



Environmental Ethics and Sustainability in Housing Design

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House was probably the first freestanding building of the prehistoric humans. This field of architectural design and construction remains of crucial importance from the social, cultural, economic, and environmental points of view until today. Take, for example, the influence of housing construction sector on the environment due to the development of industrial construction technologies, and the increasing world's population, or the emotional, psychological impact of the closest everyday built environment on the human development. Considering this, we have decided to analyze the links between types, forms, and features of housing and ethical approaches towards the environment. This research has a historical dimension: we have analyzed the importance of different land management (landscape architecture) criteria in housing development in different historical periods and tried to identify the genesis of and conditions for the environmental concern in this field. The analysis of challenges of the present situation in the housing sector development has allowed us to identify main conditions of uncertainty, constant change, and diversity of possible architectural, technological, and ethical approaches that shape this field today. We propose that housing solutions may vary from low-tech buildings made with vernacular technologies and local building materials to ecological high-tech buildings still maintaining the environmentally friendly approach; however, taking into account the constant housing shortages and the increasing world's population, the sector of affordable sustainable housing should be given a priority.

Keywords: Architecture, housing, environmental ethics, land management criteria, sustainability.

1. Introduction

Many animals build shelters, but only human beings build homes. No other species creates such a variety of dwellings (Moore 2012). Human shelters were probably first freestanding buildings ever constructed. Analysis of this article is targeted not at representative buildings or monuments, but at housing design. Architectural history and theory demonstrate that design of human homes lies at the foundations of understanding and analyzing architecture itself. For example, the 18th century architectural theorist M. A. Laugier in his Essay on Architecture used the concept

of primitive hut as a point of departure for introducing rational constructive logic and geometric forms in architecture (Llera 2006; Kuletin-Culafic 2010). Although human shelters may not be the architectural type best reflecting the evolution and achievements of architectural styles; however, it is a most widespread construction type throughout the history and surely plays an important role in contemporary extent of human environmental impact and best represents human attitudes towards the environment. Today's researchers note that virtually all surface of the Earth

is affected by a human impact (Bučas 2001). Different types of environments transformed, modified, or created by humans can be distinguished as: urban, peri-urban, rural, agricultural, etc. Contemporary interventions and human abilities to transform the environment have reached industrial pace and global scale. Geographer and anthropologist D. Harvey (2008) speaks about “the production of space and the built environment”. Alarming environmental condition of the present days is closely related to this production. According to J. Wines (2000), construction sector consumes one-sixth of the world’s fresh water supply, one-quarter of its wood harvest, and two fifths of its fossil fuels and manufactured materials. Social, aesthetic, and psychological aspects of the built environment also raise concerns. “We have made an urban world in which we are forced to live and in making that world we have re-made ourselves”, D. Harvey (2008) notes.

Moreover, talking about historical evolution of housing design two quotes of prominent architects of the 20th century can be compared. Each of them clearly embodies the spirit of a specific historical period. In 1923, great modernist Le Corbusier in his programmatic book “*Vers une Architecture*” wrote about the function and aesthetics of the mass-production house: “If we eliminate from our hearts and minds all dead concepts in regard to the house, and look at the question from a critical and objective point of view, we shall arrive at the “house machine”, the mass-production house, healthy (and morally so too) and beautiful in the same way that the working tools and instruments which accompany our existence are beautiful.” Whereas, eight decades later sculptor, architect, architectural theorist and proponent of green building design J. Wines (2000) wrote: “...there is a new generation of architects who regard the Earth itself as the ultimate “machine” and the human habitat as the extension of the concept of Gaia, or the Earth as a living organism”. These quotes reflect the radical changes both in environmental ethics and ideas how human homes should be designed and constructed. Housing constitutes the closest everyday built environment and environment in the closest interaction with humans; meanwhile, architecture embodies and shapes the worldviews and ethical attitudes towards the environment. According to D. Harvey (2008), experience of the built urban environment “gives rise to certain mental conceptions of the world and political subjectivities. These mental conceptions can shift towards a new architecture, new design criteria and new visions of urban living”. Thus, it may be stated that housing is a starting point for the analysis of human interaction with the environment from an environmental ethics point of view and a search for more sustainable approaches towards our living environment. As D. Harvey notes (2008), “the question of what kind of city we want cannot be separated from what kind of people we want to be”. While there are many publications covering technological aspects of sustainable design, this

article address the subject from an ethical point of view.

The aim of this research has been to analyze and to highlight links between housing architecture and environmental ethics in historical and contemporary contexts, and to demonstrate possible array of housing choices for more sustainable future.

Methods of research include analysis of housing history, examples, trends, and aspects of environmental ethics. Also, a photographic survey of ecological and sustainable housing examples is produced including the Scotland's Housing Expo in Inverness of 2010.

2. Development of Housing in the Context of Environmental Ethics

According to D. Harvey (2008), our created environment is “perpetually being re-shaped by technological choices, natural events (hurricanes, earthquakes, epidemics), the technologies themselves and the like”. We analyze the idea that organization of human shelter and its link with the environment are strongly related to the worldviews and ethics of certain cultures and their shifts. We argue that analysis of historical development of housing can be helpful for understanding the progress and drawbacks in this field and the contemporary situation. Designer and thinker B. Mau (1998) underlines the role of history in contemporary design. According to him, “growth is only possible as a product of history. Without memory, innovation is merely novelty. History gives growth a direction“. The ethical dimension in housing organization and architecture and its changes throughout the history could be analyzed using a set of criteria. To understand links between the predominant ethical views, forms and qualities of human shelter we have selected the set of land management (landscape architecture) criteria proposed by P. Kavaliauskas (1992). The set of five criteria – *bionomic*, *socionomic*, *psychonomic*, *ergonomic*, and *economic* - aimed at evaluating the land management processes and their results, including architecture and landscape architecture, was developed as a part of Anthropocentric Land Management Paradigm. Table 1 demonstrates similarities between these criteria and dimensions of sustainability.

We see sustainability as a contemporary concept, an outcome of the long evolution of attitudes and environmental ethics. Thus, it would be inaccurate to judge housing of antiquity from the contemporary sustainability point of view. Meanwhile, P. Kavaliauskas (1992) provides not only the Anthropocentric Land Management Paradigm (i.e. the paradigm for contemporary landscape formation), but also the analysis of evolution of the criteria and their manifestation and significance in landscape architecture and formation of the built environment through different historical periods (Table 2.). His analysis of historical development of

land management criteria (landscape architecture) is based on human settlements and recreational areas. We have adapted these criteria to the average housing of different historical periods and geographical-cultural zones (Table 2.).

This analysis of historical development of housing was also based on the study of architectural development from an environmental sustainability point of view by J. Wines (2000) and other sources of literature including R. R. Llera (2006), P. Gossel and G. Leuthauser (2005), and analysis of the individual examples of housing of different historical periods. The analysis allowed highlighting main turning points in the history of housing that are listed and discussed below. Possible shortcomings of the selected method can be the following: adaptation of the criteria aimed at evaluation of landscapes and results of landscape

formation can be too much generalized for such particular and diverse objects as housing, and, thus, can provide too much generalized results in which some aspects or turning points can be overlooked. However, we have tried to maintain the balance between generalization and particularity in our research.

Increasing environmental impact of housing. The environmental impact of housing construction was relatively small since the beginning of historical times. For example, in Egypt and Mesopotamia rectangular houses were built from sun-dried mud bricks. Similar locally sourced materials were also used in Ancient Greece. The extent and sophistication of housing construction had increased in Ancient Rome as baked bricks and concrete were introduced (Wines 2000; Llera 2006; History... 2012).

Table 1. Land management (landscape architecture) criteria by P. Kavaliauskas (1992) and dimensions of sustainability (R. Gilbert et al. 1996; Cultural... 2012; Social... 2012)

Anthropocentric Paradigm of Land Management	Concept of sustainability
Land management (landscape architecture) criteria	Dimensions of sustainability
1. Bionomic - preservation of diversity and biological conditions for human existence	1. Environmental sustainability - the extraction of renewable resources not exceeding the rate at which they are renewed; the absorptive capacity to the environment to assimilate wastes should not be exceeded; the extraction of non-renewable resources should be minimized
2. Socionomic - optimal links between society and environment, optimal social structure	2. Social sustainability - the cohesion of society and communities and their ability to work towards common goals; the ability to develop processes and structures, which not only meet the needs of the current members but also support the ability of future generations to maintain healthy societies and communities
3. Psychonomic - optimal legibility and informativeness of environment, optimal emotional impact, aesthetics	3. Cultural sustainability - developing, renewing and maintaining human cultures that create positive, enduring relationships with other peoples and the natural world
4. Ergonomic - comfort, functionality, optimal location	4. Economic sustainability - development, which moves towards social and environmental sustainability and simultaneously is financially feasible
5. Economic - productivity and efficiency	

However, due to the use of natural materials, the impact of construction of human shelters remained low or medium until the Modern Era. By the term low environmental impact it is meant that human shelters did not significantly disturb ecological balance and if abandoned degraded over time. The medium environmental impact of housing design and construction is regarded in this research as that, leaving material remains of a considerable extent, though not considerably disturbing ecological balances, as it involves no hardly recyclable or polluting synthetic materials and no developed industrial construction methods. For example, in the peak of its power the city of Rome had circa one million (Tung 2001) of inhabitants, and this explosion in urban population led to the large scale residential construction including multi storey residential blocks.

Despite the large scale, mainly natural materials and manual labor were used at that time and the construction boom was concentrated in the important centers of the Roman Empire. Thus, we regard the environmental impact of housing of this particular historical period as low or medium. Contemporary environmental impact of construction of human homes has increased significantly compared to Antiquity, Middle Ages and Early Modern periods. The magnitude and extent of this impact is conditioned by the introduction of new construction methods, industrial production of construction materials, and by continuously increasing pace and scale of construction conditioned by the growth of world's population, and demographic and social urbanization.

Table 2. Analysis of development and environmental impact of housing using land management (landscape architecture) criteria by P. Kavaliauskas (1992) (bionomic (B), socioeconomic (S), psychonomic (P), ergonomic (Er), and economic (Ek)), and comparison with the analysis of significance of different land management (landscape architecture) criteria in different historical periods in formation of settlements and recreational landscapes by P. Kavaliauskas (1992)

Historical periods	Perceived priority of general landscape formation goals			Evaluation of average housing			Evaluation of environmental impact of housing		
	Importance of land management (landscape architecture) criteria			Importance of land management (landscape architecture) criteria			Degree of environmental impact		
	High	Medium	Low	High	Medium	Low	High	Medium	Low
Prehistoric, Bronze Age	Er, P	-	-	Er	-	-			+
Antiquity	Er, P	S	B, Ek	Er	Ek	P, S			+
Middle ages									
Europe	-	P, Er	B, Ek, S	Er, Ek	-	P, S			+
Islamic world	P	Er, S	B, Ek	Er, Ek	-	P, S			+
Far East	B, P, S	Er	Ek	Er, Ek	P, S, B	-			+
Americas	Er, P	S	B, Ek	Er	Ek	P, S			+
Early Modern Renaissance, Baroque, Neoclassicism	Er, P	S	B, Ek	Er, Ek	P, S	-		+	
Modern									
Romanticism, Eclecticism, Art Nouveau	P	B, Er	Ek, S	Er, P	Ek, S	-		+	
Modernism	Er, Ek	P	B, S	Er, Ek	P	S	+		
Postmodernism	Er, Ek	B, S, P	-	Er, Ek, P	S, B	-	+		

Anthropocentric worldview. J. Wines (2000) links the philosophical achievements in Ancient Greece with the rise of anthropocentrism in human thinking and in the human relations with the environment. According to him, the anthropocentric worldview is largely responsible for the contemporary environmental problems and the extent to which the construction of human shelter contributes to them. According to Wines, the first documented environmental disaster caused by human activity occurred in Ancient Greek city of Athens after cutting down the surrounding forests. However, the anthropocentrism of the ancient world was more evident in public, administrative, or religious buildings, than in the average housing. For example, the houses in Ancient Greece were organized around an inner courtyard and built out of mud bricks on a stone foundation, often reinforced using wooden baulks. Facades were plain and roofs were covered with clay tiles (Wines... 2000; Ancient... 2012). All middle class one-family Roman houses shared many similar characteristics. That worldview of humans as masters of their living environment was continued in the Middle Ages, especially flourished during the Renaissance, and currently prevails in western culture and beyond its limits.

Inequality. Archeological findings of the prehistoric era show obvious evidences of equality in communities concerning the size and fitting of first human homes (Gimbutienė 1996; The Heritage... 2012). However, during Ancient times the gap between rich and poor became more visible. For example, in Hellenistic Greece and Ancient Rome the size of the house depended on wealth of its owner. In Renaissance Europe social status of the owner was

reflected by the size and exterior of the building. Peasant houses were simple, built with wood, clay, and stone with roofs covered with straws. Meanwhile, houses of merchants and craftsmen were two or three storey in height and more luxurious - with brick and stucco facades, stained-glass windows, their roofs were covered with tiles. Luxurious villas became a distinguishing character of rich estates in Italy and Spain (Sider 2004; Renaissance... 2008). The social dimension in the architecture of the Modern movement was aimed to return the equality to the design and construction of human housing with the help of industry (Gossel and Leuthauser 2005). However, despite these tendencies the inequality is still visible in all modern societies across the world.

Increase in housing quality standards. Our analysis has demonstrated that economic and ergonomic criteria mattered a lot in the construction of human shelters throughout the history. The houses of antiquity were designed to ensure at least the moderate comfort. For example, Egyptian houses were bleached with lime in order to reflect the sunlight. Roofs were flat and houses often had stairs leading to the roof where it had opening, thereby improving ventilation inside the house (Ancient... 2010). Ancient Greek and Roman homes were significantly more developed and comfortable than Egyptian or Mesopotamian dwellings. Small windows and organization of life around the inner courtyards also reflected climatic conditions. The majority of Roman homes had water supply and wastewater disposal systems (History... 2012). Ergonomic features of traditional housing had been developed over centuries and are still used today in traditional wood or mudbrick constructions. Introduction of a

widened spectrum of criteria into housing design in the Western world starts with the rise of the Gothic style and is evident in the Early Modern Era in the housing architecture of Renaissance, Baroque, and Neoclassicism, and in the subsequent architectural styles of the 19th century. The emphasis on the aesthetics and organization of space demonstrated the increased importance of the psychonomic and socionomic criteria in housing design. Starting with Renaissance, the classical architectural forms – classical orders, columns, pilasters, semicircular arches, vaults, and domes – were revived and variously interpreted and modified. Precise geometry and symmetrical-axial composition became widely popular. These features were increasingly introduced into the design of urban houses and manors. Human scale became important, exquisite relationship of proportions and elegance were the distinguishing features of the Renaissance housing architecture. Monumental and luxurious main entrance, plastic and curved shapes, sculptural decorations, and rich colors became important features of the Baroque house. Proportions and reasonable decor became important in the houses of the Neoclassical era, when main entrance was emphasized with portico and pediment (Sider 2004; Llera 2006; Renaissance... 2008). Generally speaking, introduction of socionomic-psychonomic criteria and increased significance of comfort in housing design demonstrate the anthropocentric approach and extension of social concerns and responsibility, becoming the major components of high quality of life and remain challenges until the present days.

Introduction of bionomic criteria to housing design. The analysis of prehistoric and ancient human shelter which had an extremely low environmental impact raises questions if the prehistoric and ancient humans were environmentally conscious and lived in harmony with their environment. For example, shelters of the Neolithic period were primitive and often unsafe, but they had greater contact with the surrounding environment, than modern homes. As they were built using local resources (sticks, mud or stones) they blended with the landscape nicely, and, if abandoned, decayed rapidly without polluting the environment. Usage of wood for construction of housing was prevailing in prehistoric times in the territory of contemporary Central and Eastern Europe due to the climatic conditions and the lack of other materials. However, the moderate scale of construction allowed consumed resources to be renewed. J. Wines (2000) notes that simple dwellings in China, Turkey, and Egypt did not require heating or air conditioning systems because they were naturally supported with the appropriate inner temperature. Ancient Roman houses collected rain water in the inward basin, which was used for the household needs. Moreover, some architectural and engineering solutions implemented by the early house builders seem very useful today. It is possible to note the striking similarity in design between the Neolithic Skara Brae settlement (The Heritage... 2012) and the

houses designed by Peter Vetsch in 1993. The long lasting practice to use local building materials is revived and promoted by the proponents of environmentally friendly architecture. R. Skorupskas and A. Dailidavičius (2011) analyzed possibilities of designing environmentally friendly houses in Lithuanian natural conditions and had proposed housing construction solutions depending on the availability of building materials in the vicinity of a building site. The possibility to source locally building materials, for example straw, can be created as well. Idea of sourcing local materials for housing construction currently gains increasing importance in housing design. R. Skorupskas (2009) has developed the idea of “house without house” which is the model of architecture that would allow developing human housing without altering the natural environment or reducing the impact to the minimum. Such housing would resemble natural shelters of living organisms existing on the surface of earth, above or below it. In this way, the early development of human shelters like living in caves and in Neolithic mud brick dwellings somehow repeats itself in the contemporary troglodyte dwellings, “house without house”, and other similar cases. It is possible to question what links and separates these two housing developments. Probable links are: exterior design, forms, materials and colors. What separates them is not only the distance in time but the shift in consciousness: prehistoric and ancient environmentally friendly recyclable houses were determined by the necessity and the absence of choice; bionomic criteria were not the conscious choice. In contrast, contemporary respect to nature by some designers and home owners is not conditioned by the helplessness but by the conscious choice and understanding of the vital importance of the healthy environment for the human survival. J. Wines (2000) argues: “It could be speculated that if mechanized cranes and earth-moving equipment had been available to the ancient Egyptians, all of this deference of nature would have been converted to re-routing the waterways, dredging the Nile, building bridges and constructing dams”.

Influence of the cultural context. J. Wines (2000) underlines that for the comprehensive solution of environmental problems the spiritual connection with nature is needed. He describes such worldviews of aboriginal cultures: “...any hand built dwelling must defer to nature’s need for reclamation; therefore, it should be conceived from the outset as part of a seamless dematerialization back into the environment when its sheltering functions are no longer required.” Historical analysis also demonstrates that cultural context strongly influenced character and links with the environment of the human housing. However, some paradoxical cases of environmental degradation despite the spiritual connectedness with it exist. For example, contemporary research suggests that, despite of strong connectedness with nature, the activities of Australian aboriginal people had influenced the climate changes. Burning forests in northwestern Australia, they had altered the local climate: extended

the dry season and delayed the start of the monsoon season (Wyrwoll 2012). The traditional belief systems of the Far East countries also emphasize the connectedness with nature. P. Kavaliauskas (1992) had distinguished the Buddhist and Hindu cultures for the consideration of bionomic, psychonomic, and socionomic criteria in formation of the living environment. This was evident in the housing design as well. Architecture of traditional homes in China and especially in Japan was also based on harmony with nature, on understanding of the constant change, on the connectedness of the interior and exterior spaces (Tung 2001; Wines 2000). However, despite

historically developed connections and the deep respect to nature, contemporary India, China and Japan share similar environmental problems as the countries of the western culture. This allows concluding, that introduction of bionomic criteria into the construction of housing can be determined by the geographical and cultural context and specific traditional worldviews; however, the increasing scientific understanding of environmental problems and threats and the extension of environmental ethics should play a major part in this process. Traditional worldviews and scientific knowledge can complement each other in this field.

Table 3. Mainstreams of architecture of the 20th century, their application to housing design and evaluation based on land management (landscape architecture) criteria by P. Kavaliauskas (1992) (bionomic (B), socionomic (S), psychonomic (P), ergonomic (Er), and economic (Ek))

Architectural trend	Characteristics	Application to housing design	Examples	Importance of land management criteria		
				High	Medium	Low
Functionalism, International style	Minimalist aesthetics, use of standardized prefabricated building parts	Constant	Torten housing estate, Walter Gropius, 1926, Dessau	Er, Ek	P	S
Expressionism, Neo-expressionism	Expressive plastic irregular forms	Rare	Copan Building, Oscar Niemeyer, 1957 - 1966, São Paulo	P	S, Er, Ek	-
Organic architecture	Interior-exterior links, use of local materials, asymmetric plans	Frequent	Robie House, Frank Lloyd Wright, 1908 - 1910 Hyde Park Chicago	P, Er	B, S	Ek
Constructivism	Emphasis on constructions and structure	Rare	Narkomfin Building, Moisei Ginzburg and Ignaty Milinis, 1928 - 1932, Moscow	Er, Ek	S	-
Brutalism	Minimalist design, exposure of building materials, use of raw concrete	Frequent	Unité d'Habitation, Le Corbusier, 1947-1952, Marseille	Er, Ek	P	S
Regionalism	Use of local materials and interpretation of regional architectural forms	Rare	Dariya Housing, Hasan Fathy, 1975, Dariyah, Saudi Arabia	P, S, Er	Ek, B	-
Structuralism	Use of repetitive structural units, plans aimed at facilitating and fostering social relations	Rare	Habitat 67, Moshe Safdie, 1967, Montreal, Canada	P, S	Ek, Er	-
Postmodernism	Interpretation of traditional and historical building features, symbolism, communication, diversity	Rare	Atlantis housing, Arquitectonica, 1978, Miami	P, S	Ek, Er	B
Ecological design	Environmentally friendly design, use of local materials and eco-technologies	Rare	BedZED, Bill Dunster, 2000-2002, Hackbridge, London	B, Er, P	Ek, S	-
Architecture of new complexity (High-tech, Deconstructivism)	Expressive, sophisticated forms, innovative building materials and technologies	Rare	Gehry Residence, Frank Gehry, 1978, Santa Monica	P	S	Ek

Proliferation of the concepts of housing. Analysis of the ideas that shaped modern and contemporary architecture in general and housing in particular reveals diversification of the sets of values and the goals involved, which resulted in a diversity of trends. Architectural historians underline that the most distinguishing feature of the 20th century was the introduction of new building materials like steel and concrete in a massive scale (Lera 2006; Tietz 2008). The radical diversity in architectural expression of the Art Nouveau design at the end of the 19th century and at the beginning of the 20th century and the early modernist architecture at the beginning of the 20th century demonstrates that the world views and the importance of certain criteria may influence the outcome more than the technologies and materials

involved. Both Modernism and Art Nouveau proclaimed the values and uses of metal structures and concrete, the industrial production of building parts that were innovations at that time; however, the Modernism was based on economic and ergonomic criteria; meanwhile the Art Nouveau concentrated mainly on aesthetic, emotional aspects; the ornamentation and building forms were inspired by nature. Metal and concrete allowed express new vivid look in Art Nouveau residential buildings. Iron allowed creating lineal forms; concrete was used to create plastic curves and intricate ornamentations. Floral elements and decorative details became popular in both interior and exterior of houses (Gossel and Leuthauser 2005; Llera 2006). Meanwhile, Rationalism and later Modernism underlined the

importance of the efficient design and construction. “There is no doubt about the close relationship between the avant-garde of the early 1900’s and the industrial and social innovations of the Machine Age” L. Silenzi (2012) notes. The Modernism stood for the implementation of the minimalist geometric forms and the use of reinforced concrete, steel and glass for mass production of building parts as a solution of the housing crisis. For example, Le Corbusier had developed a system of residential construction, which consisted of a simple reinforced concrete frame. Concrete slabs divided the floors which were connected to the staircase (Wines 2000). This was Le Corbusier’s “machine for living”. Such approach allowed developing cheap housing units and opened the way for the mass residential construction. The debatable and one-sided idea that only the building materials imply architectural form was further developed in the trend of Brutalism. These minimalist and economically efficient housing trends became especially important after the World War II, when Europe faced demographical explosion and the shortage of housing (Wines 2000; Llera 2006). Progressive design was understood only as cheap and functional (Wines 2000). However, the architectural history of the 20th century has demonstrated how many diverse factors – philosophy, ideologies, scientific discoveries, artistic trends, history and traditions, etc. – can influence architectural form. The basic architectural trends, their short description, the application in the field of housing design and the importance of different criteria in these trends are demonstrated in Table 3.

It is difficult to evaluate the application, prevalence, and importance of certain trends in the housing design and their environmental impact. For example, Modernism was and still is extremely widespread in the design of both blocks of flats and individual houses. However, J. Wines (2000), W. Welsch (2004) and many others argue that the modernist architecture, especially residential, became repetitive, pale and faceless, that it has lost its regional features and symbolism. Meanwhile, the Organic architecture conceived and promoted by F. L. Wright was mainly embodied in housing and had many positive features, like use of local materials, harmonious contact with nature, distinctive aesthetics (Gossel and Leuthauser 2005). However, the designs by F. L. Wright were mainly expensive and could not tackle the housing shortage. And, finally, the American dream embodied in F. L. Wright’s design of an individual house outside the city surrounded by nature resulted in the contemporary suburban sprawl, which today is one of the greatest environmental concerns not only in the United States. It could be added, that theoretical possibility of choices presented by the contemporary ethical and architectural trends justify the need of discussion about future trends and prospects of the housing development and design.

Trends of Sustainable Housing in the Context of Environmental Ethics

The analysis of residential development and the significance of different land management (landscape architecture) criteria in different stages of development of housing have demonstrated the relations and contradictions between ecological innovations, introduction of sustainability in housing sector, and traditional, modern, and post-modern construction and housing models. This analysis also allows drawing several conclusions concerning contemporary and future trends of housing development and the role of sustainable or ecological architecture in this context. On the one hand, we have seen an increasing environmental consciousness, ecological awareness and the widespread interest in environmentally friendly technologies and goods. This trend sometimes is even referred to as “green fashion”. On the other hand, we see diversity in architectural trends and ethical concepts, and uncertainty about the optimal choices and outcomes in the constant social, economic, technological, cultural, and environmental changes. Our task was to analyze how these trends can complement one another; how environmental awareness and corresponding housing solutions should adapt to these complex conditions.

Uncertainty and constant change. In 2000 the architectural journal *Domus* looked through possible directions of architecture and design in the 21st century. Designer and thinker B. Mau (2000) had identified ten possible design trends of the future: hypertechnology, sustainability, meditative objects, low and soft tech, hybridization, self-production, innovative presence, nano-architecture, hypercommunication, simplicitas. It is evident that these trends are diverse and even contradictory and cannot be generalized into one particular style or development direction. B. Mau (1998) has also published *The Incomplete Manifesto for Growth*. It implies that growth is more qualitative than quantitative and underlines that growth in creative activities, such as architecture and design, can take many directions. The title of the manifesto itself including the word “incomplete” suggests the inevitable changes and the freedom of creation presenting infinite opportunities. The technological progress constantly presents new opportunities as well. This idea can be linked with the concept of the “open whole” presented by postmodernist architect and theorist R. Venturi (Welsch 2004). Thus, the absence of the strict architectural trends and stylistic limitations and technological opportunities provide the space for creation of environmentally friendly architecture. However, B. Mau (1998) underlines the principle of precaution, which is essential in the concept of sustainability (Throsby, 2002) as well: “Be careful to take risks. Time is genetic. Today is the child of yesterday and the parent of tomorrow. The work you produce today will create your future.”

Diversity. Contemporary troglodyte dwellings and environmentally friendly “houses without houses”

discussed above, ecological circular buildings covered with turf and blending with the landscape constitute only a fraction in a wide spectrum of types, styles, and trends of housing design of the 20th and 21st centuries (Figure 1.).

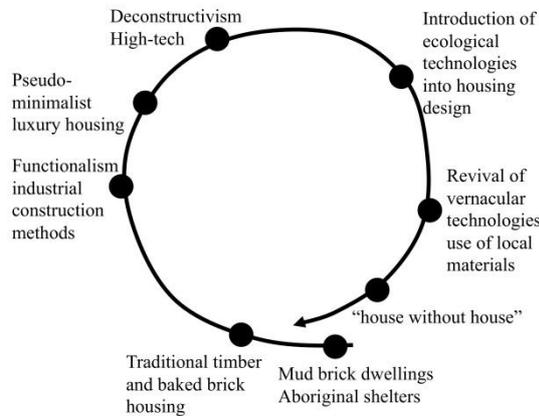


Fig. 1. Evolution of housing design revealing some similarities between prehistoric and ancient housing and contemporary trends of environmentally friendly housing design

To sum up, the diversity of theoretically available housing types has significantly increased in the Modern Era compared to Antiquity, or the Middle Ages. These designs reflect the diversity in aesthetical tastes, cultural contexts, philosophies, socioeconomic conditions, ethical views, etc. Modern and contemporary examples of housing include a wide range of typologies with the emphasis on very different sets of criteria: from economic and ergonomic (Functionalism, Brutalism) to socioeconomic-psychonomic (Structuralism, Postmodernism) and bionomic (ecological design, “house without house”, green design). The extreme opposite examples of the modern and contemporary housing design include consumerist technicized dwelling concept created by Archigram in the 1970’s, elitist pseudo-minimalist (Minkevičius 2008) luxurious houses built using the expensive hardly obtainable and hardly recyclable materials, or materials with high energy costs, and exotic materials, pale and uniform mass produced apartment blocks, colorful and provocative postmodernist designs, and environmentally friendly buildings including low-tech mud brick dwellings constructed using vernacular technologies and the houses based on advanced environmentally friendly high-tech.

Different trends of environmentally friendly architecture are often referred to as sustainable architecture. Term sustainable is often used as an analog or substitute for such terms as ecological, environmentally friendly, green, etc. However, sustainability is a social multidimensional concept, which includes not only environmental, but also sociocultural and socioeconomic goals. The concise definition of sustainable development was introduced by the World Commission on the Environment and Development during the United Nations General

Assembly in 1987. It stated that sustainable development would make it possible to meet our needs today without compromising the ability of the future generations to meet their own needs (Newman and Kenworthy 1999). Human beings are at the center of sustainable development concern (Rolston 2003). The field of environmental ethics is not limited to this contemporarily predominant concept (Figure 2.). Diversity in the field of environmental ethics presents a particular interest to our research. The environmental ethics, a new field of thought that was started in the 1970’s, presents a wide spectrum of approaches to this moral issue (Rolston 2003). These approaches range from anthropocentrism, which states that nature must be preserved not for its own sake but for the sake of *Homo sapiens*, to which it supplies an indispensable array of the ecosystem services (Ehrlich 2002), to more inclusive concepts as animal welfare ethics, biocentrism, which takes care of all the life forms not only the sentient beings, ecosystem approach, which cares of entire ecosystems and the Earth ethics, the concern of which is the entire planet Earth (Rolston 2003; Petersen 2007) (Figure 2.).

Considering this point of view, currently predominant sustainability concept can be described as anthropocentric. Thus, the contemporary environmentally friendly architecture can be based not only on the anthropocentric sustainability concept, but can be extended towards biocentrism, land ethics, ecosystem approach, or the Earth ethics (Figure 3.). For example, the concept of “house without house” described above clearly exceeds the boundaries of anthropocentrism. An ecosystem approach can be adapted not only to natural, but also to human ecosystems. For example, D. Harvey (2008) notes: “The city has to be viewed as a metabolic and ecological system in its own right and, therefore, as a vibrant and increasingly dominant part of the natural world we inhabit”. On the other hand, social, emotional, and psychological aspects should not be ignored as well, as the primary aim of housing is to meet the human needs. The anthropocentric ethics and more radical and inclusive ecosystem approaches, such as deep-ecology and the Earth ethics can be seen as aimed at the same goal. H. Rolston (2003) notes that “humans need to include nature in their ethics; humans need to include themselves in nature”. B. G. Norton (1991) has developed the “convergence hypothesis”, he claims that fully enlightened anthropocentrists and more radical naturalistic environmentalists will almost entirely agree on environmental policy (Figure 2.).

Paradigm shift. The concept of paradigm shift was defined and popularized by T. Kuhn (1970). He sees it as a revolution through which “one conceptual world view is replaced by another”. The above-described concepts of environmental ethics including the sustainability require the change in the values and worldviews of societies, which can be seen as the paradigm shift. For example, N. Duxbury and E. Gillette (2007) note “Sustainability is fundamentally

about adapting to a new ethic of living on the planet and creating a more equitable and just society through the fair distribution of social goods and resources in the world. Sustainable development questions consumption-based lifestyles and decision-making processes that are based solely upon economic efficiency”. In the analysis of the futuristic housing concepts, the scenarios of how the human living environment will develop in the future we have distinguished the concepts, which require the radical shifts in technology, values, and social structure. These concepts currently can be seen more as utopian ideas. For example, J. Wines (2000) points out two possible solutions: underground habitat and living on the water. Another radical idea was the future nomadic society with the mobile self-sustainable houses by B. Fuller (Samalavičius 2008). P. Soleri’s idea of *arcology*, meaning the merging of architecture and ecology is notable as well. The implementation of that idea was started in the United States in the desert north of Phoenix with a creation of alternative Arcosanti community (McMillan 2007). However, the works are progressing slowly and the community has attracted only 50 residents instead of envisioned 5000 (Arcosanti 2003). Radical ideas seem to attract neither society nor institutions. According to J. Wines (2000), currently the majority of examples of sustainable buildings are more experimental than real solutions against wasteful way of life. It is necessary to note that the situation remains the same after twelve years. However, another tendency can be noted as well. These are so-called “down-to-earth” approaches demonstrating the less radical and more affordable possibilities to introduce at least some ecological aspects in the housing design. The example of this approach is the Block 103 urban renewal project implemented by the Berlin contractor for urban reconstruction STERN in 1980, which involves the introduction of high- and low- tech ecological features, such as vertical and horizontal greenery, recycling of grey water, photovoltaic panels on the roofs and the re-use of existing structures and still maintains the aesthetics of traditional urban block (Figure 4).

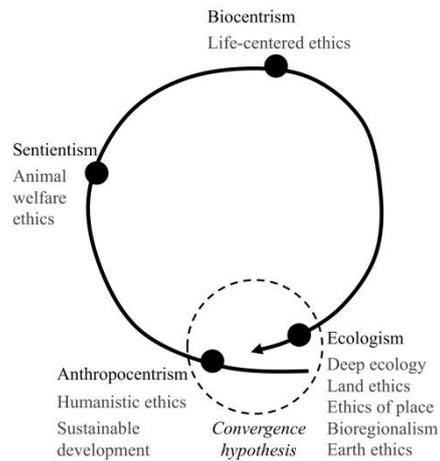


Fig. 2. Different approaches to environmental ethics and the “convergence hypothesis” developed by B. G. Norton (1991)

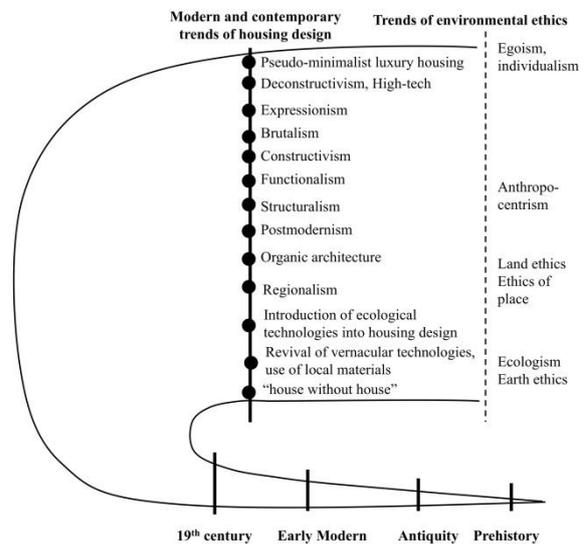


Fig. 3. Diversity of architectural trends of housing design in the 20th and 21st centuries compared to the earlier historical periods and their correspondence with different approaches to environmental ethics



Fig. 4. Fragment of the Block 103 in Berlin: vertical greenery and the “vertical swamp” installed to capture grey water for recycling (photographs by I. Gražulevičiūtė-Vileniškė)



Fig. 5. Affordable housing solutions in the Scotland's Housing Expo in Inverness of 2010: Flower House, Lios Gorm House, House HS, House NS, and Skewed House (photographs by Artūras Narvydas)

The Scotland's Housing Expo in Inverness of 2010 has demonstrated a wide array of sustainable housing examples, which can be characterized by moderate, traditional aesthetics, affordability, and could be easily integrated into different rural and urban contexts (Figure 5). The need of this down-to-earth approach is justified by the contemporary housing paradox: never before in history there was such wide array of possible housing solutions; however, the majority of the world's population live in the uniform housing blocks and in the slum-like dwellings.

4. Conclusions

1. Housing is the oldest and most extensive sector of construction possessing strong environmental influence. Simultaneously, housing constitutes the closest everyday human environment with much emotional, psychological effect on humans. Considering these influences and potential of architecture to reflect and express the values and worldviews of society, we presume that housing can be analyzed as an indicator of ethical approaches of different societies towards the environment. We argue that the introduction of environmental ethics into housing sector could strongly contribute to environmental sustainability.

2. The set of land management (landscape architecture) criteria by P. Kavaliauskas (1992) – bionomic, economic, ergonomic, psychonomic, and socionomic – allows analyzing historical development of housing and diverse contemporary trends of housing architecture not only from the aesthetic, structural, or technological points of view, but also from the point of sustainability and tracing different ethical attitudes towards the environment.

3. The analysis of historical development of human shelter allowed highlighting several points regarding environmental influence and ethical aspects of housing: environmental influence of housing construction has significantly increased in the Modern Era compared to the entire human history due to the introduction of industrial production and construction, innovations in building materials, and dramatic increase in human population; the majority of historic and contemporary housing examples embody the anthropocentric view and are based on the ergonomic and economic criteria; introduction of socionomic and psychonomic criteria were determined by evolution of cultures and a widening understanding of human needs. The introduction of the bionomic criteria into housing design was determined both by worldviews, spiritual connections with nature of specific cultures, and increasing scientific understanding of environmental problems.

4. Contemporary situation of housing design is influenced by uncertainty and constant change in economic, environmental situation and societies, by diversity of architectural trends and approaches towards environmental ethics ranging from anthropocentric to ecocentric trends. We argue that environmental ethics and technological progress must complement each other in shaping the more environmentally friendly human living environment. Contemporary paradoxical situation, when emphasis on quality of life and ecology in housing design becomes increasingly popular, and still housing shortage and environmental impact of housing construction are greater than ever in history, main attention should be paid to affordable environmentally friendly housing. Moreover, in the future housing design should not be limited to the goals of anthropocentric sustainability but extended beyond it towards the ecosystematic, Earth-centered ethical views.

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Aplinkos etika ir darnumas projektuojant būstą

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Būstas tikriausiai buvo vienas pirmųjų žmogaus statinių. Ši architektūrinio projektavimo ir statybų sritis yra ypač reikšminga socialiniu, ekonominiu, kultūriniu ir aplinkosauginiu požiūriais. Pavyzdžiui, žmogaus būsto statybų daroma įtaka aplinkai ir žmogaus gyvenamosios aplinkos emocinė, psichologinė įtaka jo vystymuisi negali būti nuvertintos. Atsižvelgiant į būsto poveikį aplinkai ir žmogui, straipsnyje nagrinėjami ryšiai tarp būsto tipų bei bruožų ir etinių požiūrių į aplinką, jų kaitos. Atliekant tyrimą, aptariama istorinė analizė ir dabartinės tendencijos, turinčios įtakos būsto projektavimui ir darnumui. Atliekant istorinės raidos tyrimą, nustatoma skirtingų kraštovarkos (kraštovaizdžio architektūros) kriterijų, 1992 m. suformuluotų P. Kavaliausko, reikšmė formuojant būstą skirtingais istoriniais laikotarpiais ir įvairiuose kultūriniuose kontekstuose. Atlikus šią analizę, nustatytos sąlygos, kurios paskatina projektuojant būstą atsižvelgti į ekologinius, aplinkosauginius kriterijus. Analizuojant šiandienines būsto projektavimo ir statybos aplinkybes bei tendencijas, buvo nustatyti svarbiausi veiksniai: nuolatiniai ekonominiai, ekologiniai ir socialiniai pokyčiai ir jų lemiamą nežinomybę, architektūrinių ir technologinių sprendimų ir etinių požiūrių į aplinką įvairovė. Visi šie veiksniai turi įtakos šiai sričiai. Atsižvelgiant į tai, darnaus būsto sprendimai gali būti įvairūs: nuo nesudėtingų tradicinių technologijų ir vietinių medžiagų panaudojimo iki architektūros, paremtos aukštosiomis ekologinėmis technologijomis. Visgi, atsižvelgiant į tai, kad nuolatos daugėja pasaulio gyventojų ir trūksta kokybiškų būstų, pirmiausia reikia ieškoti aplinką tausojančio ir kartu prieinamo būsto sprendimų.