematic fields of integration* (see below)
2. **Formulating strategic goals** (taking into account the demographic developments and energy efficiency as well as climate protection goals) for the city as a whole
3. **Consensus and priority building** for the implementation of the goals with subsequent city council resolution and feedback to the departments

C – Implementation strategy

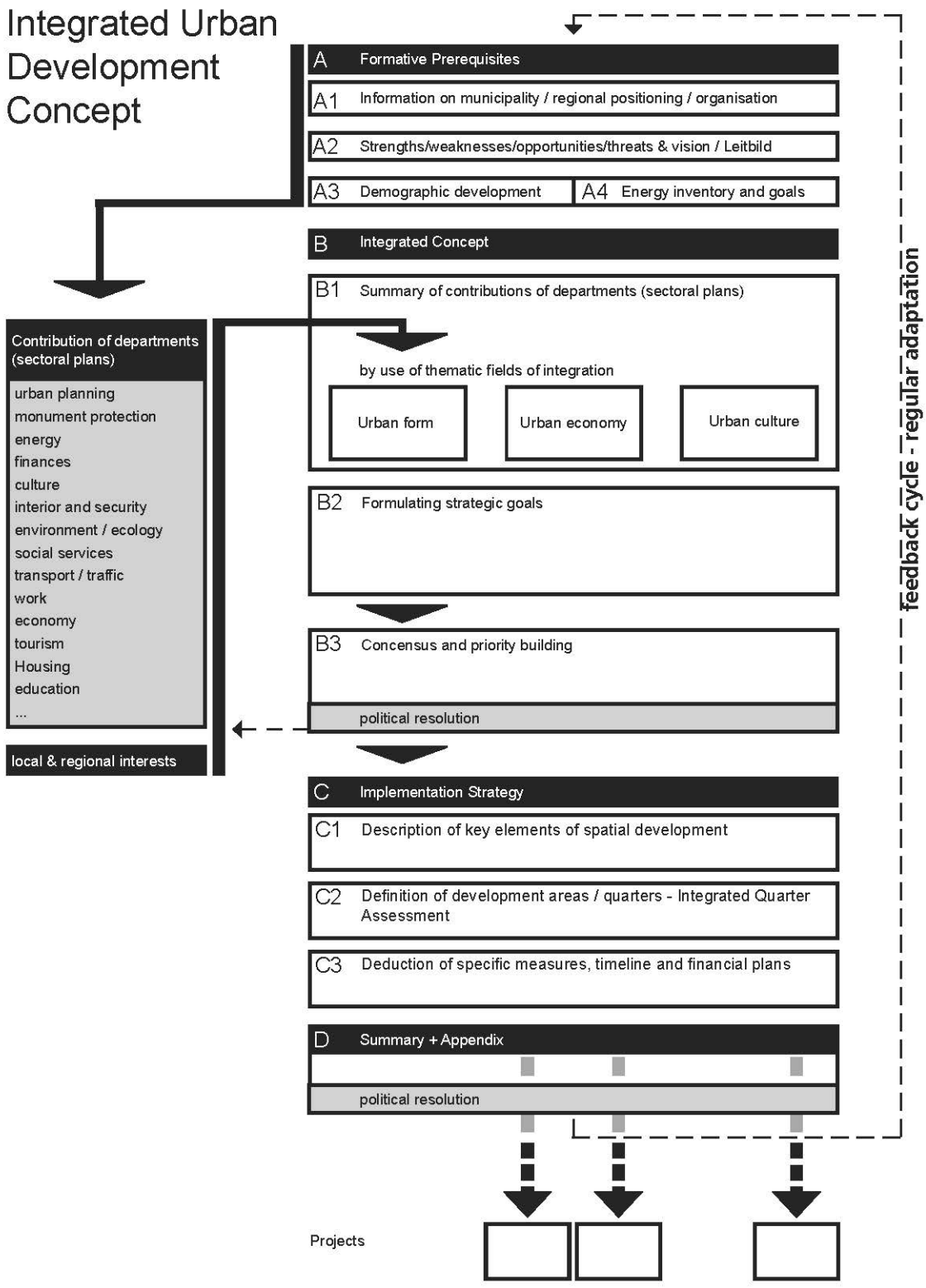
1. **Description of the key aspects** for **spatial development** that are derived from the city-wide strategic goals
2. **Definition of development** areas for further in-depth analysis, conceptualization and execution of the ***Integrated* Quarter *Assessment***
3. **Deduction of specific measures with statements on the financial viability and the timeline of implementation** for the development areas/ developmental key aspects (if necessary with a repeated city council decision)

D - Summary and appendix

1. **Summary of the concept**
2. **Compilation of important materials** that contribute to the conclusiveness of goals settled upon and to the transparency of the strategies developed (illustrating maps, plans,

summarized sectoral plans of the different administrative departments, other supplementary information)

FIG 4.01: Integrated Urban Development Concept – schema



Demographic changes and energy goals are included from the start in all sectoral considerations as prerequisites for an integrated approach to urban development (A). These basic parameters are coordinated on the political level and are considered to be binding for the planning. The planning departments adopt the assumptions and goals determined in the SWOT analysis and in the demographic and energy framework for the development of sectoral plans.

To combine the concepts from individual departments into an integrated concept (B) it is necessary to concentrate on the main strategic goals. Papers that summarize the intermediate and long-term goals of the departments as well as the according measures that have been deemed the most important ones can facilitate this. Depending on the size of the municipality it should be determined whether an integrated structure of the departmental results can be developed using thematic fields of integration. These thematic fields refer to specific questions and will include the relevant strategies of different planning sectors under superordinate topics, like the *urban economy, urban culture or urban form (Gestalt)*. The integrated concept then describes city-wide strategic goals which serve as the guideline for the implementation and evaluation of planning measures in the city.

A spatial integration of the strategic goals is necessary for the implementation strategy (C) of the *Integrated Urban Development Concept*. This localisation arises from the superposition of the city-wide strategic goals and is delineated on the city map when feasible. Development areas are defined and the prioritisation of the strategic goals is considered. According to the *Integrated Quarter Assessment* proposed here (see 4.2) the strategic goals are subjected to a further in-depth analysis and underpinned with measures on the level of the urban quarter.

The summary and appendix (D) provide an overview and transparent insight into the process. The summary serves the public communication of the *Integrated Urban Development Concept* which will have to be politically backed by a resolution / vote. The preparation of an *Integrated Urban Development Concept* is an iterative process. Adaptation and up-dating on a regular basis are fundamental to its success.

4.1.3 Relevance of the Integrated Urban Development Concept

The *Integrated Urban Development Concept* is a planning instrument, which serves the municipality to plan a coherent development and evaluate the implementation of projects. In Germany the concepts have a growing importance in the communication with the superordinate political levels – the regions (county/provinces), states (Länder) and the federal government. Federal funding schemes for urban development are e.g. based on the preparation of *Integrated Urban Development Concepts*.

As shown in chapter 3, the interdisciplinary topics of energy efficiency and climate protection require a professionally and spatially integrated approach in the municipalities. The foundations for this are the strengths and weaknesses of the urban area as well as demographic and energy-relevant contexts. By means of an Integrated Urban Development Concept the goals of sectoral planning are coordinated and strategies on a city-wide basis developed. Such a concept needs to be profound, concise and politically backed. An interdisciplinary and participatory preparation serves these aims. Finally it is a document, which should be accessible to all and subject to public communication and regularly be up-dated accordingly. The proposed method for an *Integrated Quarter Assessment* is a pragmatic part of such an all-encompassing integrated planning process.

4.2 Methodology – The Integrated Quarter Assessment (IQA)

Public discussion and the political decision making process can profit from an integrated assessment of the topics built urban heritage and efficient infrastructure on the level of the quarter in relation to the existing urban structure. It is the goal to achieve a simple, comparable and integrated assessment of urban quarters through an interdisciplinary discussion. The discussion should lead to differentiated statements concerning the consequences for an energy-efficient urban restructuring that is efficient and compatible as well as reconcilable with the built urban heritage values. This should give rise to recommendations regarding further proceedings, to the determination of priorities, and ultimately to measures that can be taken. The described method facilitates important landmark decisions in *energy-efficient urban restructuring*.

The *Integrated Quarter Assessment* is based on the idea of a city-wide integration – as proposed by Koziol et al. (BMVBS 2011) and based on the *settlement structure typologies* by Roth et al. (BMRBS 1980) – of the expertise on energy supply infrastructure and building stock typologies (TABULA 2012) Foundation for the analyses and their depiction is a topographical map of the city showing the building structures (figure-ground) and plots. (scale 1:25.000 to 1:40.000 for the city, 1:2500 to 1:4000 for the quarter). The urban structure and infrastructural assets, the urban development schemes as well as the built heritage values of the quarter are depicted. The SAVE/ InterSAVE – Projects (MEE DK 1997) e.g. offer simple survey methods of urban built cultural heritage values bases on existing documents. With the help of these existing methods analytical representations of urban structure, built urban heritage and energy supply infrastructure can be gained with comparatively little effort. These representations serve as a basis for the interdisciplinary discussion.

4.2.1 Process

Under the leadership of the city planning department, an interdisciplinary group of experts is provided with an official/ political mandate and undertakes the *Integrated Quarter Assessment*. This requires a moderated one-day workshop with an inspection of the quarter and a panel discussion of all participating experts. The expert group should consist of experts for urban planning as well as representatives from at least three of the following disciplines: Monument protection or history of architecture, city- or supply engineering, civil engineering or architecture and possibly traffic engineering / public transport.

Based on a preparatory description of the quarter (I) and an inspection of the quarter by the expert group, a survey is made of the relevant aspects of sustainable urban structure, built heritage values and energy efficiency of the infrastructure (II-1). In the following consensus-oriented discussion the three topics will be assessed on the basis of five criteria each (II-2, for the criteria see list below). The results of the *Integrated Quarter Assessment* are put into a differentiated report.

On the basis of the *Integrated Quarter Assessment*, recommendations regarding the *energy-efficient urban restructuring* of the quarter can be made, and measures can be reappraised on an urban architectural and developmental level. A cross-sectional view of multiple urban areas on the basis of the *Integrated Quarter Assessment* can further identify contradictions or synergies of the measures, respectively, on city-scale.

4.2.2 Structure

The *Integrated Quarter Assessment* is organised into three main parts:

I – Preparatory description

1. **Basic information** on the quarter in concise text passages regarding location and topography, historical development and significance as well as current quarter situation and relevant funding programs

2. **Supplementary documentation** concerning the location of the quarter in the city as a whole (topographical map, scale 1:20.000 to 1:40.000) and photographs / sketches of typical sites und distinctive features of the quarter

II – Integrated assessment

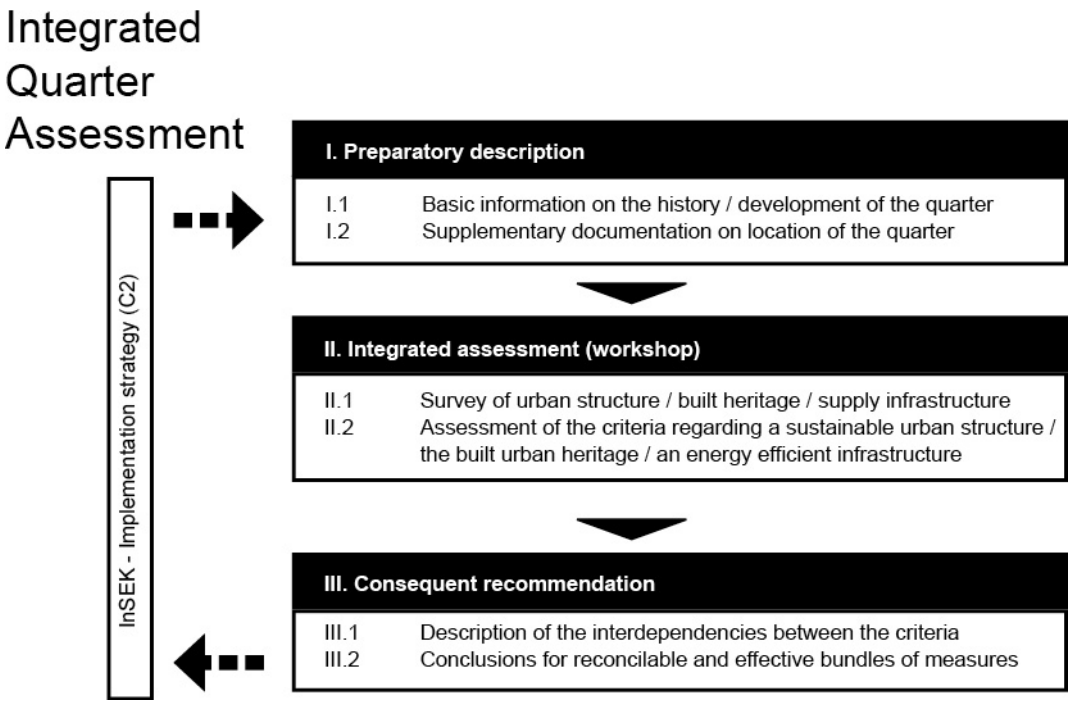
1. **Survey of urban structure / built heritage / supply infrastructure** (three paragraphs with supplementary maps / aerial views, scale 1:2000 to 1:4000) as a result of an inspection of the quarter by a group of experts.

2. **Assessment of the criteria regarding a sustainable urban structure / the built urban heritage / an energy efficient infrastructure** in a consensus-oriented, moderated discussion group using a point-based grading system.

III – Consequent recommendations

1. **Description of the relationships and interdependencies between the criteria** to evaluate possibilities of action (protocol of the expert discussion)
2. **Conclusions** for compatible, reconcilable and effective bundles of measures

FIG 4.02: Integrated Quarter Assessment – schema



Basic quarter information – preparatory description (I.)

The description of the quarter is prepared prior to the workshop and serves as a common foundation for the expert workshop. It contains information concerning location and significance of the quarter within the city as well as concerning its historical development and distinctive topographical features. A short description of the quarter's political, economical, and social development, of model projects regarding energy efficiency, of main protagonists and of groups with vested interests is feasible in this context; The necessary information may be derived from existing urban development strategies. If of relevance, it is also recommendable to include information on the city/quarter's climate and on previous strategies to adapt to climate change.

Quarter assessment – expert workshop (II.)

The quarter description is expanded through the expert analysis of the initial situation regarding urban structure, urban heritage and supply infrastructure. This survey is a result of the quarter inspection through the expert group and serves to record the aspects relevant to an assessment of the quarter. It is documented in three short text passages and presented graphically in topographical maps (scale 1:2000 – 1:5000) to allow for a fast assessment as well as a superposition of the criteria.

The assessment is carried out in a consensus-oriented discussion by means of the five relevant criteria for each of the three key topics: sustainable urban structure, built urban heritage values and energy efficient infrastructure (see list below). The expert group awards between one and three points (relevance "low" to "high") to each criterion by consensus. The primary aim here is not the counterbalancing of potentials, but the integration of different aspects from each topic. The assessment reflects the result of the interdisciplinary expert discussion so that is has a sound foundation, even though it remains subjective.

The relevant criteria and the basis for their assessment are described in the following.

Sustainable urban structure

Compactness of the built city structures (low / high compactness)

Open (detached / fragmented) or closed (attached / continuous) built structure in the quarter

Population density low / high density

Number of inhabitants per area unit of the quarter in relation to the city as a whole

Utilisation ratio of space (occupancy resp. vacancy) (low / high occupancy)

Relation of utilized to unutilized square footage / spaces in the buildings of the quarter

Functional mix – mix of uses (low / high mix)

Distribution and integration of housing, working areas and supply capabilities in the quarter

Presence of green and open spaces (low / high presence)

Undeveloped areas and un-sealed plots in the urban quarter

Built urban heritage values

Perceptibility of the urban form (*ensemble*, *Gestalt)* low / high perceptibility

Structural continuity of urban built *ensemble* as a result of space defining building lines, formative facades or rooftops in the quarter

Existence of built structure worthy of protection low / high existence

Historical, architectural, cultural and constructive values of the building stock in the quarter

Architectural significance of the facades and urban space low / high significance

Aesthetically, stylistically, structurally defining building fronts', street spaces' or square design in the quarter

Existence of significant view axes, landmarks low / high existence

View axes or landmarks contributing to spatial orientation within, identification with or uniqueness of the urban quarter

Amenity of public space low / high amenity

Quality of sojourn, accessibility, and perceptibility of public spaces

Energy efficient infrastructure

Connection to public transport low / high connection

Amount and variety of public transport stops, frequency, route variability as well as cycle track networks in the quarter

Standards of retrofit of the buildings low / high standards

Quota / percentage of not renovated buildings compared to, buildings refurbished either according to or not according energy standards valid at the time of refurbishment in the quarter

Uniformity of ownership structure low / high uniformity

Distribution of private / public ownership (large or small scale) of buildings in the quarter

Efficiency of supply infrastructure low / high efficiency

Optimization of energy supply infrastructure and energy sources in the quarter

Energy efficiency of building stock low / high efficiency

Average energy requirements of the existing *building typologies* (e.g. according to TABULA) or the energy consumption of the buildings according to Energy Performance Certificates (existing architectural solutions for climate potential exploitation and needs of comfort and functionality)

To simplify the final evaluation the number of points per criterion was limited to three. To obtain a reproducible spectrum of values that is easily measured by a scale, the method of adding the values of the three key aspects was chosen. The sum of all the points (15 – 45 points) **describes a trend for the importance of the need for action** in the quarter: The **higher** the value of the overall assessment, the lower the need and under circumstances the possibility for action; the **lower** the value, the higher the need / possibility for action. Additionally, the relationships and interdependencies of the criteria indicate whether there are feasible possibilities for action.

The *Integrated Quarter Assessment* finally results in a differentiated description of consequences of the findings for the *energy-efficient urban restructuring* in the quarter and provides recommendations on reconcilable and efficient measures.

Consequent recommendations (III.)

The relationships between the different criteria are expressed in writing. A high value of points for a criterion may describe restricted possibilities of action because the optimum value for this criterion has already been attained or because changing it is not desirable. A low value of points may indicate a high need for action, though the possibilities for action may be limited due to a high value of points in another related criterion. These interdependencies are subject of the expert debate and documented in a protocol.

The relationships and interdependencies between the criteria are substantiated over and beyond the point values to gauge the consequences of possible measures in the quarter. Measures that aim at improvements for all three topics are to be preferred. If a large expected improvement in energy efficiency of the infrastructure collides with aspects of the built cultural heritage, then compromises have to be negotiated on the basis of the *Integrated Quarter Assessment*. Recommendations for further proceedings (e.g. deepened analyses, application of specific measures) are proposed.

4.2.3 Relevance of the Integrated Quarter Assessment

The *Integrated Quarter Assessment* allows for negotiations of the disciplines urban planning, monument protection and energy supply engineering concerning defined urban quarters in the city. This prevents an assessment of the need for action that is independent of the spatial assets – as it is currently common in climate concepts and energy action plans – and allows for an *energy-efficient urban restructuring* that is both effective and compatible with the built cultural heritage. The suggested method is based on selected insights into the different survey processes concerning the thematic fields of built urban heritage and energy efficiency on the urban level that were developed and tested within the last ten year in Europe. Relevant criteria of the different disciplines are combined in the proposed procedure and assessed in an integrated manner.[45] The Integrated Quarter Assessment may point out when and where further in-depth analyses are required and allows for the drafting of a development strategy for the quarter in interaction with the city as a whole. As a result measures may be devised that conform to the requirements of the different disciplines and are mutually supportive.

Low-threshold processes that are embedded early in the planning such as The *Integrated Quarter Assessment* can additionally support an *Environment Impact Assessment* (EIA) that already includes the built cultural heritage in evaluating energy efficiency measures as worked on in the SUIT project (EC 2004a) and actually in the 3Encult project (WP2). The *Integrated Quarter Assessment* may also be able to channel different interests from the start, and to prevent shortcomings and flaws later on in the process.

The consensus-oriented method allows for an equal-value assessment of the individual disciplines using a point-based grading system. This is an aid in weighting the objective as well as subjective

[45] Within the *3Encult* consortium the issue of benchmarks and categorization of monument values in connection with energy efficiency was debated with help of two methods: On the one hand the SAVE method, having been extended to categorize energy efficiency and heritage values of buildings / building parts of historic buildings. And on the other hand *Du-Mo-Method* (Du = duurzam (sustainable) and Mo = monument), which is being applied in the Netherlands and describes the procedure of counterbalancing energy efficiency and monument values of buildings. (Spiekman & Troi 2013)

assets of the built cultural heritage as well as the energy-relevant situation in the quarter. The system of points makes determining the needs for action clearer and easier to communicate outside of the expert group.

Obviously, the assessment based on numbers imparts a clarity and decidedness that it does not truly possess, and which at a first glance does not measure up to the situation. But the system of points symbolically emphasizes and juxtaposes the interests of the built cultural heritage and energy efficiency in the quarter. After the point-based *Integrated Quarter Assessment* of these topics it is both possible and necessary to compile a differentiated description of the needs for action from a superordinate perspective that combines all disciplines.

The *Integrated Quarter Assessment* does not provide a categorization of the quarters. But a comparison of the quarters within the city can be conducted using its reproducible procedures. This may form the basis of a city-wide evaluation of the integrated development strategies and *energy-efficient urban restructuring* measures and identify those that may be mutually inclusive or complementary, as well as those that may be mutually exclusive or contradictory.

4.3 Exemplary Application to the City of Görlitz

To illustrate the individual steps of the *Integrated Quarter Assessment* described in chapter 4.2, it was applied in an exemplary manner to the quarter “Südstadt” of the city of Görlitz. The required expert workshop was in this instance simulated by the authors at the *Görlitz Centre of Expertise in Urban Revitalisation*.

Görlitz is Germany’s easternmost city and directly borders the polish city of Zgorzelec. It was originally a trading town situated on the Via Regia (trade route running from Santiago de Compostela to Kiev) and first documented in 1071. The town has a historic centre of Renaissance buildings that was partially remodelled in the Baroque age. In the 19th century it evolved into a centre of industry, and buildings in the characteristic Wilhelminian style of the era were erected as city extensions. When in times of the GDR large housing estates were built on the outskirts of the city, there was a concomitant neglect of the historic city centre. During the Second World War there was hardly any destruction in Görlitz, so that over 4,000 protected monuments remain. The in large parts almost completely conserved urban ensembles from the Renaissance, Baroque and Wilhelminian eras shape the unique appearance of the city today. At the moment Görlitz has about 55,000 inhabitants, compared to about 95,000 in the 1930s; the city of Zgorzelec, once a part of Görlitz, has about 32,000. The demographic developments of population decrease with an accompanying increase in the average age currently are factors that influence urban planning in Görlitz. Zgorzelec is facing different challenges, which are of no relevance for this study.

4.3.1 Considering the City

First a simplified survey of the supply infrastructure, the urban structure and the built urban heritage was performed (see map: *City Assessment* in appendix). Settlement structures were analysed according to the *settlement structure typologies* compiled by Roth et al. (BMRBS 1980). Both *settlement structure typologies* and existing development and funding programs are depicted in the topographical map. The programs are summarized according to funds for urban development schemes (building refurbishment, urban restructuring, urban architectural preservation) and economic development schemes (trade, tourisms, enterprise). Also, the localization of preservation and design statutes is depicted. The existing supply infrastructure and utilized energy sources were also surveyed and depicted.

Considerations that take the whole city into account can be of value in controlling superordinate urban development measures and will help to reveal possible synergies and contradictions of measures on a city-wide level.[46] This is true for areas as diverse as the development new supply infrastructures or plans to up-grade, revitalise or deconstruct specific areas. Such a city-wide perspective can be

[46] Koziol et al. as well recommend a comparable map as a basis for the proceeding in *energy-efficient urban restructuring*. (BMVBS 2011, p. 66f, p. 74)

compiled either during the development of *Integrated Urban Development Concepts* or later in the process, e.g. in the context the implementation strategy.

4.3.2 Selecting the Quarter

The city-wide analysis described above can also serve to identify and / or to define the urban areas where an Integrated Quarter Assessment is to be conducted. The quarter chosen for this example is situated on the southern edge of the city centre of Görlitz in the „Südstadt". It is part of the Wilhelminian city extension and as such located south of the train station on the far side of the historic centre.

The selection of the quarter „Südstadt" was based on the following criteria:

- The quarter should not be situated in the historic centre of the city
- The quarter should contain none or very few tourist attractions
- The quarter should be a primarily residential one
- The quarter should contain urban structures typical for Görlitz

To test the validity of the method for different initial situations, the Integrated Quarter Assessment was performed for five more quarters.[47]

4.3.3 Documenting the IQA „Südstadt"

The documentation of the Integrated Quarter Assessment on the example of the quarter „Südstadt" in Görlitz, Saxony, illustrates the procedures detailed in chapter 4.2. According to the structure of the Integrated Quarter Assessment described there, first a description of the quarter with the basic parameters is made. The results of this analysis are then depicted in maps, and in the final recommendations the specific findings and their consequences for planning measures are summarized. (see pages 1-5 of *Integrated Quarter Assessment* in appendix)

[47] These are quarters in the old town, the city centre, a settlement of detached houses on the outskirts of the city, a housing development area of the GDR (prefabricated industrial construction) as well as a pre-war settlement of semi-detached houses (town houses). The correspondent documentation for these quarters is not provided here for they only served as tests to validate the method and do not provide for findings for specific low emission solutions or efficient energy use in the quarters as such.

5 Conclusions – Efficient Energy for the European Cultural Heritage in the Urban Context

Cities are accountable for a large part of the world's emission of greenhouse gas. At the same time they are especially sensitive to alterations caused by the climate change. Thus it is of central importance for the cities to take action in this respect. This is facilitated by the fact that they have a large number of possibilities in diverse areas to do so.

All climate protection goals and policies, be they from the European Union or the Federal Republic of Germany, focus on the building stock of the cities as a central field of action. This is due to the fact that most of the buildings were erected prior to the first heating insulation ordinances or similar energy efficiency strategies in Europe. Protected monuments are accorded a special consideration and are to a degree exempt from the energy relevant regulations (e.g. in the German EnEV or the European EPBD). But this only begins to meet the need for protection required by the built cultural heritage with its unique structures that characterize the city scapes. Also, the current discussion that focuses on the dilemma of individual construction elements optimized for thermal transmission coefficients versus protected urban ensembles made unrecognizable by thick layers of insulation on their facades does not do justice to the multiple possibilities of action that municipalities have.

Climate protection goals and policies primarily address the municipalities, which in consequence need tools and methods suitable for implementing and realizing the set energy goals. The cities interviewed in the course of this study corroborated the statement that the communal task of climate protection is still largely in the testing and development phase.[48] Specifically regarding the building stock the municipalities can only initiate, promote or control measures for communal buildings, with almost no possibility to do this for privately owned ones. Activating the private owners is often difficult because of economic restrictions due to prior refurbishment measures. Another obstacle can be an insufficient knowledge of the owners regarding adequate energy efficiency measures. For this reason it is important that municipal administrations live up to their often cited reputation as role models and authorities that can inform and advise.

The interviews also showed that cities participating in certification processes such as the *European Energy Award*[49] have significant methodical and content-related advantages. This can strengthen both the formation of interdisciplinary task forces and the development of adequate measures, and increase the necessary political backing. Still, if there is no immediate economic advantage recognizable, climate protection and energy efficiency measures are often accorded a lower priority compared to other aspects such as the promotion of the regional economy. Stronger arguments are needed to resolve this. Some cities accordingly suggest that climate protection should be a mandatory communal task, instead of the voluntary one it currently is. Reliable figures on the positive economic impact of *energy-efficient urban restructuring* would also be of value.

Other obstacles are difficulties the interviewed cities are currently having in surveying the energy efficiency measures taken up to date, and in estimating the actual emissions and energy consumption of buildings. One reason for this can be found in data protection policies that restrict gaining relevant data from partners of the municipal authorities such as the municipal energy supplier or the guild of chimney sweepers. A solution of this conflict is needed.

This study shows that measures with a larger, spatially integrative approach are preferable over those that target individual buildings without considering their urban context. Based on a superordinate urban context such integrative approaches can devise solutions for increasing the energy efficiency in the city as a whole. At the same time, they can utilize synergies and avoid contradictions of different measures. The complex topics climate protection and energy efficiency require an interdisciplinary procedure for the best possible use of the available resources. *Energy-efficient urban restructuring* must be based on a city-wide perspective of the built environment. It can then allow for a refurbishment of the built cultural heritage that retains the unique aspects of the buildings and may results in the further development of quarters that remain worth living in.

[48] „Aufbau-, Erprobungs- und Entwicklungsphase" (trans. by author) (cp. DIfU 2011, p. 25)

[49] initiative funded by the Free State of Saxony, Germany

What should not happen is that the communal protagonists are burdened with additional administrative hurdles and more data surveys. For this reason the currently common practice of compiling concepts for urban sustainable development (as proposed in the *Leipzig Charter*) in parallel with energy actions plans is neither feasible nor efficient. Instead, the existing findings on the balancing of energy and CO_2 emissions should be incorporated into the existing instruments of urban development planning. The *Integrated Urban Development Concepts* should be modified in a manner that allows the energy topic to give the developmental impulse it is capable of.

The methods presented in this study show a workable approach for this by assigning the same central importance to energy relevant aspects as to demographic development, a factor that began to prevail at the beginning this century. They also take up the issue of the methodological aids the interviewed cities considered necessary.

The methods describe actual planning processes for the development of integrated concepts as well as for strategies that target the communication and interaction of experts, politicians and the public. These methods allow for a simple spatial and functional integration of a complex planning condition:

- The simple procedures of the methodologies facilitate quick decision-making and political coordination by combining experience, expert knowledge and extensive data compilation.
- The cooperative procedures of the methodologies facilitate an integrated and strategic planning based on transparent coordination and binding decisions.
- City-wide integrated strategies facilitate the spatial integration of the different planning topics, which then allow for adequate and effective measures on the district level.
- A balanced valuation of built urban heritage, energy efficient infrastructure and urban typologies facilitates the functional integration of the different planning perspectives.

The challenges posed by the built urban cultural heritage with regard to an *energy-efficient urban restructuring* should be analysed in depth and systemized on the basis of the actual scientific findings. Existing research results on energy efficiency and the building stock offer first approaches that can serve as a basis for an urban development consistent with both preserving cultural heritage and increasing energy efficiency.[50] This should lead to a substantial pool of energy efficiency measures on urban scale that are compatible with the urban built cultural heritage.[51]

Appropriate tools that overlie urban and infrastructural parameters can be derived from discussing and adapting *settlement structure typologies* (BMRBS 1980). When detailed further by age, build-in situation, and refurbishment status of the buildings this may allow for general statements concerning the initial energy situation of an urban quarter (cp. BMVBS 2011). A *European urban structure typology* (*Europäische Stadtstrukturtypologie)* as a supplement to the *European building typology* (cp. IWU 2012) could offer a simple method for the municipalities to identify quarter-related potentials regarding energy savings, reduction of emission and optimal energy supply infrastructure.

The built urban cultural heritage is a non-renewable resource; obviously coordinated measures that protect it from destructive interventions by taking the pressure off this building stock are preferable to uncoordinated individual ones. The interviewed cities stated that meeting the energy goals would be significantly easier if more and better information were available with regard to funding programs: on their type, transparency and the possibilities to combine them.

In summary it can be said that the goals for energy savings, energy efficiency and greenhouse gas reduction are ambitious. To try meeting them primarily by means of measures that target the building stock is short-sighted. Furthermore, the means public and private protagonists have of taking action are limited due to constructional, financial, organisational obstacles. As a result the rate of refurbishment is significantly lower than expected (Michelsen & Müller 2010).

[50] For references and studies on the topic see furthermore for example the research projects: *3Encult* (http:// www.3Encult.eu, 12.12.12.) / SECHURBA (http:///www.sechurba.eu, 12.12.12) / CO2OLBricks (www.coolbricks.eu/ 12.12.12.)

[51] The German Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) announces the compilation of a municipal guide for reconcilable measures in historic quarters of the city. (BMVBS 2013)

The long-term structures in a quarter such as roads, *building typologies*, supply infrastructure, free spaces etc. are deciding elements for the initial energy situation. Accordingly, any *energy-efficient urban restructuring* as discussed here cannot be achieved on a short-term scale. Devising adequate and effective measures for an *energy-efficient urban restructuring* that simultaneously allow for a sensitive handling of the built cultural heritage presents a major challenge. But not without prospects for success, quite to the contrary: Existing urban structures offer significant possibilities to achieve energy efficiency, for instance through compact building structures, a network of transport systems, synergetic land use and a reduced land consumption. An additional use of resources is avoided through the continued development of the building stock. The historic city is to be seen as a starting point for *energy-efficient urban restructuring*

Energy relevant urban restructuring has to comply with the requirements of the built urban heritage, and be driven by a “Baukultur“, which enables a sensitive handling of the existing and establishing of the future, cultural and architectural values. In this sense every measure to increase energy efficiency also has to be seen under the aspect of the further development and improvement of urban structures.

It takes time and communication to plan long-term measures that are effective both in the sense of an efficient use of resources and a holistic environment protection, but it is an investment that pays. With regard to the historic building stock this means that packages of measures have to be implemented that simultaneously protect the built cultural heritage from large-scale, invasive interventions and improve the energy efficiency. We should aspire to develop and support alternatives to the refurbishment of buildings, which can be applied in locations where an invasive retrofit is not possible or desirable, or where it needs to be supplemented, and which can be offered to private property owners. Such a method for an indirect energy related upgrade of buildings would be a constructive contribution of municipal planning to the protection of the built cultural heritage and the energy efficiency of the cities.

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7 Appendix

1) map *City Assessment*
2) pages 1-5 *Integrated Quarter Assessment*

CAPTION

Types of settlement structure

- *ST 1 - detached, semi-detached housing - low density*
- *ST 2 - village centre / detached, semi-detached housing - high density*
- *ST 3 - terraced housing*
- *ST 4 - row-housing / linear building structure - medium density*
- *ST 5 - row-housing / linear building structure - high density*
- *ST 6 - block building structure*
- *ST 7 - inner city block building structure (19th century, Wilhelminian)*
- *ST 8 - medieval city*
- *ST 9 - industrial and warehouse buildings*

Programmes, schemes and statutes

- *urban restructuring programmes / funds*
- *buisness development programmes / funds*
- *preservation / design statute*
- *district boarders*

Energy sources

- *renewable energies*
- *coal*
- *gas*
- *oil*

Heating supply systems

- *individual building heating*
- *long-distance district heating*
- *local district heating*

City Assessment

superimposed depiction of

development schemes, settlement types, supply systems

Integrated Quarter Assessment , City-scale Görlitz

(exemplary depiction, serves only as an illustration)

Scale 1 : 25 000 Date: 31.03.2013

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Integrated Quarter Assessment

Quarter: *„Südstadt“*

I - Preparatory description

1 Basic information on the quarter

1A – Location & topography
The quarter „Südstadt“ is located about 2 kilometers from the historic old town and south of the city centre of Görlitz (Fig.1), from which it is divided by a train track. The quarter is characterized by a cohesive Wilhelminian building structure (Fig.2) and is clearly delineated from the surrounding quarters. In the eastern area of the quarter there is a distinctive topographical ridge.

1B – Historical development & significance
The „Südstadt“ came into existence around the middle of the 19th century as an extension of the city in the course of industrialisation, railway construction and population growth. The Wilhelminian building blocks are almost completely preserved and encompass over 80% of cultural monuments, in most cases with an architecturally significant appearance. (Fig.3)

1C – Quarter development today
The quarter „Südstadt“ is part of a urban preservation statute since 1991, and since 2003 it is also part of the federal urban development scheme ‘Stadtumbau Ost’. In the current Integrated Urban Development Concept the quarter „Südstadt“ is marked as a „consolidated area“ due to the positive development in the past 20 years.

2 Supplementary material

2A - Site of the quarter within the city context

Fig. 1 Site (no scale), based on topografical map, M 1:25.000

2B - Documentation in picture and scetches

Fig. 2 urban built environment of the quarter (Sechsstädteplatz)

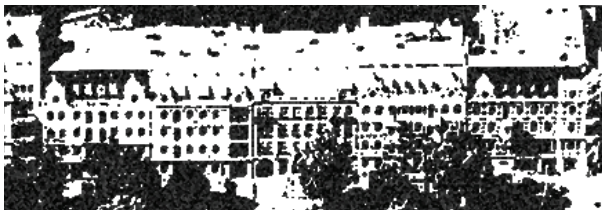


Fig. 3 Facades, scetch (Biesnitzer Straße 75-77)

II – Integrated assessment

1 Survey of urban structure / built urban heritage / infrastructure

1A – Urban structure

The typical urban typology in the quarter „Südstadt“ is a compact and closed Wilheminian block structure with predominantly four-story appartment houses and an average floor space-index of 1.5. This corresponds to the structural settlement type 6 – block building structure / type 7 - wilhelminian block building structure.

Corresponding to these compact structures the population density is high with about 3,355 inhabitants/km² (cp. Old town 7,903 inhabitants/km² or Rauschwalde 1,962 inhabitants/km²).

The high level of vacancies determined around 2005 (40%) shows a declining tendency.

The quarter “Südstadt” is mainly a residential one. There are some commercial units and sufficient local supply structures. Several cultural and sporting venues as well as recreational areas are also present. There is a sufficiently high number of public open and green areas.

1B – Built urban heritage (see also map 1B Built urban heritage)

The residential buildings of the quarter “Südstadt“ are predominantly (>80%) listed cultural monuments and as such especially worthy of protection.

The quarter „Südstadt“ is characterized in large parts through a cohesive built environment. Through the preserved space-defining building lines the urban ensemble as well as the functional, architectural and aesthetic relationships can still be easily perceived.

More than half of the buildings have an extremely significant appearance with intricately designed facades.

The “Südstadt” contains many formative visual axes. The tower of the Jakobskirche is a kind of landmark and serves as a point of orientation from several directions.

The Wilhelmininan block structure is interrupted by two squares and one park that have a high significance for the quality of the urban realm.

1C – Infrastructure (see also map 1C Infrastructure)

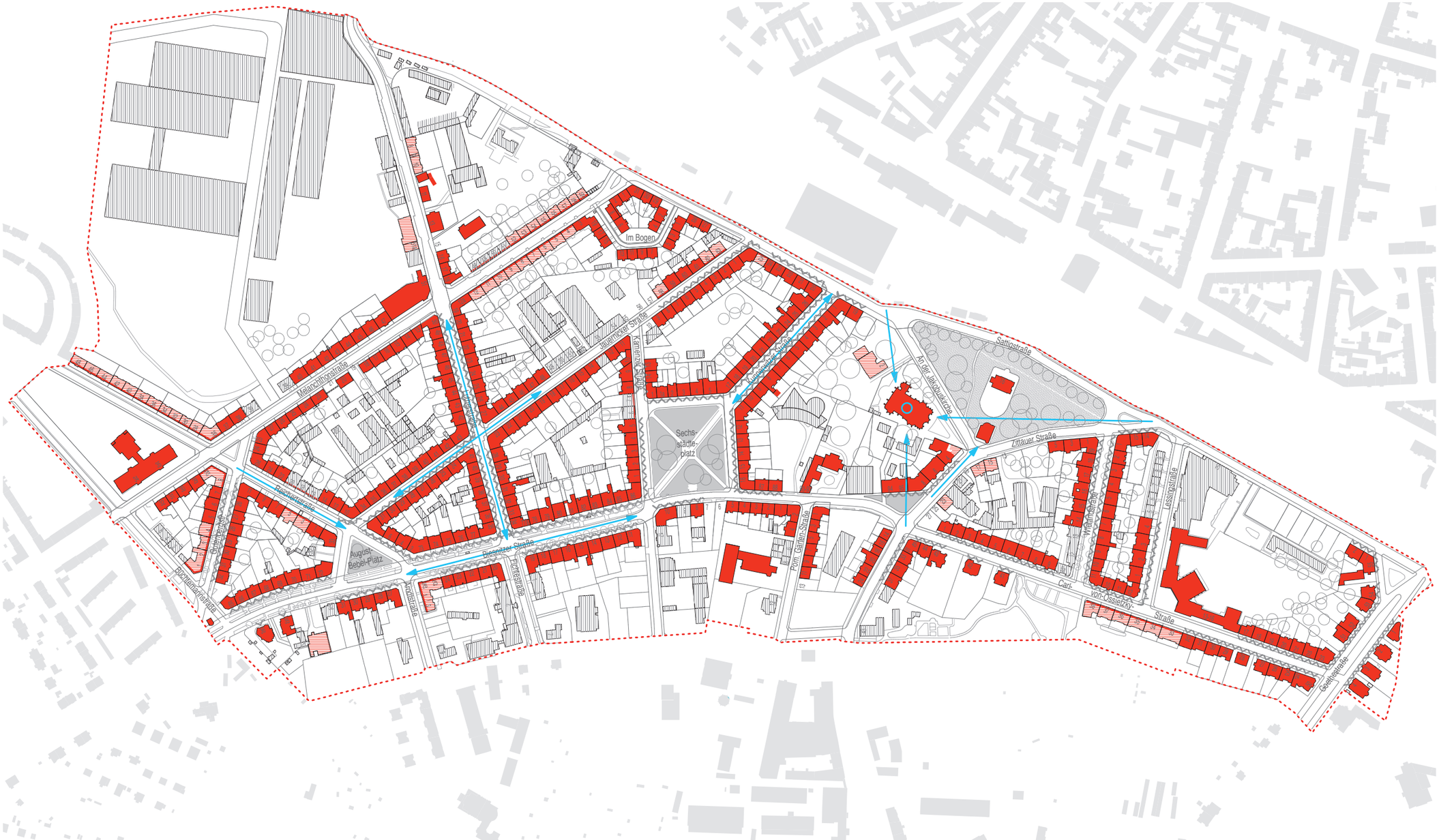
The quarter „Südstadt is connected to the public transport system by one tram and two bus lines easily reached on foot. A supraregional connection is given by a direct access to the main train station in the north of the “Südstadt”.

The refurbishment of the buildings was conducted mainly in the 1990s. The state of refurbishment is generally good, but corresponds only to an intermediate energy standard in terms of the standards in use today. Only few buildings in the quarter still remain unrefurbished.

Ownership structure is characterized by very heterogenous individual ownership

Energy source of the quarter „Südstadt“ is mainly natural gas, primarily used in self-contained central heating of the apartments. Only the commercial areas in the western part of the quarter are connected to the long-distance district heating.

The most frequently occurring building type in the quarter (apartment housing (AH), built 1860 - 1918) can attain a final energy demand of 37.8 kWh/m² according to the TABULA building typology. This is an intermediate building efficiency, by comparison.



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Integrated Quarter Assessment
„Südstadt“, Görlitz

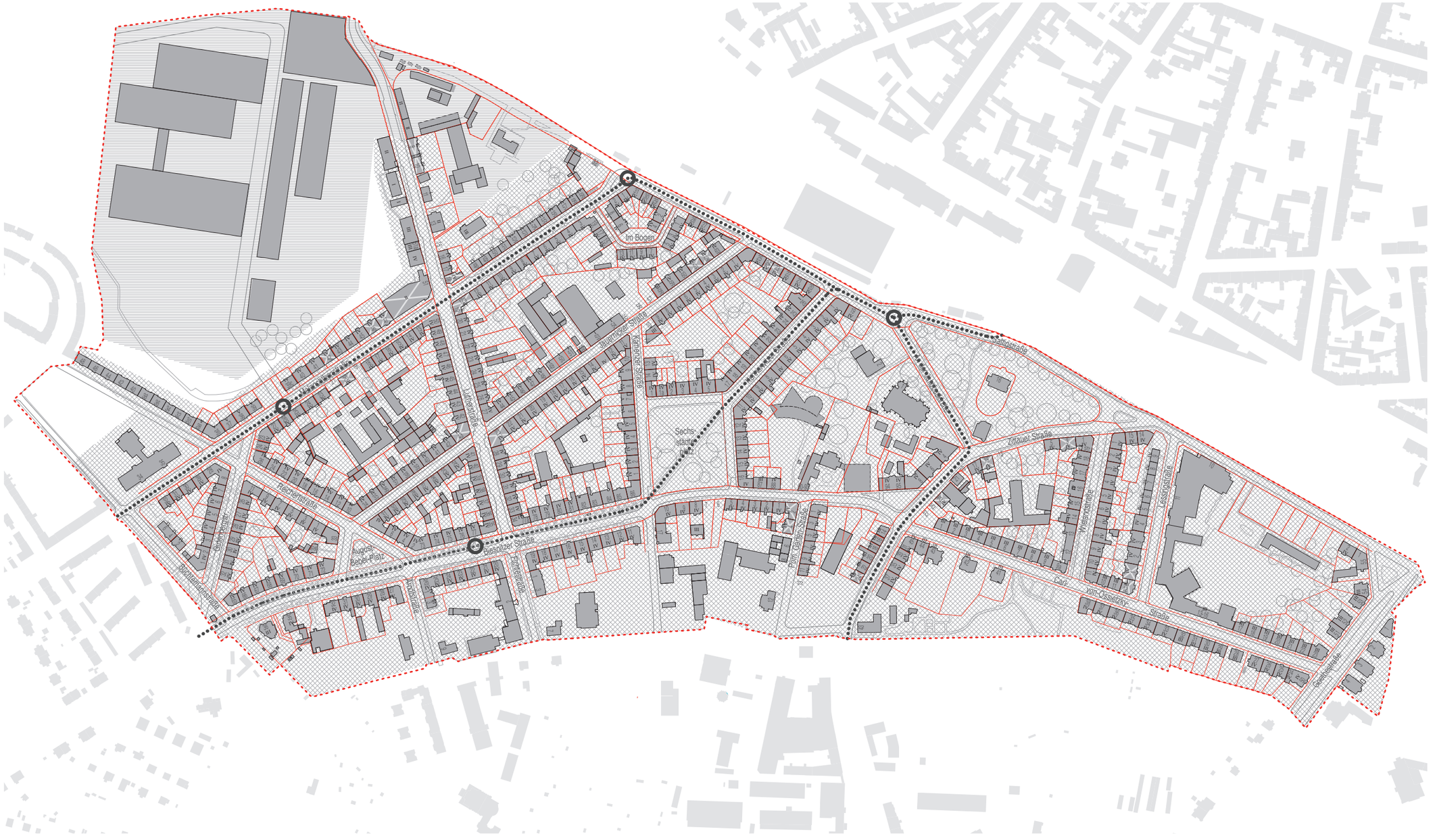
II - Built urban heritage
Map 1B

Documentation after site inspection / serves only as an illustration

Appendix 2) page 3

Scale 1 : 5000

Date: 31.03.2013



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Integrated Quarter Assessment
„Südstadt“ Görlitz

II - Infrastructure
Map 1C

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Appendix 2) page 4

Scale 1 : 5000

Date: 31.03.2013

II – Integrated assessment

2 Assessment of the criteria

... Sustainable urban structure

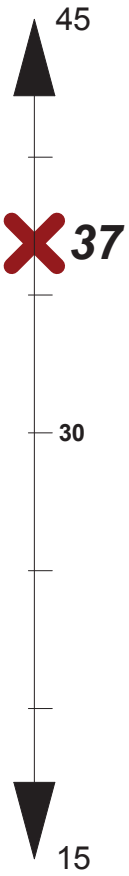
Compactness of the built city structures	●●●	15
Population density	●●○	12
Utilisation ratio of space	●●○	
Functional mix – mix of uses	●●○	
Presence of green and open spaces	●●●	5

... Built urban heritage values

Perceptibility of the urban form (ensemble, Gestalt)	●●●	15
Existence of built structure worthy of protection	●●●	
Architectural significance of the facades and urban space	●●●	
Existence of significant view axes, landmarks	●●●	
Amenity of public space	●●●	5

... Energy efficient infrastructure

Connection to public transport	●●●	15
Standards of retrofit of the buildings	●●○	
Uniformity of ownership structure	●○○	10
Efficiency of supply infrastructure	●●○	
Energy efficiency of building stock	●●○	5



Assessment
The total of 37 points for the quarter Südstadt refers to a compartively lower need for action.

III – Consequent Recommendations

The primary task is of course to maintain the achieved status with adequate measures, but communal planning has the following options for taking additional action:
Vacancies in the quarter can indicate a potential for increasing the heterogeneity of utilization. Using vacant space as offices or for services can increase the functional range.
Further improving the quality of the public space can initiate an increased demand for residential or office space and thus result in a higher percentage of utilized square footage.
The coming years will see a renewal of heating technique as a consequence of the refurbishment that took place in the 1990s. A rough check of heat supplies for the main Settlement Type ST6 (Blockbebauung) shows that long-distance district heating offers a high degree of efficiency and is the better suited for such compact structures. The municipal energy supplier should investigate how the long-distance district heating in the western part of the quarter can be expanded. It falls into the responsibilities of the municipalities as shareholders of the energy supplier to provide attractive terms and conditions for connecting to the long-distance district heating.
Because of the importance allotted to the appearance of many of the quarters' buildings, there is essentially no possibility of a facade insulation at a later date, but other measures such as the insulation of roof or cellar ceilings or the exchange of windows still offer the potential for energy savings. Compatibility with building physics has to be tested separately in each case.
For roofs visible from the street there is only a limited possibility to install solar thermal or photovoltaic systems. Offering alternate areas to the property owners may constitute a compromise.
Due to the heterogeneous ownership structures one of the main functions of communal planning is to inform and coordinate with the help of adequate organizational structures.