

Challenges and Dimensions of Sustainability in Social Housing: General Consideration and the Case of Kaunas

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The article is aimed to discuss and reconsider the concept and challenges of the social housing in the world and in Lithuania. The research consists of three major parts. In the first part the evolution of social housing from the 18th century until nowadays was analyzed and evaluated and the main trends of architectural expression of social housing were distinguished and shortly characterized. The second part was devoted to the introduction of the dimension of sustainability in the design of affordable housing. The idea of sustainable architecture and the trends of its expression were presented and the composite trends of social housing in urban settings with dimensions of sustainability were formulated and characterized. The third part of the research dealt with the local specifics of the city of Kaunas: the possibilities of localization of the social housing of different trends were analyzed and the experimental design of the social housing complex demonstrating the possibilities of application of environmentally friendly technologies and the potential of rehabilitation of neglected urban areas was shortly presented.

Keywords: *social housing, sustainable architecture, Kaunas, Lithuania.*

1. Introduction

Relevance of the research. The term “social housing” can be interpreted differentially in various political and institutional contexts; generally this term refers to the rental housing units, owned and managed by the state or non-profit institutions or by public-private partnerships aimed at providing accommodation that is affordable to eligible households whose needs are not met by the market (DGHT, 2012; HHC, 2012; SF, 2012). This research was induced by the lack of the social housing in Lithuania and particularly in Kaunas and the challenges of creating the environmentally sustainable social housing in urban settings. However, the deeper analysis of the issue revealed the more global perspective, contradictions and ambiguities related with the social housing and the issue of sustainability in this context:

1) The basic challenge underlying the idea of social housing is how to create the adequate living conditions with minimal possible economic costs. The extreme results of this challenge can be either the very high quality housing that is as equally expensive to construct and to rent as commercial development or low cost but poor quality development that soon degrades into slums;

2) The economic constraints are not the only challenge in the social housing sector. Subsidized housing is a subject of strong ethical and social sensitivity. The issues of social stigmatization and social segregation should be dealt with extreme precaution in the social housing area. The social

paradox of the subsidized housing is that even if the planning and design is done with the extreme precaution and devotedness of architects and institutions involved the results can be shockingly unexpected. Take the New Gourn Village designed by H. Fathy, which had all the features of environmentally friendly, socially responsible and economically feasible design, but still ended as a failure (Steele, 1989);

3) The third complex challenge – the socioeconomic, sociocultural, and environmental responsibility – was added to this contradictory puzzle with the increasing environmental awareness and the rise of the concept of sustainability.

It can be predicted that with the continuous growth of the world’s population, which had recently reached seven billion, the demand for the affordable housing and the pressure on the environment by the construction industry will increase in the future. The showcase of this process will be the developing countries in Asia, Africa, and Latin America, which simultaneously have to cope with the unauthorized urban growth. The populations in the majority of the post-communist transition countries are shrinking. Nevertheless, these countries still face the problem of affordable housing. High percentage of urban poor or those social groups, who cannot afford any form of private housing or high rents, are present in countries like Ukraine, Latvia, and Lithuania. In the year 2004 Lithuanian residents who could not afford to

purchase or rent their own housing were demanding 8500 social housing units. Currently this demand is circa 26 000 housing units. Some applicants are doomed to wait for the social housing even for 20 years. Circa 3 billion Litas are needed in order to meet this demand and this makes the social housing one of the most costly areas of social care. The social housing units constitute only three percent of the total housing stock in Lithuania (LAS..., 2010; SF..., 2012). The situation in transition countries can be referred as the Soviet paradox: the majority of the housing stock, except the higher quality apartments for the Communist party officials, of this period was designed and constructed as economy class flats. The poor quality of works and materials is evident in many cases as well. Some skeptics note that the housing stock of the Soviet period, which, in fact constitutes the majority of urban fabric of transitional countries, can degrade into slums and urban ghettos, if no measures will be taken (Tung 2000; Milerius et al. 2009).

The issues discussed above justify the relevance of this research, which is aimed to review the history and trends of social housing and to propose the classification of the social housing models, to analyze the possibility to introduce the dimension of sustainability into the design and construction of the social housing, and to formulate the proposals for development of social housing in Kaunas.

2. Methods

In order to understand the general and local aspects of social housing and the dimension of sustainability in designing and constructing the affordable housing units, the complex methodology of the research was formulated. The research includes: the analysis of literature in order to determine the stages of development and challenges of social housing; the analysis of projects and examples in order to determine the trends of social housing; comparison and generalization in order to distinguish and characterize general models of social housing; analysis on site in the city of Kaunas and the analysis of maps and aerial photographs in order to explore the dimension of contextuality and to find the possible congruencies between the type and design of the social housing and the qualities of the surrounding environment; experimental design by A. Narvydas in order to demonstrate the possibilities of architectural expression, sustainable design and possible links with the context of the project of the subsidized housing; generalization and formulation of the conclusions.

3. Results

3.1. Development and Trends of Social Housing

Analysis of literature has demonstrated that the development of the social housing is closely related with the industrial revolution and its outcomes. The two extremes of the mere necessity of workforce and the effectiveness on the one hand and the utopian thought on the other had defined the landscape of what nowadays could be seen as the predecessors of the social housing during the 18th and 19th centuries. The early examples of the worker housing provided by the state or factory owners are the housing for the salt-works workers in the Arc-et-Senans designed by N. Ledoux and the housing constructed for the industrial

workers in the British factories of industrial revolution in the 19th century (Samalavičius 2008). However, throughout the 19th century the problem of providing at least the decent housing for the population of growing cities remained unsolved and, in fact, had aggravated in some aspects. The notorious dumbbell tenements in New York City were the example of the misery of the urban poor. House and Garden magazine of that period wrote: “The dumbbell block is perhaps the worst type of tenement ever allowed in a modern, enlightened community. The halls and ten of the fourteen rooms on each floor are dark and ill-ventilated, dependent for light and air solely upon narrow airshafts which give little or no light below the top floors” (ADNC 2012). Harsh social criticisms, for example the J. Riis’s investigative journalism “How the Other Half Lives” and the increasing understanding of the human needs and rising living standards had caused the breakthrough in social housing development in pre-war, inter-war and post-war 20th century (Tung 2001). This point in history marked the clear understanding of difference between the cheap commercial housing and the social housing: the first category was profit oriented and the owners did not care about the living conditions as far as the profits kept flowing and the authorities imposed no requirements and penalties; meanwhile, the social housing was aimed to improve the existing human misery caused by the cheap tenements and unauthorized housing.

Literature demonstrates that the structure, architectural expression, location and links with context of social housing are closely linked with the development of the styles and trends of the modern and contemporary architecture throughout the 20th and 21st centuries (table 1). The first worth mentioning examples corresponding to the concept of social housing were the so called “idealistic” or showcase examples. These housing units for workers, the prominent examples of which were constructed in Germany and Austria, were the great social success, as running water and sanitary facilities were not common feature of worker housing at that time. The classic example of this stage is the Karl Marx-Hoff by Karl Ehn in Vienna with service facilities, abundant parkland (only 18.5 percent of the 1000 m long and 156 000 m² large area was built up in this housing estate, with the rest of the area developed into play areas and gardens) and expressive high quality architecture was the actual glorification of the working class and the “Ring-road of the proletariat” (Tung 2001, VD 2012, KMH 2012).

Strong social commitment of the early 20th century architectural avant-garde was manifested in the ideas of the proponents of industrially prefabricated affordable housing and expressed in the condensed manner in the iconic quote by Le Corbusier (1985) published in 1923: “A great epoch has begun. There exists a new spirit. Industry, overwhelming us like a flood which rolls on towards its destined ends, has furnished us with new tools adapted to this new epoch. The equilibrium of society today depends on it. Architecture has for its first duty, in this period of renewal, that of bringing about a revision of values, a revision of the constituent elements of the house. <...> Industry on the grand scale must occupy itself with building and establish the elements of the house on a mass-production basis. We must create the mass-production spirit. The spirit of constructing mass-

production houses. The spirit of living in mass production houses. The spirit of conceiving mass-production houses.” The Törten housing estate built in 1926–1928 in Dessau is the example of this functionalist mass-production attitude towards the affordable living space (TE 2012). The Törten estate was made famous and saved by the names and fame of W. Gropius and Bauhaus; however, there are numerous less successful examples like the universally known and the most quoted notorious Pruitt-Igoe case, which well embodied the gap between the good intentions of functionalist design and inhumane environments it can create. Another affordable housing concept from the modernist era can be referred to as the large housing units concept. These are the large vertical housing units with

integrated service facilities, roof gardens, and “the streets in the sky”, i.e. the deck access scheme, constructed in the following decades after the World War II. The brutalism style, taking its name from the French expression for the architectural concrete – *béton brut* and declaring the honest use of construction materials, was predominant during that time. Le Corbusier’s Unité d’Habitation is considered the prototype and the iconic example of this architectural trend. Even if the realizations of the housing units concept can be traced back to the communal houses of the pre-war Soviet Russia (including the most widely known Narkomfin building), the post-war brutalism architects, such as Alison and Peter Smithsons, Jack Lynn and Ivor Smith had created the most characteristic examples like Robin Hood Gardens in London and Park Hill in Sheffield (Melvin 2008).

Table 1. Trends and models of social housing of the 20th and 21st centuries

Trend of social housing		Historical period and region of formation and development	Basic idea and features	Chrestomatic examples of architectural expression
Prewar period	Idealistic, showcase model	Interwar period, mainly in Western Europe	Blocks with relatively small flats with basic amenities, showcase modernist architecture, abundant green spaces, service facilities including laundries, kindergartens, doctor office etc.	Großsiedlung Britz Hufeisensiedlung (“Horseshoe Estate”), Bruno Taut, Martin Wagner, 1925–1930, Berlin Karl Marx-Hof, Karl Ehn, 1927–1930, Vienna Torten housing estate, Walter Gropius, 1926, Dessau Siemensstadt Housing Estate, Hans Scharoun, Martin Wagner, Walter Gropius, Otto, Bartning, Fred Forbat, Hugo Haring, Paul Rudolf Henning, 1929–1934, Berlin.
Postwar period	Functionalist concept	From Interwar period up to now, in developed and developing countries	Housing units of different size constructed of standardized prefabricated building parts	Pruitt-Igoe housing scheme, Minoru Yamasaki, 1954, St. Louis, Missouri
	Functionalist approach to the housing problem in the Soviet Union and socialist countries	From 1950s until the collapse of the soviet regimes	Multi-flat, multi-storey housing units constructed of standardized prefabricated building parts	Mass housing projects implemented in the Soviet Union and socialist countries
	Large housing units concept	From Post-war period up to now, in developed and developing countries	Large housing units with communal facilities	Unité d’Habitation, Le Corbusier, 1947–1952, Marseille Park Hill, Jack Lynn and Ivor Smith, 1957–1961, Sheffield Pedregulho Housing, Affonso Eduardo Reidy, 1950–1952, Rio de Janeiro
	Regionalist concept	From the second half of the 20 th century up to now, in developed and developing countries	Interpretation and application of local building traditions, techniques and materials	Dareeya Housing, Hasan Fathy, 1975, Daryah, Saudi Arabia New Gournia Village, Hasan Fathy, 1945–1948, New Gournia, Egypt
	Structuralist concept	From the second half of the 20 th century up to now, the United States, Europe and other developed countries	Architecture facilitating and fostering social relations, housing complexes composed of repetitive structural units	Habitat 67, Moshe Safdie, 1967, Montreal, Canada. Mountain Dwellings, BIG- Bjarke Ingels Group, 2008, Copenhagen
	Postmodernist or individualist concept	From the second half of the 20 th century up to now, the United States, Europe and other developed countries	Individual approach to each case, unique expressive designs, community involvement	Extra Vert housing, Hamonic + Masson, 2011, Paris
	Ecological concept	From the second half of the 20 th century up to now, in developed and developing countries	Minimizing energy consumption, introduction of green technologies and vegetation	Block 103, STERN, 1980’s, Berlin BedZED, Bill Dunster, 2000–2002, Hackbridge, London
Realistic concept or “slum upgrading”	Second half of the 20 th century, in developing countries in Asia, Africa, Latin America	Legalizing and upgrading of infrastructure and buildings in existing (often illegal) settlements	Slum Networking, from 1987, India	

The sixties and seventies were marked by the shifts in the architectural thought and diverse criticisms from architectural and social points of view of the modernist concepts of affordable housing. Jane Jacobs (1961) criticized the entire idea of modernist urban planning based on the free plan and strict functional zoning, seeing the multifunctionality as the main driver of the healthy and lively cities. The good example of such criticism is her ideas on the deck access scheme preferred by the brutalism architects: "Not only are these interior parts of the buildings streets in the sense that they serve the comings and goings of residents, most of who may not know each other or recognize, necessarily, who is a resident and who is not. They are streets also in the sense of being accessible to the public. They have been designed in an imitation of upper-class standards for apartment living without upper-class cash for doormen and elevator men. Anyone at all can go into these buildings, unquestioned, and use the traveling street of the elevator and the sidewalks that are the corridors. These interior streets, although completely accessible to public use, are closed to public view and they thus lack the checks and inhibitions exerted by eye-policed city streets." O. Newman's research (1973) on the modernist housing estates and crime also contributed to this area. His study of New York has demonstrated the higher crime rate in high-rise blocks of flats with abundance of open space around than in more densely built low-rise housing projects. The main Newman's conclusion was that the failure of these estates could be conclusively linked to the modernistic architecture and urban design (UTDPS, 2012). The strong opponent of functionalism Ch. Jencks (1987) thus described the detonation of the notorious Pruitt-Igoe housing scheme at 3.32 pm on 15 July 1972: "Pruitt-Igoe was constructed according to the most progressive ideals of CIAM (the Congress of International Modern Architects) and it had won an award from the American Institute of Architects when it was designed in 1951. It consisted of elegant slab blocks fourteen storeys high with rational "streets in the air" (which were safe from cars, but as it turned out, not safe from crime); "sun, space, and greenery", which Corbusier had called the "three essential joys of urbanism" (instead of conventional streets, gardens, and semi-private space, which he banished). It had a separation of pedestrian and vehicular traffic, the provision of play space, and local amenities such as laundries, crèches, and gossip centres - all rational substitutes for traditional patterns. Moreover, its purist style, its clean, salubrious hospital metaphor, was meant to instil, by good example, corresponding virtues in the inhabitants. Good form was to lead to good content, or at least good conduct; the intelligent planning of abstract space was to promote healthy behavior."

T. Turner (2008) thus has described the philosophical and ideological climate of the sixties and seventies: "Since then, the pessimists have been able to gather much evidence for their view that human society is incapable of progress: Stalin's Great Terror, the Second World War, the Holocaust, the atomic bomb, the Vietnam War, the 300 lesser wars between 1945 and 1990, the industrialization of agriculture, environmental degradation and destruction of the world's

primeval forests. It is no wonder that so many academic disciplines talk of "postmodernism". Discontent with design limitations and rules imposed by modernism finally resulted in the shift towards what is often called the postmodernism in architectural design and planning. According to T. Turner (2008), in architecture, postmodernism means anything that comes after the modern movement. The main identified shortcomings of the modern movement in architecture were its internationalism, universalism and functional minimalism (Jencks, 1987; Welsch, 2004). Thus, it is not surprising, that multidimensionality, multivalency, complexity, individualism, pluralism, traditionalism, and symbolism were identified as the solutions for these problems (Welsch, 2004; Turner, 2008). According to T. Turner (2008), "instead of trying to create a rationalist utopia, with a place for everything and everything in its place, postmodern planners have embraced the concept of diversity". The same trend of course is applied to the social housing. The idea of diversity means, that local traditions, craftsmanship, details and features could be integrated in the design and the local populations could have their say. This approach is embodied in the works of H. Fathy. As he noted in his work "Architecture for the Poor", "In Nature, no two men are alike. Even if they are twins and physically identical, they will differ in their dreams. The architecture of the house emerges from the dream; this is why in villages built by their inhabitants we will find no two houses identical. This variety grew naturally as men designed and built their many thousands of dwellings through the millennia. But when the architect is faced with the job of designing a thousand houses at one time, rather than dream for the thousand whom he must shelter, he designs one house and puts three zeros to its right, denying creativity to himself and humanity to man. As if he was a portraitist with a thousand commissions and painted only one picture and made nine hundred and ninety nine photocopies. But the architect has at his command the prosaic stuff of dreams. He can consider the family size, the wealth, the social status, the profession, the climate, and at last, the hopes and aspirations of those he shall house. As he cannot hold a thousand individuals in his mind at one time, let him begin with the comprehensible, with a handful of people or a natural group of families which will bring the design within his power. Once he is dealing with a manageable group of say twenty or thirty families, then the desired variety will naturally and logically follow in the housing." The multivalency of the postmodern design allows to search for individual solutions for each individual case of social housing and to take into account not only the light, space, greenery and functionality, as the modernists did, but also local traditions, ecological precautions, esthetic and psychological aspects. Even if the design and construction of affordable housing is still restricted by the limited costs, the original idea or expressive design can save the project. This is the postmodernist paradox in a positive sense: the social housing project can become an urban landmark and icon.

Looking back at the history of architecture in general and of social housing in particular, it is possible to conclude, that both modernist and postmodernist concepts have their

own advantages and shortcomings. The analysis of the strengths and weaknesses of above distinguished trends of social housing (table 2) helps further constructing the argument on the prospects of the social housing with diverse architectural expression and the strong dimension of sustainability.

3.2. Introduction of Sustainability Concept into Social Housing

The last decades of the 20th century can be characterized by the re-estimation of values in virtually all areas (Turner, 2008). These ideas had crystallized into the concept and strategies of sustainable development. Sustainable development stands for meeting the needs of present generations without jeopardizing the ability of future generations to meet their own needs; the issue of sustainability can be analyzed in four overlapping dimensions, i.e. social, cultural, economic, and environmental and is applied to virtually all aspects of life (Benson and Roe, 2000; JDS, 2002; EC, 2012). In its strategy for sustainable development the European Union declares (REUSSD, 2009; EC, 2012) the goals to “achieve a continuous long-term improvement of quality of life through the creation of sustainable communities able to manage and use resources efficiently, able to tap the ecological and social innovation potential of the economy and in the end able to ensure prosperity, environmental protection and social cohesion.”

The European Union key priority challenges of sustainability are: climate change and clean energy,

sustainable transport, sustainable consumption and production, conservation and management of natural resources, public health, social inclusion, demography and migration, global poverty and sustainable development challenges (REUSSD, 2009; EC, 2012). Regarding these shifts in understanding of sociocultural and socioeconomic development and ecology, it is not surprising that the field of architectural design seriously takes into account these obligations to the environment, the present and future generations. The sector of social housing is extremely important and sensitive in this regard. In order to analyze the dimension of sustainability in the design of the social housing it is necessary to define and characterize the concept of sustainable architecture.

The review of literature shows the proliferation of terms used to describe the designs based on some principles of sustainability: “sustainable architecture”, “environmentally responsible architecture”, “green architecture”, “ecological architecture”, “eco-architecture”. Even if the first post-war attempts to design with nature not against it can be dated to sixties and seventies, there is still confusion in defining and characterizing this architectural trend. The term “sustainability” is in use for more than 20 years now, though the Internet search engines do not provide the satisfactory straightforward definition of sustainable architecture. In our previous researches (Kamičaitytė-Virbašienė and Gražulevičiūtė-Vileniškė 2010, 2011) we defined the sustainable architecture as the architecture entirely based on the principles of sustainable development. The sustainability

Table 2. Strengths and weakness of the main trends of social housing

Trend of social housing	Strengths	Weaknesses
Idealistic, showcase model	High quality architecture and public spaces	High costs. Show case models often remain only the positive examples, but are not introduced on the wider scale
Functionalist concept	Low costs, use of prefabricated elements and possibility of mass-production	Uniformity, functional minimalism, often associated with dreariness and boredom by the society, low self-identification with architecture and environment
Large housing units	Large housing blocks include various services and amenities. Large scale buildings can become prominent architectural examples like Le Corbusier’s Unité d’Habitation and Pedregulho Housing by Affonso Eduardo Reidy	Safety problems in stairwells and other inner spaces of communal use, sense of isolation of community, the aesthetics of <i>béton brut</i> and other ideas of brutalism are often rejected by the society and communities as dull and inhumane
Regionalist concept	Respect for and use of local traditions and materials resulting in low costs and in architectural aesthetics acceptable to society and communities, respect for traditional lifestyles, continuity and evolution of architectural traditions	Strengthening of social segregation as wealthier social classes may appreciate modern construction techniques and materials and trendy cosmopolitan architectural aesthetics
Structuralist concept	Respect for social interactions, distinctive architecture	Structuralist designs may not always produce the desirable effect of social condenser
Postmodernist or individualist concept	Search for individual solutions for individual problems, diversity, inventiveness, unusual solutions, attractive designs acceptable to society	Postmodernist architectural experiments can result in kitsch
Ecological concept	Use of renewable and recyclable resources, respect for environment, promotion of biodiversity and environmentally friendly lifestyles	Extreme care for ecology may result in a secondary treatment of social issues. Some of environmentally friendly technologies are expensive and require special maintenance
Realistic concept or “slum upgrading”	Low costs, preservation of local communities	Improvements may not eliminate social segregation, stigmatization, and safety problems

of the building should be programmed in the stage of design and be present throughout the entire cycle of the existence of the building: from the design and preparation of the construction site to the demolition or reuse of the building or conversion of the site. The sustainable architecture not only should embody the principles of sustainability itself; it also should enhance the sustainable development of the environment: to promote the rational use of energy and resources, social cohesion, preservation of historic and natural environment, and contribute to the improvement of general quality of life. Several trends of sustainable architecture can be distinguished based on the research by J. Wines (2000). The table 3 shows the trends of sustainable architecture and their characteristic contextual environment.

Different documents, organizations, and designers provide different ideas and guidelines on how to design sustainable buildings. These ideas can be expressed in abstract principles, such as contextuality and legibility, social and ecological responsibility, psychological and aesthetic acceptability, durability and flexibility (Kamičaitytė-Virbašienė and Gražulevičiūtė-Vilenišké 2010, 2011) or in very concrete guidelines, such as (Wines, 2000): smaller buildings, use of recycled and renewable materials, use of low-embodied-energy materials, use of harvested lumber, water catchment systems, low maintenance, recycling of buildings, preservation of the natural environment, energy efficiency, solar orientation, access to public transportation. Table 4 demonstrates the possibilities of design of social housing with the dimension of sustainability. Below we discuss diverse ways how the four basic dimensions of sustainability can be integrated into the design of the affordable housing.

Social sustainability. Social inclusion and cohesion, social diversity are the important aspects of sustainability regarding social housing. This can be achieved by urban infill thus creating social mix, by compact multifunctional development with public spaces, and by involvement of community and future residents. The applicants for the social housing can be very diverse: those, who want but cannot substantially improve their living conditions because of various reasons and those, who do not want to put any effort and take the social care for granted. The involvement of the applicants in the design and even construction of social housing could be a good means for social cohesion and inclusion and help distinguishing between these two groups. C. Cumberlidge and L. Musgrave (2007) present numerous examples of involvement of socially vulnerable groups into design and construction projects. Luis Blanc apartment building in Paris is a good example of a social housing unit built as an urban infill in the historic environment (Falkenberg 2008).

Cultural sustainability. High quality aesthetics, psychological acceptability, identification with the living environment, contextuality, cultural continuity and evolution are important for sustainable social housing designs. Cultural continuity and evolution can be maintained through the regionalist designs, involvement of local materials and craftsmanship. Involvement of artist into social projects and creating unique expressive designs are good ways to create a cultural phenomenon out of a social housing. Expressive exteriors should be favored even if they are kind of fasadisms, hiding traditional flats. Scattered-site public housing project in Charleston in the United States started

Table 3. Trends of sustainable architecture (Wines, 2000; Kamičaitytė-Virbašienė and Gražulevičiūtė-Vilenišké, 2010, 2011)

Trend	Short description	Characteristic environment (HU – historic urban center and historic suburbs; IU – inner urban areas; PU – suburban and peri-urban areas; RL – rural landscape; NL – natural landscape)	Characteristic functions and scale (AC – architectural complexes; LPC – large scale public and commercial buildings; MPCR – medium scale public, commercial, residential buildings; SI – small scale buildings, mainly individual houses)
Aesthetization of eco-technologies	Aesthetics created by ecological technologies and environmentally friendly innovations	HU, IU, PU, RL, NL	AC, LPC, MPCR, SI
Building-garden concept	Integration of the garden into building	IU, PU	MPCR, SI
Building-landscape concept	Integration of architecture into landscape	RL, NL	AC, LPC
Interpretation of natural forms	Architecture takes inspiration from the forms of nature and cosmology; characteristic organic shapes	PU, RL, NL	MPCR, SI
Adaptation of traditional building forms and techniques	Adaptation of vernacular building traditions and materials, interpretation of ethnic architectural forms	PU, RL, NL	MPCR, SI
Coherence of sustainable architecture and built historic urban environment	Visual continuity, evolution of and adding new values to historic urban environment	HU	AC, MPCR, SI

Table 4. Composite trends of social housing in urban settings with dimensions of sustainability

Social housing trend	Introduction of dimension of sustainability into social housing trends	Abbreviation	Realization possibilities
Functionalist concept	Introduction and aesthetization of eco-technologies Building-garden concept	Sustainable functionalism SF	Introduction of low cost eco-technologies Roof terraces with gardens Urban gardening
Large housing units concept	Introduction and aesthetization of eco-technologies Building-garden concept	Sustainable housing complexes SHC	Introduction of low cost eco-technologies Roof terraces with gardens
Regionalist concept	Adaptation of traditional building forms and techniques Introduction of eco-technologies	Sustainable regionalism SR	Construction from wood or mud brick, buildings strongly adapted to local climatic conditions Involvement of the residents into design and construction activities Urban gardening
Structuralist concept	Introduction and aesthetization of eco-technologies	Sustainable structuralism SS	Introduction of low cost eco-technologies Roof terraces with gardens Urban gardening
Postmodernist or individualist concept	Introduction and aesthetization of eco-technologies Building-garden concept Interpretation of natural forms Coherence of sustainable architecture and built historic urban environment	Environmentally friendly Postmodernism EFP	Solutions, strongly related to context, involvement of future residents into building design, involvement of artists, individual, expressive, unexpected and even ironic designs
Ecological concept	Introduction and aesthetization of eco-technologies Building-garden concept Interpretation of natural forms Coherence of sustainable architecture and built historic urban environment	Ecological sustainability EcoIS	Adaptation of existing housing stock Urban infill Adaptive re-use of non-residential buildings Reuse of building materials, such as shipping containers Use of renewable and recyclable materials Urban gardening
Realistic concept	Introduction of eco-technologies Adaptation of traditional building forms and techniques Coherence of sustainable architecture and built historic urban environment	Economic sustainability EconS	Adaptation of existing housing stock Urban infill Upgrading of existing residential buildings Reuse of building materials Involvement of the residents into design and construction activities Urban gardening

in the late 1980s adopted the form of traditional Charleston single house, thus not only contributing to the solution of the social problems but also to the continuity and extension of the city’s architectural culture (Tung 2001). The Row Houses initiative in Houston demonstrated the possibility to involve artists and community into socially sensitive project (Cumberlidge and Musgrave 2007). Mountain dwellings designed by Bjarke Ingels Group in Copenhagen are a good example of non-traditional individual approach to housing and of remarkable design (AD 2012).

Economic sustainability. Energy efficiency, sustainable consumption and production are equally important for economic and environmental sustainability. Even if achieving high energy efficiency or constructing a passive social housing require more costs, this would allow to spend from 3 to 5 times less on maintenance (SF 2012). The affordable housing projects aimed at improving the quality of life of the poor can require some contribution – financial or in a form of work – by its intended beneficiaries. Social housing and slum upgrading projects (Slum Networking

in India) in developing countries demonstrate the social and economic benefits of this approach. For example, the Elemental project in Chile provides housing as a baseline service for individuals to adapt and extend as their social and economic conditions change (Cumberlidge and Musgrave 2007).

Environmental sustainability. Climate change, sustainable energy and transport, preservation and sustainable management of natural resources are important ecological aspects that can be addressed in the social housing projects. The use of local and renewable resources, technological improvements, application of ecological technologies can become an integral part of the social housing design. The use of shipping containers in the temporary housing projects currently is trendy and environmentally sustainable practice (SCH 2011). The Ivory Park Ecocity project in Johannesburg in South Africa has demonstrated that the application of ecological technologies in solving social problems is not a prerogative of developed countries (Cumberlidge and Musgrave 2007).

3.3. Challenges of social housing in Kaunas

Current situation of social housing in Kaunas.

Kaunas, the second largest city in Lithuania with its current population of 321 200 inhabitants (KMS 2012), has to deal with similar social housing problems as the other urban settlements of the country. The municipality of Kaunas currently has more than 3000 applications for social housing. Several strategies were considered for solving this problem: purchasing or renting flats in the existing apartment blocks, building new social housing units. Real estate developers propose the municipality to purchase or to rent newly built apartments in commercial development housing projects, considering such private-public partnership as the fast and the most appropriate solution for the problem. The idea of subsidized renting is difficult to implement due to the peculiarities of the real-estate market in Lithuania, where the official market for rent is nearly inexistent. Thus current situation of the social housing in the city demonstrates that neither strategy has adequately solved the problem yet (SF, 2012).

Possible types and locations of social housing in Kaunas.

The shifts of the economic situation and the consequent shifts of the real estate prices in this decade have demonstrated that the social housing sector needs diverse and flexible solutions not limited to business-as-usual functionalist designs. The affordable housing solution can range from the realistic concept of upgrading and adapting of the existing buildings to the ecological and postmodernist concepts, aimed at changing the negative image of the subsidized housing.

The realistic (EconS) and ecological (EcolS) social housing concepts can be beneficial in the periods of economic downturns, when vacant properties that have low demand in the real estate market can be purchased or rented by the municipality and adapted to the social housing needs.

The postmodernist or individualist (EFP), structuralist (SS), regionalist (SR) and even large housing units (SHC) social housing concepts can be implemented with the purpose of raising the prestige of the social housing, as currently it is often viewed as a sign of lower social status or even social stigma. Municipality often has to deal with the protests of communities when renting or purchasing the flats for the social housing use (SF, 2012). The expressive architecture of the social housing units and the public spaces created around them could foster urban renewal in a wider scale.

The map in the Fig. 1. demonstrates the possible contextual links between the trends of sustainable social housing identified in the previous section and the areas of Kaunas city of different character. The map was designed after considering not only environmental aspects, but also the urban morphology, functions, heritage values, and local identities of different areas in Kaunas city. The postmodernist or individualist (EFP), ecological (EcolS) and realistic (EconS) social housing concepts can be used in historic center and suburbs and territories of former fortress. In the territories of valuable relics of rural landscape priority

should be given to the ecological (EcolS) and postmodernist or individualist (EFP) concepts. In the territories of low-rise residential housing and public and commercial objects (mostly the peripheral parts of the city) the functionalist (SF), regionalist (SR), postmodernist or individualist (EFP) concepts should be chosen as the trends for social housing, though ecological (EcolS) and realistic (EconS) concepts are also possible. In the territories of high-rise residential housing and public and commercial objects (modernist residential districts) the functionalist (SF), structuralist (SS) and even large housing units (SHC) concepts can be chosen as the main trends for social housing, though ecological (EcolS) concept is also possible. In the territories of industrial and commercial objects the most appropriate trends can be functionalist (SF), brutalist (SHC) and structuralist (SS) concepts of social housing. Functionalist (SF), structuralist (SS) and postmodernist or individualist (EFP) concepts can be the most suitable in the areas of commercial, public and residential objects (for ex.: urban corridors, territorial neighborhoods centers).

Outcomes of the experimental design of sustainable social housing in Kaunas. The results of the experimental design by A. Narvydas illustrate the concept of postmodernist or individualist social housing (EFP), aimed at changing the image of such development and demonstrating the possibility of sustainable urban regeneration induced by the social housing project.

Highly devastated plot was chosen near the garrison camp in Panemune residential area at the eastern part of Kaunas city. The main idea of this project was to implement the concept of the “city within a city”, consisting of 14 autonomous, but also jointly connected buildings. Each building was carried out for commercial, recreational, and residential functions. Commercial and residential functions are separated by the first-floor terrace, which could be used as possible place for maintaining private gardens. The height of the buildings is 4 floors plus roof terrace because contextual building type is low-rise single-family housing; other architectural features such as buildings location, forms, sizes, scales, colors also highly correspond with the contextual environment. The whole complex consists of 168 social apartments, creating a total 26,880 m² of residential and commercial spaces. The conceptual formation of adjacent areas is also proposed: the areas for further residential and commercial development, green spaces and links, riverfront and recreational infrastructure are designated (Fig. 2).

The energy supply for the whole complex would be provided from the sustainable systems such as: solar panels, wind turbines and geothermal energy. In order to provide solar energy solar panels would be installed on the roof of each building (it would cover 5376 m², providing 20 percent of required energy). Another 10 percent would be provided by the wind power. It is proposed to install 19 turbines in the adjacent park area. The remaining energy (about 70 percent) would be obtained by geothermal energy; vertical collectors would be installed at the basement of each building.

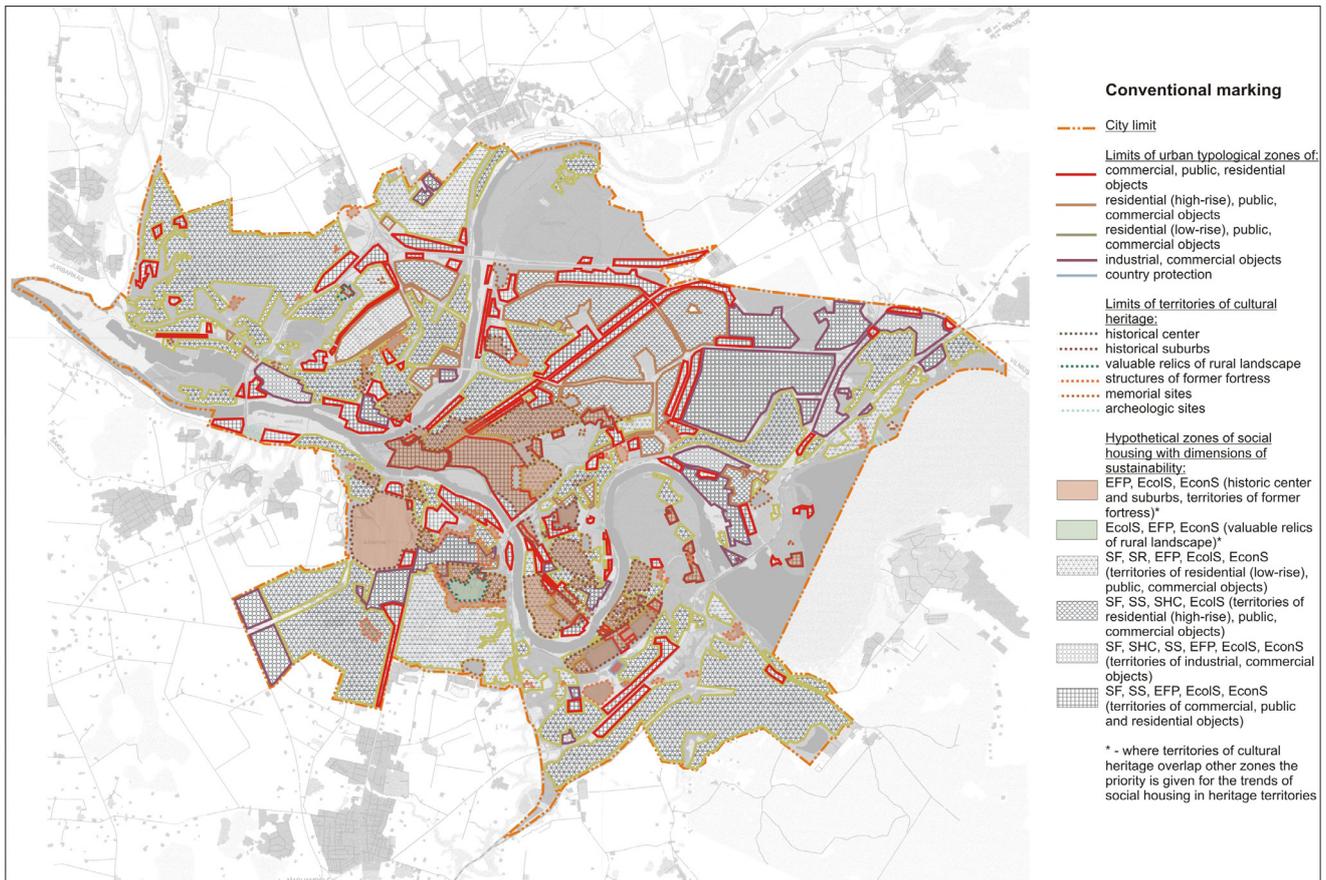


Fig. 1. Hypothetical zones of social housing with dimensions of sustainability

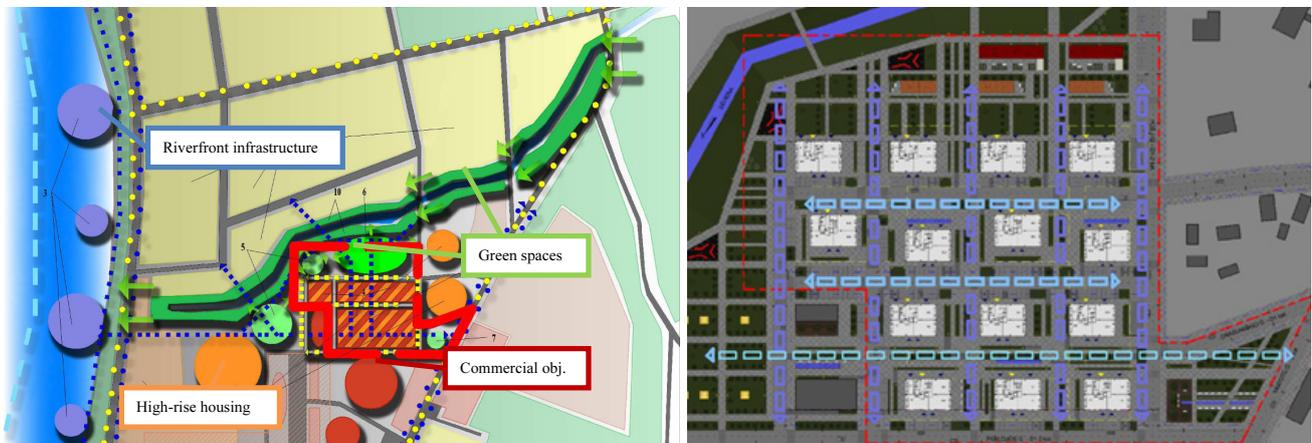


Fig. 2. The conceptual formation of adjacent areas and proposed spatial pattern of the social housing quarter in Panemune

The use of ecological building materials is proposed in the experimental design: flat laminated wood panel façade is chosen, it consists of a steel frame (made from recycled materials), insulation, and pressed wood decorative panels. It was proposed to green the roof terrace as well: part of the roof terraces will be planted with native plant species: woody shrubs and herbaceous plants. System of rain water collection will be equipped: rain water accumulated on the roof will be filtered and collected in a tank in the basement; from there it will be used for watering plants in the roof terrace.

The main result of the project – concentrated living and working spaces, created new attraction point at highly abandoned site of Kaunas city by implementing principles of sustainable housing design. The main dimensions of sustainability implemented in this project are: the introduction of eco-technologies and building-garden concept, multi-functionality and fostering of social relations, improvement of environmental quality of adjacent areas, and coherence of sustainable architecture and built historic urban environment (the chosen building type, so-called morphotype, highly corresponds with Panemune urban structure and spatial pattern) (Fig. 3).



Fig. 3. The experimental design solutions of social housing quarter in Panemune representing the postmodernist or individualist concept (EFP)

4. Conclusions

1. The history and evolution of the social housing projects beginning with the start of the 20th century demonstrate the relevance of this issue both in modernist and postmodernist architectural movements and strongly confirm and expand the social dimension in architecture present from the times of Vitruvius.

2. The experience of the 20th century and the failure of many functionalist affordable housing projects demonstrate that there is no universal model for social housing. On the other hand, experience demonstrates that even theoretically the most culturally and socially sensitive projects sometimes are doomed to failure. This shows the complexity and contradictions of socially orientated architecture in constantly changing economic and environmental conditions and proves that the individual problem needs individual solution.

3. In order to understand better the diversity of the models for social housing and the possibilities to modify and combine them for the better outcome, we had distinguished eight trends of architectural expression and organization of social housing – idealistic showcase model, functionalist concept, large housing units concept, regionalist concept, structuralist concept, postmodernist or individualist concept, ecological concept, realistic concept or “slum upgrading” – and demonstrated the possibilities to integrate the dimension of sustainability in this field.

4. The site and context of the social housing project are not less important than its type and design. The analysis demonstrates that from the one hand the social housing projects should be “better located within the network of opportunities in cities” as the C. Cumberlandidge and L. Musgrave (2007) note in order to avoid social segregation, the formation of ghettos and the non-sustainable urban expansion. From the other hand, new projects can become catalysts for revitalization of deprived urban areas. Our analysis of possible locations of different trends of sustainable social housing in the territory of Kaunas

demonstrates the importance of the coherence between the context and the trend of architecture.

5. The results of experimental design of sustainable social housing in Kaunas by A. Narvydas show possible individual solution for the particular place. The abandoned plot surrounded by single-family housing and objects of cultural heritage in the garrison camp in Panemune is transformed into a quarter of social housing. Proposed architectural expression and urban form of the quarter is consistent with the contextual architectural urban and natural environment using the principle of nuance (new development corresponds with the context according the location, size, scale, form, and colors of houses).

6. The use eco-technologies in the experimental social housing project is proposed: solar panels, wind turbines, geothermal energy, to use ecological building materials, to collect rain water, and to green roof terrace.

7. The designed quarter will be multi-functional complex, which will additionally create jobs and will foster social relations of inhabitants of the quarter. The qualitative changes of adjacent neglected areas are also planned: conversion of car parking garages into green recreational space – community park, the areas for further residential and commercial development, riverfront and recreational infrastructure are designated. Thus the proposals of the project even exceed the limits of postmodernist social housing concept by creating a sense of community and catalyzing positive qualitative changes of abandoned adjacent areas.

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