



DISCUSSION PAPER

Enhancing the quality of life in Polish cities with energy and resource efficient revitalization

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Lisa Schneider, Camille Serre

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Abstract

Unsustainable development has taken its toll on the urban fabric, bringing about a number of negative effects, such as congestion, low-stack pollution and urban sprawl. Considering the overall well-being of urban dwellers and their good health, the environmental footprint of cities should be mitigated with new investments and redevelopments that are resource and energy-efficient.

Relevant concepts, planning tools, as well as policy frameworks and measures have been available at global, European and national level. All those solutions, combined with lessons from the past decade of revitalization experience and available funding present Poland with a unique opportunity.

Along with the idea of placing energy and resource efficiency into the heart of Polish revitalization effort, a chance emerges to reshape Polish cities into attractive, healthy and economically vital communities. This scenario would help to effectively tackle major challenges such as shrinking resources, air pollution or risks related to climate change, as well as pave the way for others to follow.

Having presented an outline of urban revitalization concept, its history, multidimensionality and its links to notions of sustainable development, quality of life and environmental **value, this document sets the stage for discussion on the revitalization track record in Poland – an ongoing process, characterized by continuous neglect of the effects that urban pressure puts on the environment.** This has also been highlighted in the Polish Act on Revitalization 2015, which seems to ignore global challenges, as well as the resource and energy-efficient urban development paradigm.

The situation is expected to change, as the relevant European policy goals have been directly reflected in the Partnership Agreement and funding schemes for 2014-2020. Additionally, several Polish policy documents (e.g. The National Urban Policy 2023, The Strategy for Responsible Development [SOR]) link urban development with sustainability, resource efficiency and the low-emission transition.

By presenting global, European and national data, **this paper highlights the negative consequences of inefficient urban development patterns with respect to land use, mobility and built substance. It also outlines tools and measures supporting resource and energy efficiency in urban planning and management. Last but not least, the document summarizes health and economic benefits awaiting neighbourhoods, districts and cities in relation to energy-efficient revitalization.**

Two existing policy frameworks: **The Polish Programme for Model City Revitalization and the German energy-efficient urban redevelopment programme (KfW 432)** have been presented as prime examples of the leadership that national governments can provide to shape the sustainable, resource and energy-efficient city renewals. Simultaneously, the case studies of **Łódź** and **Potsdam-Drewitz** are perceived as inspirational models of good practice in this area.

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Introduction

Cities have become a mirror image of development and civilization processes throughout history. Changes that affected whole societies and economies found their reflection in the urban fabric: i) industrial revolution triggered rapid urbanization and the rise of the working class; ii) growing number of car owners among aspiring middle class sparked the urban sprawl at the expense of the increasingly neglected city centres. **Nowadays, shrinking resources, extreme weather conditions due to climate change, along with water and air pollution, influence the state and shape of cities.**

Rapid urbanisation, along with economic and architectural trends have driven cities into inefficient patterns leading to congestion, air and noise pollution, car-dependency, excessive resource use and high greenhouse gases (GHG) emissions. Some districts, especially city centres become socially and environmentally degraded, while others (suburbs) experience unsustainable growth, emphasized by urban sprawl, which increases both the infrastructural costs, and environmental burden. **There is a necessity to reduce the environmental pressure related to rapid urbanization with more sustainable, urban patterns. For the well-being of citizens and the Planet, the environmental footprint of cities needs to be mitigated with energy and resource efficient investments, solutions and measures.**

Poland is not exempt from the burden of negative urban pattern. **As a result of nearly 80 years of unsustainable development Polish cities are facing major challenges in regard to congestion, low-stack pollution and depopulation.**

-
- According to **The World Health Organization Poland hosts 33 out of 50 most polluted cities on the continent (WHO 2016)**, whereas country's air pollution causes up to 46 thousands premature deaths every year (EEA 2017). Old and energy-intensive buildings' portfolio outdated power boilers along with the economical barrier and the energy poverty phenomenon are just few of the main factors that hinder air quality in Poland.
 - A study by The Polish Academy of Sciences revealed that **in the next 30 years the population of all 66 major Polish cities with over 100,000 inhabitants will shrink, in some cases by as much as 50%. Two main factors responsible for this condition are aging population and migration to suburbs (PAN 2017)**. This poses a serious risk to local governments and Polish economy as costs of urban sprawl grow rapidly. The Global Commission on Economy and Climate estimates that costs of urban sprawl for the American economy exceed \$1 trillion annually. These costs include increased infrastructure, public service delivery and transportation expenses (GCEC 2015).

As part of the European Cohesion policy 2014–2020, Polish municipalities will receive nearly EURO €6 billion of structural support for their revitalization effort. The funds will be distributed through 5 national and 16 regional programs. **Those investments, due to their scale and complexity, create a unique opportunity to enhance the quality of life in Polish cities.**

Unfortunately, currently available recommendations based on Polish experiences with revitalization lack the multidimensional perspective as well as knowledge of combined social, economic and environmental benefits of the process. In order to monitor and successfully upgrade the quality of ongoing revitalization investments, it is necessary to analyse the implemented and internationally awarded projects like the ones in Łódź or Gdańsk, as well as to delve into the global experience.

More than 30 years of work by architects and urban icons such as Jan Gehl or Leon Krier, along with the comprehensive programs implemented by other European governments teach us that **revitalization:**

- **should be designed and planned in a comprehensive manner, not solely dedicated to most neglected areas** but also **anticipate the potential and future risks** in fairly well kept districts;
- **should consider the influence of those investments in the broader context of the whole city fabrics.**

The negative trends in urban development should be rather addressed by revitalization investments designed around the concept of a sustainable city. This approach has been taken for instance by the German government and the German Bank for Reconstruction (KfW). The former implements in cooperation with the Länder (regional governments) and municipalities urban redevelopment assistance programmes ('Städtebauförderung') dedicated to empowering cities as economic actors and as attractive places to live. The latter concentrates on the energy-efficient redevelopment of urban areas ('Energetische Stadtsanierung').

Polish revitalization effort, supported by the combined budget of EURO €6 billion, creates a unique opportunity to reshape Polish cities. In order to take full advantage of potential benefits associated with the revitalization process, it is important to proceed in the holistic manner:

- **implementing** solutions based on **principles of a compact and connected city**, designed around many **communities instead of one city centre, dedicated to humans not cars**, with **mix-use, walkable districts**;
- **enhancing energy and water efficiency, along with the quality of green public spaces** – leading to the reduction of **greenhouse gases (GHG) emissions and of low-stack pollution**, as well as **adaptation for climate change** (especially enhancing city infrastructure resilience against extreme weather conditions such as storms and torrential rains, heat waves and heat islands, etc.);
- **strengthening of the existing functions** and **creating new competitive advantages that attract investors** - business entities and entrepreneurs, along with new tenants, residents, nongovernment organizations, local government offices, as well as craftsmen and artist workshops.

This approach further supports protection of human health, enhances the overall quality of life for citizens and creates economically dynamic, vibrant and healthy urban fabric.

Polish government, while drawing on past and present experiences of its revitalization efforts, could lead the way towards sustainable city development in the Central and Eastern Europe.

This discussion paper aims to support the overall upgrade in the quality of life of citizens in Polish cities and infuse energy and resource efficiency into the heart of Polish revitalization practice by:

- **introducing the legal and conceptual framework for revitalization in Poland and on the European level;**
 - **overviewing the social, economic and environmental benefits of a holistic approach to the revitalization processes, which focuses on energy and resource efficiency;**
 - **featuring selected good practices of successful revitalizations from Poland and Germany.**
-

Revitalization is a holistic process by definition. Therefore, it also includes environmental actions, although in practice they are not always appreciated or exposed enough.

Prof. Piotr Lorens

1 Revitalization in the new millennium: a complex, multi-dimensional concept for sustainable urban (re)development

1.1 The concepts of revitalization

The idea of “revitalization” was put forward in the middle of the nineteenth century by A.F. Clarke Wallace, an American anthropologist, who was the first to propose the term “revitalization movement”, understood as “an effort of members of a society to construct more satisfying culture by inner revival” (Wallace 1956). Since then, the concept evolved and currently the revitalization is foreseen as “a complex activity undertaken in urban areas, particularly in the old districts and selected areas, combining technical activities with actions aimed at reviving the socio-economic aspect of urban life” (Lorens 2009).

According to Lorens’s definition the following is a set of revitalization objectives:

- **urban and architectural** - related to the renovation and modernization or sometimes revival of architectural complexes, including residential and post-industrial complexes, including conscious shaping of the cultural landscape of the area;
- **technical** - related to improving the quality of urban structures – including technical and road infrastructure;
- **social** - related to stopping negative social trends, counteracting social exclusion, as well as the development of local social capital and improving sense of security;
- **economic** - related to economic revival, including promotion of entrepreneurship, development of tourism and realization of new undertakings of a commercial nature;
- **environmental** - related to improvement of environment, liquidation of pollution and emissions.

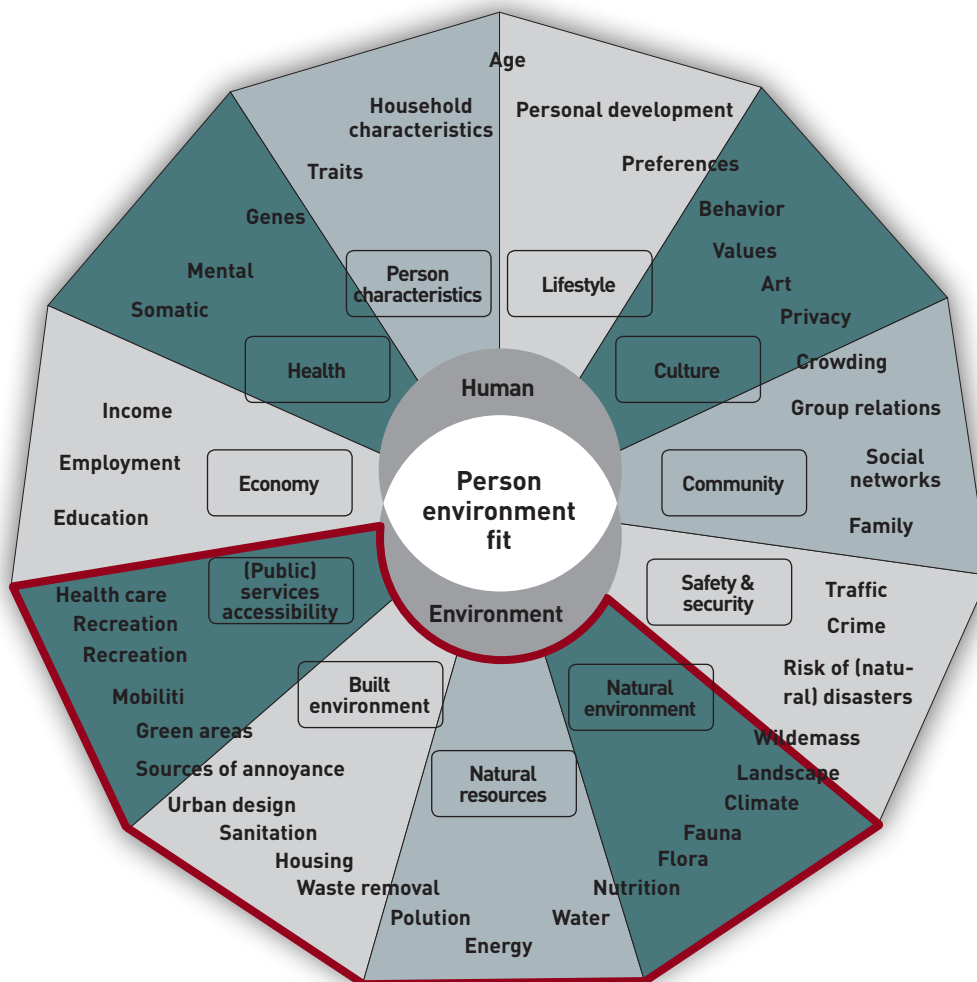
Revitalization programmes operate within multidimensional systems as the urban environment and should address all five thematic areas simultaneously as they are directly inter-related. Unbalanced actions involving only selected objectives can produce negative effects, as already observed in Poland such as: i) gentrification, or the opposite; ii) urban decay; iii) economic upgrade with environmental degradation and adverse influence on human health; iv) cultural and environment protection with negative influence on the economic development being the source of dissatisfaction among residents, an ineffective public spending.

In order to achieve sustainable urban development, **revitalization processes should rely on social, economic and environmental pillars, carefully study local potentials and include the resource and energy efficiency within its framework.** In addition, revitalization programs should become an integral part of broader urban development strategies (or even wider region and country level strategies) - for exactly the same reason: **revitalized areas are not isolated islands, but parts of the overall complex urban system. If implemented in the holistic manner, they have a potential to enhance the quality of life of all citizens in urban systems.**

1.2 The quality of life and the environment quality nexus

The quality of life model proposed by Irene van Kamp (2003) showcases the complex interlinks between the social, economic and environmental aspects of human life and presents the holistic approach towards sustainable human habitat. It is particularly helpful to understand why revitalization processes should support a greater quality of the environment to increase the liveability and attractiveness of cities (Figure 1).

Figure 1: Aspects of (human) liveability and (environmental) quality of life



Source: Van Kamp et al. 2003

The urban environment is becoming people’s major habitat. It provides means for the development of important attributes of citizen life, such as health, family, work, or leisure. Through its physical, social or symbolic characteristics it might be the source of well-being and satisfaction for the local population (Lansing and Marans 1969) or quite the opposite, the source of continuous stress. Unfortunately, **the current state of cities develops patterns confronting people with various adverse environmental conditions**, such as **noise, malodour, air pollution, external safety risks, crowding, litter** etc. **The health effects of these conditions on humans range from annoyance, psychological alterations and morbidity, even to mortality** (van Poll 1997).

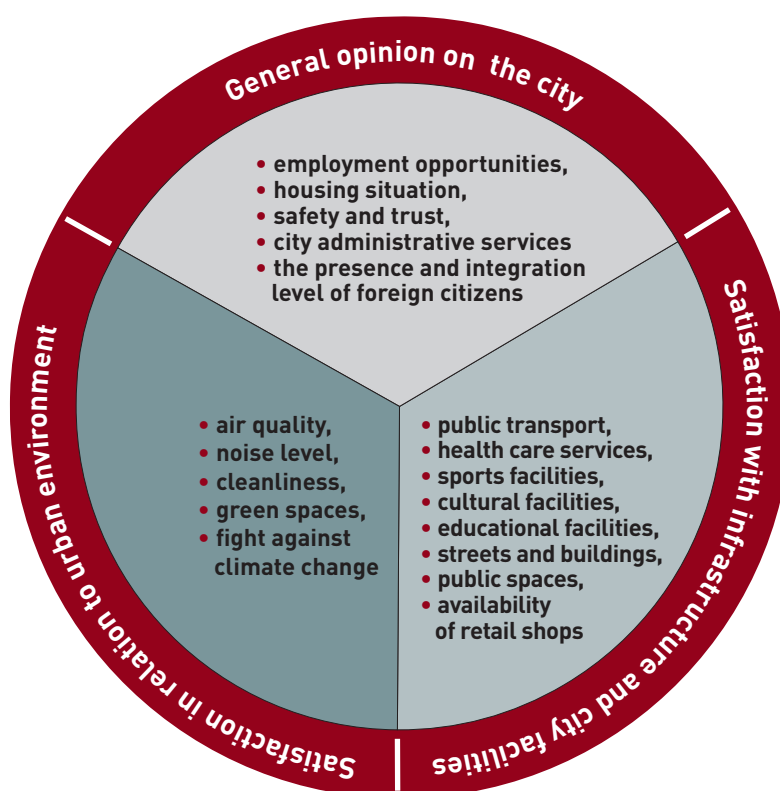
Research on the interlinks between the concept of the quality of life (QOL) and the environment quality (EQ) has been conducted by psychologists, sociologists, architects, human ecologists, social geographers, and, last but not least, epidemiologists. Within the framework of its analyses the National Institute for Public Health and the Environment in the Netherlands (RIVM) found that urban dwellers perceive their quality of life subjectively, in terms of their level of happiness, life-satisfaction, fulfilled needs and wishes. In such context the local environment quality can be seen as a source of stress factors (such as noise, air pollution and their respective influence on human health and well-being) but also as a positive aspect of the environment influencing human perception (RIVM 2002). Furthermore, two methods of measuring the influence of the environmental factors on the quality of life have been distinguished:

- exposure of urban dwellers to “adverse environmental conditions, such as sound-pressure levels or odour concentrations”;
- the effects of environmental conditions e.g. on human health, on the performance of the local economy, or on the “diminished perceived quality” (van Poll 1997).

The RIVM multidisciplinary research of the QOL and the EQ created basis for the European Commission’s analyses of citizens’ satisfaction in the cities they inhabit. Starting in 2004, the Commission began conducting analysis of the “perception of quality of life in European Cities”. It has been repeated every three years and compares satisfaction of European city dwellers from different cities.

In 2015 the Commission used the following areas of analyses to compare the quality of life in major European cities.

Figure 2: Quality of life in European Cities 2015, European Commission



Source: adelphi based on EC 2015

Those indicators are used by the Commission to compare the competitiveness of European cities. They influence the European urban policies and can prove useful when analysing the enhancement in the quality of life and citizens’ satisfaction level, in relation to the revitalised areas in Poland.

2 The framework for revitalization in Poland

In Poland, first revitalization initiatives started in the 1990's. This initial stage was characterized by individual initiatives inspired by grassroots activists or local governments. During this period first political and economic post 89' transformation effects could be observed in cities.

Local administrations have been empowered by the decentralization reform to take responsibility for quality of infrastructure, public services management and well-being of their citizens. The advent of market economy triggered thorough socio-economic changes. Some cities have benefited from those changes, while others plunged into multidimensional decay, which besides social and economic decline had visible spatial repercussions e.g. neglected factories and industrial zones, decaying neighbourhoods and growing unemployment rates.

In the beginning of the 21st century the idea of revitalisation started to spread among local governments, as an answer to transformation-induced challenges, as well a response to long-term negligence often dating back to the years preceding World War II. Local governments' own funds were supplemented by pre-accession funds, and after Poland's accession to the European Union new opportunities had emerged.

The European budget for 2007-2013, combined with its structural funds, have supported pan European exchange of experiences among local governments and experts, enabling propulsion of urban renewal and revitalization in Poland.

The procedure was usually structured in accordance with one or both following approaches:

- buildings and/ or infrastructure renewals and refurbishments (using **"hard" measures**);
- enhancing the social potential of marginalized groups (**"soft" measures**).

Those investments were usually directed towards the most disadvantaged areas and groups and rarely integrated with the whole urban development strategies.

This stage of revitalization has been summarized by the National Institute for Spatial Policy and Housing (Instytut Rozwoju Miast 2016) in a publication titled: "People, Space, Change" promoted by former Polish Ministry of Economic Development, as a set of good practises. The publication presents an in-depth overview of over twenty implemented projects. Based on conducted research and gathered information, authors distinguished three "rules" of successful revitalization: i) planning based on thorough assessment of the initial situation in a given district (diagnosis); ii) public participation in the process of planning and implementation, and last but not least; iii) strategic approach, where revitalization is an element of the city-development strategy.

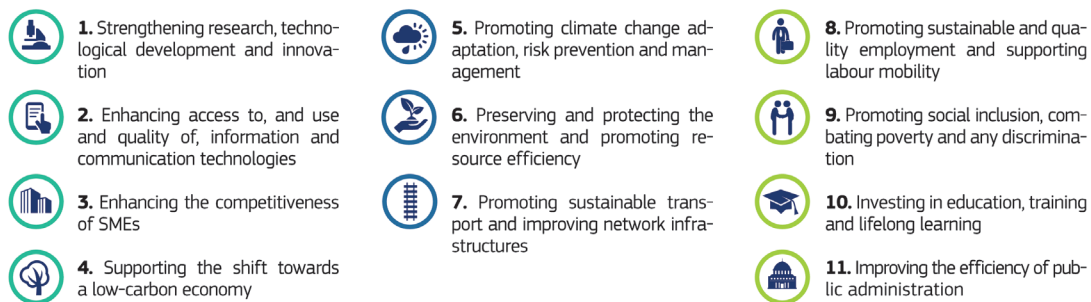
When reviewing these good practices, it becomes apparent that at this stage the environmental protection in Poland (understood not solely as rehabilitation of devastated areas but rather as mitigation of pressure that cities put on the environment and human well-being) has been non-existent.

Hardly any research has been done to verify the impact of the conducted interventions on the overall quality of life of the community. None of the conclusions or recommendations have mentioned the concept of a sustainable city, the energy and resource efficiency, or the indicators of the environment quality enhancement as factors of successful city renewal. Meanwhile those factors have become crucial for the European sustainable development.

The Europe 2020 strategy emphasises smart, sustainable and inclusive growth. The environment quality in cities and resource efficiency are among factors shaping the European urban policies.

The general success of the revitalization projects implemented under the 2007-2013 budget in Poland has inspired Polish government to create a dedicated revitalization programme under the 2014-2020 European Budget. According to the Partnership Agreement between Poland and the European Commission on the current budget, Poland has been allocated about **EURO €77.6 billion of structural funds. Over EURO €6 billion of structural support have been dedicated to the revitalization of Polish cities** and distributed through 5 national and 16 regional programmes. It is important to note that **structural funds are the key mechanism for the implementation of the European Cohesion Policy and therefore have to support the achievement of its goals.** Out of eleven Cohesion Policy priorities four are dedicated to environment protection, resource efficiency and low-emission transition.

Figure 3: Eleven thematic objectives of the European Regional Policy 2014-2020



Source: EC 2014

Both, the Partnership Agreement and the national and regional funding schemes directly reflect the European policy goals and imply conditions on which those funds can be invested. Yet, the Act on Revitalization (Ustawa o Rewitalizacji) adopted in 2015 after several years of public discussion, underlines the necessity of public participation and proper diagnosis, **while limiting the environmental approach solely to environment rehabilitation measures.**

Correspondingly, the current legal and political frameworks in Poland fully support the holistic approach towards revitalisation (along with broader urban development) and deliver legal grounds as well as an obligation to include all the enumerated objectives in these processes.

Sustainable development along with the resource and energy efficiency is validated in the following Polish policy documents:

- a) **Polish Constitution Act**, “Art.5 The Republic of Poland shall safeguard the independence and integrity of its territory and ensure the freedoms and rights of persons and citizens, the security of the citizens, safeguard the national heritage and shall ensure the protection of the natural environment pursuant to the principles of sustainable development”.
- b) **The National Urban Policy 2023**, adopted by the Polish government in 2015, as the embodiment of recommendation provided by the Leipzig Charter (a leading document shaping European approach towards urban development, adopted by EU Ministers in 2007.

c) **The Strategy for the Responsible Development (SOR) adopted by the Polish government in 2017**, which among others assumes:

- supporting integrated revitalization of degraded areas (taking into consideration social, economic, environmental, urban and technical components);
- implementing low-emission urban strategies aimed at the air quality enhancement, as well as climate resilience;
- introducing sustainable urban mobility strategies merged with complex infrastructure investments.

d) **The Polish structural funding schemes.**

In conclusion, the Act on Revitalization can be perceived as a reflection of Polish revitalization experiences from 2007-2013. Unfortunately, it neglects current European goals and the overall global paradigm of the inherent necessity for the sustainable, resource efficient infrastructural investment, as well as the Polish policy framework shaping the approach towards the sustainable urban development. Polish revitalization practice poses serious risks in relation to:

- **the capital lock-in in the energy intensive investments;**
- **a lost opportunity related to such strategic investment if conducted in unsustainable manner.**

In regard to global commitments by the world community, as declared in the 2030 Agenda for Sustainable Development, the Paris Agreement and the New Urban Agenda, along with Polish regulations and ongoing implementation processes conducted in Polish cities, it becomes increasingly apparent that the Polish Act on Revitalization from 2015 needs to be amended.

The inclusion of environmental aspect in revitalization brings significant benefits – reduction of maintenance costs, reduction of smog generated by heating and transport, lower health care costs, friendlier climate due to the use of greenery, better quality of life. By creating a more human friendly space, we reduce external environmental costs connected with the emissions of greenhouse gases and other pollutants. The revitalization effort delivers also enabling conditions for adaptation to climate change, which is the future challenge.

Andrzej Kassenberg, PhD

3 Global challenges and the resource efficient urban development paradigm

3.1 Revitalization efforts in the context of global urban development

Urban poverty and unemployment rates, food and water insecurity, air pollution along with adverse effects of climate change are just a few of the major, pressing challenges that nations acknowledge but local governments have to face.

With 54% of the global population living in cities (2014), and the urbanization rates expected to reach 66% by 2050 (ESA 2014), the existing city structure and the new urban developments need to deliver bold solutions in order to tackle present-day challenges threatening the global community.

The Global Commission on the Economy and Climate – a major, international initiative comprised of former heads of government, finance ministers and leaders in the field of economics and business has estimated that between 2014 and 2030 around \$90 trillion is likely to be invested in urban infrastructure, land use and energy systems. The future implementation pattern of those investments will prove paramount to global peace, food security and economy.

As summarized by the former Head of the UN Habitat Joan Clos, there is a clear correlation between good urbanization and development. The linkages between good urbanization and job creation, livelihood opportunities, and improved quality of life, should be included in every urban renewal policy and strategy (New Urban Agenda 2016).

Drawing a similar conclusion, the European Commission introduced a strategic European investment policy targeting all EU regions and cities. The Regional Policy's goal is to boost both the local and pan-European economic development, as well as to improve people's quality of life through over 350 billion Euro worth of investments from the EU 2014-2020 budget. **Energy efficiency is a key horizontal criterion (also known as a 'cross-cutting theme' or 'environmental mainstreaming') and remains obligatory for all investments deriving from structural funds. This requirement promotes environmental sustainability across the European economy.**

3.1.1 Efficient land use and sustainable urban pattern

The total area covered by world cities is set to triple in the next 40 years. If the current inefficient urban development patterns continue, cities will endanger human health and well-being by:

- **threatening the food supplies, sprawling towards the important resources of farmlands;**
- **hindering water security with high demand and outdated infrastructure;**
- **increasing greenhouse gases (GHG) emissions, leading to overpassing the established 2°C average global temperature warming limit and possibly reaching up to an 4°C increase;**
- **contaminating air with heating and transport based pollution;**
- **hampering economic development.**

According to the estimates by the Global Commission on Economy and Climate costs of urban sprawl for the American economy exceed \$1 trillion annually. These costs include increased infrastructure, public service delivery and transportation expenses. Urban sprawl influences the competitiveness of the economy, and hinders private budgets.

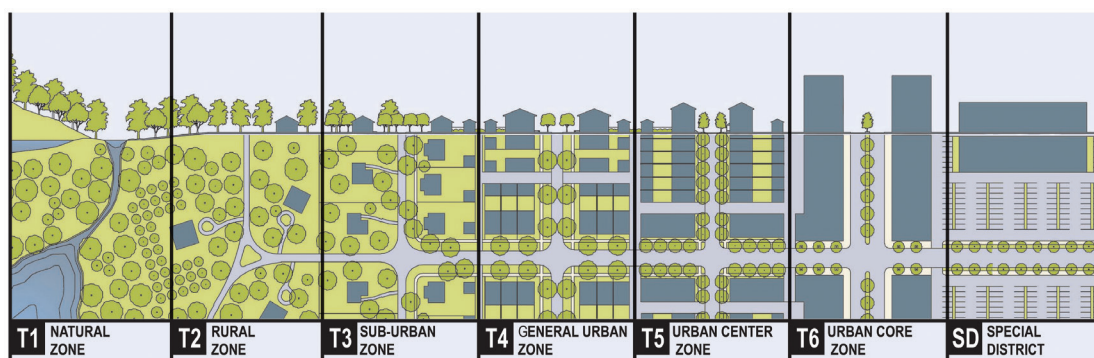
Residents of the most congested Polish cities spend more than eight hours a month in traffic jams. According to a report by Deloitte and Targeo traffic congestion on Polish roads costs the country PLN 14,6 million per day and more than PLN 3,8 billion per year. Each motorized inhabitant of the seven largest Polish cities lost an average of PLN 3.300 per year due to traffic (Deloitte, Targeo 2016,). Traffic congestion, along with heating habits expose Polish city dwellers to poisonous air pollutants. We must not forget that 33 out of 50 most polluted cities in Europe are located in Poland (WHO 2016) .

More than 30 years of research conducted by The Urban Land Institute, The New Urbanism movement and the Environment Protection Agency experts prove that the sustainable urban pattern, especially the mixed-use developments, help mitigate the negative effects of urban sprawl and private car dependency, and at the same time, deliver economic, social and environmental benefits. **While requiring lower costs per unit infrastructure and public-service, the mixed-use communities ensure the following:**

- **improvement of human health by increasing physical activity**, especially when combined with development of public transportation systems, along with bicycle and pedestrian friendly pathways, as well as green, public spaces and playgrounds, (Annual Review of Public Health 2006);
- **minimizing of car dependency and environmental related burden** (e.g. noise, air pollution);
- **enhancing of water security and climate change adaptation**, confronting water related climate change disasters such as floods and draughts with green public spaces serving as natural water reservoirs, supporting local small retention, as opposed to outdated water treatment infrastructure build on the principle of pumping the water out of the urban structure.
- **provide significantly higher returns to local governments** through property and sales taxes (Reconnecting America, Center for TOD, 2007).

In the beginning of the 21st century architects at Duany Plater-Zyberk & Company used a tool called transect (traditionally used by biologists and ecologists to study the characteristic elements in plants and animals of the environmental habitats) to systemize and code urban patterns. The prototypical American rural-to-urban transect was published in 2003. It divided the green and build environment into six Transect Zones. This instrument has been widely used by urbanists all over the world. It introduces multi-functions (living, working, leisure) and shapes the character of new developments or revitalized areas.

Figure 4: Transect, rural-to-urban zoning

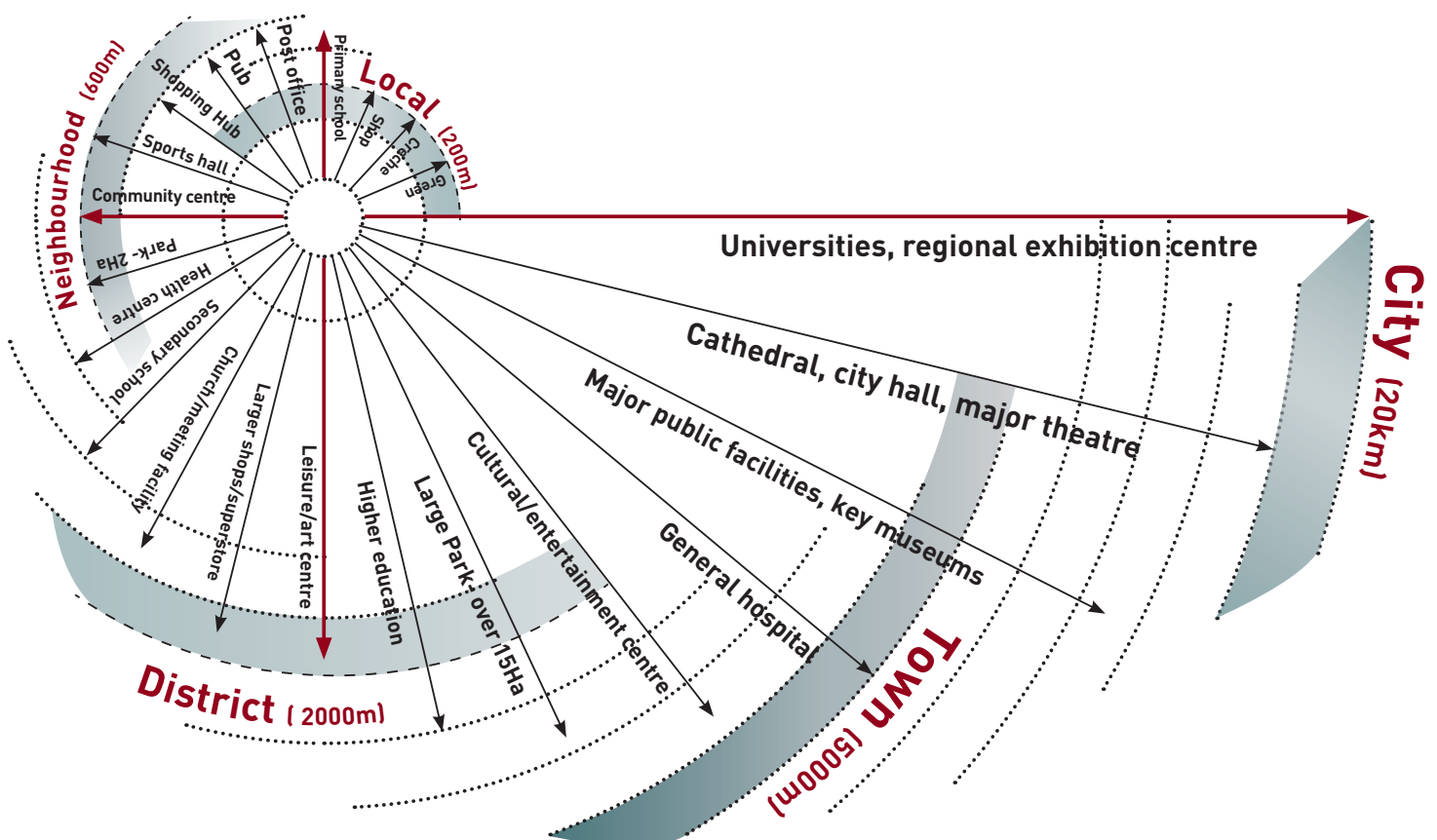


This new approach was meant to replace the separated-use zoning systems that used to be popular in the 20th century and which encouraged car-dependency and land-consuming sprawl. The six Transect Zones were designed to deliver a real neighbourhood structure, with walkable streets, mixed-use neighbourhoods, well connected, intermodal transportation options and housing diversity. "The T zones vary by the ratio and level of intensity of their natural, built, and social components. They may be coordinated to all scales of planning, from the region through the community scale down to the individual lot and building, but the new zoning itself is applied at the community (municipal) scale" (CATS 2018).

This special instrument gives local governments, experts and other stakeholders involved in the master planning preparation an opportunity to shape the existing urban pattern in a more sustainable manner, that corresponds to the local character and specific needs of the area.

Further analysis of the concept of compact, sustainable, energy and resource efficient city approach has provided a list of necessary measures that need to be introduced on neighbourhood, district and city levels in order to support the walkability and biking habits, as well as promote the use of public transport. The two key components of a compact city are: i) access to local services, amenities and public spaces, (where the maximum proximity to every point of the neighbourhood does not exceed 400 meters); and ii) connectives of every community to a bigger city structure. This solution helps to limit private vehicle usage, dropping it from 20% to even 40% (Urban Land Institute 2008).

Figure 5: The list of public and private services along with necessary amenities supporting the compact, connected city structure



Source: Rogers Stirk Harbour + Partners 2014

Compact, human scale neighbourhoods and districts, along with well-connected communities, which combine dense, mixed-use urban pattern, with green public spaces and tight city borders, prove to be an inevitable choice for future urban settlements, when health of citizens, their well-being and the quality of environment is considered.

That is why all renewal efforts and investments conducted in Poland should build on extensive international expertise, and introduce the verification process that examines the efficiency of urban and mobility patterns within the revitalized area. Transect analysis combined with compact city principles have already been introduced to the Polish revitalization practise by the City of Warsaw and Mycielski Architecture and Urbanism.

3.1.2 Energy-efficient urban mobility

Urban transport is a significant source of air pollution, chronic congestion and severe risks for citizen safety. Furthermore, it is an important factor that enhances energy demand in urban settlements.

The choice of transport mode is defined by age, type of activity and above all, by accessibility. Within the well-connected communities with easily accessible and reliable public transportation the environmental burden is mitigated, whereas opportunities for local economic development, innovation and healthy lifestyle are enhanced.

Resource and energy-efficient mobility patterns and measures:

- **decrease the levels of private car ownership and influence positively sustainable mobility behaviour** (The 2011 analysis conducted in Vauban, a mixed-used community in Freiburg, Germany with 5.000 inhabitants showed that citizens living within the Vauban boundaries had 160 cars per 1,000 people, while in the surrounding neighbourhoods of the Freiburg area, this ratio was 393 to a 1,000. Furthermore, only 16 percent of trips in Vauban were made by car, whereas the tally outside of the neighbourhood was as high as 30 percent);
- **limit costs related to chronic congestion**, which in Europe reach as much as 80 billion Euros annually (European Commission 2013);
- **mitigate transport related air pollution.**

Although the revitalization projects are implemented in strictly defined boundaries, they should encompass the overall urban mobility pattern, grant access to several forms of mobility (multimodality) and increase the number of possible connections between various forms of transportation (intermodality). Successful intermodal projects in Germany connect train stations, bus stops, electric car charging and renting stations and biking rental points to offer multiple transportation choices. Such projects could be located within the revitalized areas. Moreover, city governments can actively cooperate with local businesses in order to influence mobility patterns of employees by diversifying companies' opening hours (similar solution has been introduced by the City of Białystok to limit the number of buses needed during morning rush hours, yet at the same time to facilitate all transportation needs of factory workers). **In order to support the resource and energy-efficient mobility behaviour, mitigate traffic related challenges and enhance the quality of life of citizens in the revitalized areas, the revitalization project needs to be implemented with regard to the overall city structure.**

3.1.3 Energy-efficient buildings

Cities consume up to 80% of global primary energy. Transportation systems, businesses, and buildings need energy throughout their entire life cycle. According to the European Commission, “buildings are responsible for approximately 40% of energy consumption and 36% of CO₂ emissions in the EU. Currently, about 35% of the EU’s buildings are over 50 years old and almost 75% of the building stock is energy inefficient, while only 0.4-1.2% (depending on the country) of the building stock is renovated each year” (EC 2018).

Improving the energy efficiency of buildings should become a core element of every revitalization process. The enhancement of the building energy performance significantly:

- **reduces risks of illnesses caused by poor indoor climate** (e.g. irritations of eyes, nose and throat, mental fatigue, headache and sleepiness etc. [Univesity ILR 2002]) and enhances the overall comfort and well-being of their occupants;
- **improves energy savings for private budgets** – possible savings might reach up to 50% of household budget (Roadmap 2050) **and helps to mitigate the risk of energy poverty for many disadvantaged households;**
- **stimulates the economy:** according to the EC, the construction industry generates about 9% of Europe’s GDP and accounts for 18 million (direct) jobs (EC 2018).

According to the data gathered by the Central Statistical Office (GUS), in 2011, the total number of buildings in Poland exceeded 6 million, with over 5 million having been built between 1918-2002. 2.2 millions of those are located in urban areas and their vast majority has a very high level of demand for final energy and thus should be targeted for thermal modernisation (BPIE 2016).

Buildings consume energy throughout their whole life cycle (material production, construction process, maintenance and daily operations such as heating, air conditioning, lighting, etc.). The energy-efficient approach should be planned and implemented by taking into account all stages of a given building’s life cycle and by accommodating its users’ habits.

There are two major investment pathways leading to enhancement of energy efficiency in buildings: i) decreasing energy demand by minimizing heating losses within the building structure e.g. installing new windows, insulating walls and roofs, efficient ventilation etc. and ii) increasing the efficiency of the energy source, e.g. dismantling old outdated stoves, introducing district heating and/or Renewable Energy Sources (RES) (IEE 2014). Both pathways have already been implemented in Poland. However, the regulatory and financial backing introduced by the structural support promoted the former approach unfortunately on rather minimum level, which might result in a lost opportunity when the overall benefits of deep thermal modernization are considered.

Based on the estimates by the Polish Energy Conservation Agency (KAPE) and the National Energy Conservation Agency (NAPE), the estimated cost for a thermal modernisation of 50% of all single family and multi-family houses, as well as non-residential buildings in Poland (depending on the adopted level of intervention) varies between EUR 67 billion and EUR 117 billion. Still, the necessary investment might present a unique opportunity for economic development. In Germany, the support for thermal modernisation of existing facilities, along with the construction of passive houses led to 340,000 new jobs, while investments worth EUR 1.4 billion returned a profit of around EUR 7.2 billion. Additionally, according to the Building Performance Institute Europe (BPIE), in 2030 the annual energy savings from thermal modernisation might reach between 5% and 26% of 2013’s consumption, while the reduction in the greenhouse gases (GHG) emission may vary between 8% and 59% (compared to 2010). Further significant benefits related to deep thermal modernization of the existing building stock, concerning both the building structure and the heating source, would considerably decrease low-stack pollution in Polish cities.

4. Resource and energy-efficient revitalization-learning by example

4.1 The Polish Programme for Model City Revitalization

Greater understanding of global challenges, as well as recognition of opportunities related to sustainable, resource and energy-efficient urban development is crucial when shaping a successful national support for city revivals. The Revitalization Programme introduced through the structural support 2014-2020 by the Polish government and the European Commission creates a unique opportunity to mitigate the environmental challenges, confront migration and build competitive advantages of Polish cities. However, it must be implemented with regards to resource and energy efficiency paradigm.

In 2015 the Polish Ministry of Investment and Economic Development (former Ministry of Economic Development) introduced a Programme for Model City Revitalization, supplying it with a budget of over EUR 11 million. The Programme, initiated with the call for proposals, is addressed to Polish cities and aims to deliver a set of good practices, coupled with a holistic approach towards revitalization of urban areas. Ultimately, twenty cities have been chosen and are working with the Ministry on various solutions in particular thematic areas, useful for conducting successful, holistic urban renewal.

The following thematic areas have been chosen to deliver a variety of good practices reflecting the crucial topics of sustainable but also resource and energy-efficient urban development.

Table 1: The Polish Programme for Model City Revitalization objectives

<p>a) Revitalization financing:</p> <ul style="list-style-type: none"> • blending public and private funds, • engaging private investors, owner associations and other stakeholders in revitalization project financing, • strategic budget preparation for future financing based on the EU structural funds or local government funding.
<p>b) Social policy and local labour market:</p> <ul style="list-style-type: none"> • programmes aiming at job creation, tackling local unemployment with educational offers and enhanced entrepreneurship.
<p>c) Public participation:</p> <ul style="list-style-type: none"> • raising awareness and creating capacity building tools in order to engage stakeholders in community activities, along with promoting the spirit of responsibility for revitalized areas.
<p>d) Housing:</p> <ul style="list-style-type: none"> • social housing, building upgrade and renovation conducted by local governments and citizens alike, local communities, confronting gentrification.
<p>e) Shaping urban patterns:</p> <ul style="list-style-type: none"> • confronting city centre degradation, • enhancing density, • creating new investment opportunities for the buildings portfolio, • creating attractive public spaces and mobility solutions.
<p>f) Environmental protection:</p> <ul style="list-style-type: none"> • rehabilitation of devastated areas (cleaning, creating new commercial and non-commercial functions, e.g. green public spaces).

<p>g) Economic recovery coupled with enhancing investment attractiveness:</p> <ul style="list-style-type: none"> • successful investment plans, analyses, investment offers, • barriers and enabling conditions for investor engagement.
<p>h) Urban mobility:</p> <ul style="list-style-type: none"> • public and private transport solutions, • sustainable mobility and multimodality, • walkability, biking.
<p>i) Local cultural and environmental heritage:</p> <ul style="list-style-type: none"> • developing new model solutions in the field of protection, as well as utilizing the potential of cultural and natural heritage.

The Polish Programme for Model City Revitalization, envisioned to deliver practical knowledge on the basis of implemented projects, directly reflects the principles of a modern, sustainable city concept and European Regional Policy 2014–2020 priorities. The programme's outline builds on the idea of an integrated approach. **The complexity of projects, chosen to be implemented in the framework, indicates that the priority of the call lies in finding complementarity between the social, economic, spatial, environmental, cultural and technical components.**

The final results of this ambitious programme are not available yet, but having made an assumption on the basis of the call for proposals, the issue of resource and energy efficiency is expected to be incorporated into the framework of the implemented projects. At the same time, the current Act on Revitalization and chronic incomprehension of the city renewal priorities put the whole topic at risk of being marginalized.

Many of the twenty projects selected by the Ministry, especially the ones that benefit also from the Regional Operation Programs' funds, intend to introduce the environmental components. **Wrocław for example, which focuses on the improvement of housing conditions in the revitalized neighbourhoods, performs integrated analysis based on elements related to the advancement of green public areas, as well as mitigation of flood threat, along with noise, air and soil pollution. Grajewo's revitalization programme targets an area of over 76 ha, which is located in the city centre, and serves a home to 4.000 of the city's 22.000 inhabitants. The city plans to invest in building redevelopments in complement with social interventions. It will also use Regional Operation Program funds to install new sanitation solutions and conduct thermal modernization in order to increase the energy and water efficiency of its multifamily building blocks.**

The aforementioned description of the Polish approach gives the impression that the environmental dimension of revitalization, especially the resource and energy efficiency, are being included in the outlines of revitalization as one of the aspects of a properly performed process with dedicated financial schemes. Unfortunately, this is not present in the nationwide debate on urban renewals. Energy poverty and corresponding topics seem like the only area that attracts attention of the media and other decision makers.

4.2 The German energy-efficient urban redevelopment programme

Beginning in 2011 the German government has successfully started to support local administrations' efforts in the field of energy-efficient district redevelopment. It has been doing so through KfW 432-the German energy-efficient urban redevelopment program. Within its framework, the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) provides financing for municipalities through the German Bank for Reconstruction (KfW). The procedure has been organized on the federal level and aims to reduce greenhouse gases (GHG) emissions by improving the energy efficiency in German cities and mu-

municipalities. The budget for the programme comes from the Energy and Climate Fund, which is being financed by the income from the CO₂ emission trading scheme. **The energy-efficient urban redevelopment programme consists of two pivotal components: integrated neighborhood strategies and implementation management.**

Municipalities and other urban protagonists (e.g. housing companies) can apply for non-investment grants dedicated to energy-related urban renovations in order to: i) prepare an integrated neighborhood strategy (to be implemented within one year; max. 65% of the costs are covered) and ii) cover the personal costs for a refurbishment manager (over 5 years, max. 65% of the costs are covered). From the time when the program was introduced, 981 projects worth EUR 58.3 million have been approved.

Integrated neighborhood strategies usually apply a number of measures such as efficient energy supply systems, increased use of renewables and sustainable urban planning. This approach leads to efficient and healthy housing, which not only favours climate protection, but also helps to address local demographic and economic challenges. Additionally, it helps all relevant actors (citizens, the housing sector, property owners, tenants and energy supply companies) focus on common goals and implementation strategies.

The refurbishment manager coordinates a long-term project implementation process. His tasks are: i) to convince all stakeholder groups to support the goals of energy-efficient redevelopment; and ii) to ensure that integrated approach is present throughout the entire project implementation cycle.

The integrated interventions conducted within the framework of the KfW 432 programme are best illustrated by the following examples, where neighbourhood refurbishment has been carefully studied along with other measures, e.g. addressing smart urban planning, developing of local renewable energy production, or promoting mobility or/and social aspects. By opting for an integrated approach, the measures can mutually amplify their impact and thus benefits.

In Lüneburg the refurbishment of ancient military barracks located on university campus has coincided with complete sustainable redesign of energy supply for campus buildings and parts of the neighbouring district. Today, residents and students alike are enjoying the benefits of cleaner air, lesser energy consumption within campus boundaries and comfortable heating and cooling solution.

The pressure resulting from rising prices on the real estate market and the need for affordable housing have prompted **Stuttgart officials to go sustainable and social, by transforming an old freight depot near the city centre into a residential area. Not only shall the formerly abandoned space be used sensibly, but it will apply an innovative method for on-site wastewater treatment, combined with heating and cooling solutions for the new district. The residents in an already tense urban environment will benefit from financial savings and comfortable heating and cooling services.**

In the district of Potsdam-Drewitz a myriad of measures has been taken to revamp a classic Soviet-style neighbourhood from the late 1980s, currently facing social challenges. The strategy involves building renovation. It serves as a showcase for energy savings, redesign of public spaces and sustainable mobility measures, combined with social design and participatory elements for citizens. The goal is to enhance sustainable efforts and strengthen the neighbourhood as a community. The complete case study of the project has been presented in the following chapter.

4.3 Good practices in Poland and Germany as a reflection of resource and energy-efficient city revivals

4.3.1 Łódź Downtown

The portrait of the district and its problems

Łódź Downtown area, due to its social degradation, linked to deep depreciation of the urban fabric, which translates into low quality of life and contributes to the bad image of the city, has been designated for revitalization. The residential and non-residential buildings (including some of significant historic value) are in particularly bad condition. Many of them, due to infrastructure limitations, haven't been connected to district heating network and consequently the area suffers from low-stack emission, generated by coal boilers and tiled stoves. This situation has been identified as the key contributor to poor air quality in Łódź. Other challenges include excessive pressure of heavy traffic and inadequate public transport service.

Revitalization programme and its environmental dimension

Motivated by intention to make Łódź Downtown a healthy heart of the city, a friendly space to live and a place to realise one's potential, the city has developed a comprehensive programme of revitalization measures, which address the problems of social, economic, spatial-and-functional, technical and environmental dimensions identified in the diagnosis.

The programme includes the renovation and overhauls of over 20 streets and nearly 100 buildings, including those of historic value to the city, as they will house office spaces, social services and cultural functions.

- The modernization of residential buildings will curb low-stack emission from heating. Educational facilities and public lighting will be modernized to become energy-efficient, while the streets will become more pedestrian friendly, with calmed traffic, wider pavements, tree lanes and benches.
- Public transport will gain new rolling stock – one that meets low-carbon and accessibility standards.
- New friendly and inviting urban spaces will be created, including the so called “pocket parks” – green places with resting infrastructure.
- Entrepreneurs will be offered business spaces at ground floor level in street adjacent buildings.

In addition to what has been stated above, the Programme lists supplementary measures, strictly connected with revitalization goals and objectives. Various stakeholders are expected to implement numerous projects, including i) schemes supporting installation of renewable energy sources; ii) reclamation and advancement of urban greenery, such as green roofs and elevations; iii) development of infrastructure for public transport, intermodal solutions, cycling and pedestrians.

The aforementioned measures will improve the technical standard of residential and service buildings, promote development of public and semi-public spaces co-arranged by citizens, improve the equipment of residential areas with the necessary technical network infrastructure; realize a consistent preference for pedestrians, stimulate the use of public transport by raising its quality and increase the share of biologically active area absorbing rain water – all helping adaptation to climate change.

These measures are also expected to contribute to social cohesion by:

- preventing spatial segregation;
- limiting social problems export outside the revitalized area;
- reducing poverty risk (through lowering the operational costs of residential buildings via the energy efficiency measures);
- integrating citizens around a common goal (e.g. green public spaces renewal).

Ultimately, revitalization is going to change the image of the city and its centre by transforming the residential areas into friendly and attractive spaces to live in.

The Municipal Revitalisation Programme (GPR), adopted in September 2016, was developed through a participatory process (involving various consultation forms: meetings in the revitalized area, reconnaissance walks, surveys) as an effort to meet the needs and expectations of citizens. The city has attracted involvement of stakeholder organizations such as real estate administrators, professional associations and chambers, NGOs, property owners, utilities, and universities, which became strategic partners and provided useful expertise.

The resulting document, i.e., (GPR), due to its interdisciplinary character, is not considered a sectoral policy, but a system tool of urban governance and an implementation plan for the Strategy of the Integrated Development of Łódź 2020+ with respect to revitalization tasks.

The funding

The financing sources include ERDF, the city budget, other UE and domestic funds, as well as private contributions (e.g. for extension of district heat pipework).

4.3.2 Garden city of Drewitz-Potsdam

The portrait of the district and its problems

Drewitz is a large-scale residential area located on the outskirts of Potsdam in East Germany. It was built in the 1980s and currently accommodates about 5,800 people. The settlement has been facing many difficulties so characteristic of the socialist architecture that has flooded Central and Eastern European countries: low quality large-panel buildings (especially in regard to low energy efficiency), neglected public spaces, large transport route running through the centre of the housing estate, and the overall urban pattern rather for cars not for people, which has negatively influenced the level of inhabitant identification with place of residence.

Revitalization programme and its environmental dimension

In early 2000s local institutions, acting in cooperation with the municipal housing company ProPotsdam GmbH and other stakeholders, were looking for an effective method to counteract social and spatial degradation of the district. As a result, in 2009 a vision of the garden city of Drewitz was introduced as a contribution to the competition “Energy renovation of large housing estates”/“Energetische Sanierung von Großwohnsiedlungen” and is being developed ever since. Revitalisation plans have started with a series of scenario workshops and the comprehensive participatory process that involved residents and other stakeholders. Energy efficiency and climate-friendly urban renewal the most important elements of the garden city concept implemented in Drewitz.

An ambitious goal of revitalisation has turned into a revolutionary transformation of a settlement into the first nearly CO₂-free district of Potsdam. According to plans, by 2050 the final heat demand will be reduced by half (through deep thermal modernization leading to insulation of buildings, roofs and replacement of draughty windows and doors) and the CO₂ emissions by over 80%. In addition, requirements for new buildings, design and development of culture, as well as civic participation and social inclusion strategies have been formulated. The integrated concept of climate and energy protection serves as the basis for further energy related district renovation with zero-emission as a goal for 2050. To ensure a vigorous city renovation, Energie und Wasser Potsdam GmbH (EWP), ProPotsdam GmbH and local municipality of Potsdam have started a close cooperation. The project implemented in Drewitz is a pilot project of the KfW 432 programme.

The district has been changing since 2009 and significant progress is clearly visible. Previously, monotonous prefabricated buildings and repulsive zones shaped the image of the area. Today a walkable green area along the former Konrad-Wolf-Allee, which is surrounded by renovated apartments equipped with lifts. There are also other facilities that improve local quality of life, such as modernised school and kindergarten. Along with the development of public and bicycle transport car-parking places have been transformed into high-quality green areas, which significantly reduced traffic and air pollution. The green areas developed along district's main streets created the so-called "Green Cross" – nowadays a hallmark of Drewitz. Further restructuring aims at creation of cafes in the "Green Cross" centre which will surely make the place more liveable. There have also been plans to renew modest housing (affordable to wider population), as well as to redevelop the area surrounding the former department store at Slatan-Dudow Street in order to erect new buildings .

Urban ecology is underestimated in Poland. And yet it is the natural environment that makes cities suitable for life at all. Coexistence with nature is the foundation of a balanced social life. Otherwise we will live in "stone cities".

Ewa Kipta, architect and urbanist

Conclusions

The energy and resource efficiency in regard to land use, urban pattern, infrastructural investments, mobility, housing and energy production, is an absolute necessity. It supports human health, enhances the overall quality of urban spaces and tackles major global challenges.

The quality of environment, which has been proven an important factor of city liveability, along with its attractiveness to citizens and investors, needs adequate recognition in urban regeneration. Moreover, if the high quality of urban environment is to be secured, energy and resource efficiency measures need to be integrated into urban development patterns. Consequently, the urban revitalization planning and implementation should aim for:

- compact and well connected communities with mixed-use patterns (applying available tools e.g. transect for planning);
- multimodal urban mobility promoting sustainable choices;
- reduced energy demand (loss), and increased efficiency of energy sources, as part of energy efficiency measures applied to buildings.

In the previous European budget and structural funding period (2007-2013), the environmental dimension has largely been absent from Polish revitalization track record. The Act on Revitalization introduces a necessity of land reclamation as the only significant environmental component to city renewals. **Fortunately, examples of urban footprint mitigations and successful implementation of the aforementioned practices can already be found in Polish cities.** The fact that they provide a useful model to follow within the current European budget period of 2014-2020 can be perceived as promising. Those cases prove that the existing legal framework is sufficient for resource and energy efficiency integration into the revitalization programmes.

Nonetheless, in order to support broader implementation of this approach, which stays in line with the European Cohesion Policy horizontal criteria, as well as with the national strategic documents (National Urban Policy, Strategy for Responsible Development), the following recommendations are being proposed on the basis on the conducted analysis:

- **Resource and energy components should be embodied in the Polish revitalization practice - by amendments to the Act on Revitalization, or adoption of relevant regulations and indicators.**
- **Local governments should be supported by nationwide financial schemes and capacity building programmes.** The inspiration could be drawn directly from the German energy-efficient urban redevelopment programme (KfW 432). At the same, further research is necessary to properly tap into the potential of the recently introduced The Polish Programme for Model City Revitalization.

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