Healthy Housing Environment in Sustainable Design

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Abstract. The 21st century is a century of contradictions: great opportunities but also great hazards. The situation in which the humankind has found itself in the 21st century requires urgently that the need for sustainable development in its spatial, social, environmental and economic aspects is fully appreciated. The quality of housing environment, in which the young grow and the elderly spend most of their time, should meet the expectations and needs of contemporary man. This paper aims to investigate how the issues of growing life expectancy, the desire to spend it in good health and the trend for healthy lifestyle are addressed in the principles of sustainable development and what methods should be adopted for creating healthy housing environment promoting physical health, emotional wellbeing and social coherence. The subject of health in the context of housing environment was addressed at the conference in Vancouver on human settlements. The World Health Organisation listed several definitions of concepts related to human health. The Cologne Recommendations contained a statement that physical surroundings, just as the dwelling place itself, are the condition of well-being, they can promote social integration and positively influence children's mental development, but – if inappropriate – they may be the reason for poor concentration and memory, anxiety and difficulties in fostering inter-human relations. Abundant research on the influence of greenery, water and natural landscape on recovering from stress and intellectual fatigue shows that the role these factors play is absolutely invaluable. Research carried out by Ipsos MORI company for RIBA provides certain guidelines as to people’s invariable and variable needs, which, although indirectly, give some information also in the context of the healthy housing environment. It is then legitimate to ask a question about the extent to which the goals, tasks and methods of sustainable development and sustainable design satisfy the needs and expectations related to designing a housing environment that could be called healthy. There are numerous lists of principles and methods of assessing the sustainability of individual structures, whole complexes or areas. Author suggests three basic features that should characterise a housing environment so that it could be called sustainable: it should be economical, pro-social and beautiful. Correct and effective combination of all aspects in sustainable design requires assiduous efforts in several areas: education and awareness-building among designers, officials and users as well as adequate policy and promotion of solutions, which will encourage shaping a healthy housing environment in the urban scale.

1. Introduction
The 21st century is a century of contradictions: great opportunities but also great hazards. It is an age of personal freedom on the one hand and social responsibility on the other, overpopulation and shrinking birth rate, depleted stock of non-renewable energy sources and photovoltaic cells getting cheaper than ever, insufficient amount of clean water and violent floods, wind energy and havoc-wreaking hurricanes. An age called the age of information and globalisation, the latter phenomenon becoming particularly
apparent when it took the form of the global economic crisis. The following issues acquire particular importance in the situation the humankind has found itself in: the awareness of globalisation, understanding the nature of interactions with the environment, recognition of the finite character of available space, water and clean air and the ensuing need for self-limitation, appreciation for the significance of context and tradition. In short: understanding the necessity to strive for sustainable development [1].

Housing environment is this special part of urban structure, which to a significant degree determines the quality of life and development opportunities of the people who live in it; the above is particularly true with reference to its youngest and oldest inhabitants. Nevertheless, changes in time budget, working from home or working flexi-time are factors, which contribute to the fact that a growing number of professionally active adults also change their lifestyles and spend more time at their place of residence. The requirements a good housing environment must meet are growing. Humans live longer and are active for a longer time; they want to live for many years in good health, all of which promote healthy lifestyle. At the same time, however, cities offer fewer and fewer opportunities for contact with nature, the amount of undeveloped land within city boundaries is shrinking. A new concept has recently appeared in the publications on the subject – nature-deficit disorder, which adversely affects health and general development, especially in the case of children. Rethinking the city may be a response to this situation – treating it as a zoopolis rather than metropolis – and the emergence of a new direction – landscape urbanism [2]. Housing environment is of great significance for satisfying the psychophysical needs of city dwellers. People expect that the place where they live will give them a safe shelter, the sense of identity as well as physical and psychological comfort. They seek cosiness, privacy and intimacy, bioclimatic comfort, safety, hygiene and good conditions for psychological and physical regeneration.

One of the greatest challenges housing environment designers are facing in the 21st century is, how to reconcile two opposing tendencies – offering individuals the possibility to choose freely their place and form of residence and at the same time observing the principles of sustainable development and giving priority to the needs and growth potential of a given city derived from these principles. Housing areas are not uniform within an urban structure. We could distinguish at least three most characteristic zones: inner city or city centre – densely developed, where the housing function is one of many diverse urban functions; typical housing estates with the housing function as the dominant one, and suburbs, with the dominant role of open areas. However, regardless of the differences in location, function or urban structure, it should be assumed that each of those zones must be characterised by one fundamental feature, i.e. it should offer its residents healthy living conditions that promote development. The ever-growing public awareness of the connection between lifestyle and living conditions requires granting the quality of housing environment the status of the most fundamental indicator of quality of life and considering the health-promoting character of housing environment as one of the factors contributing to its quality, in compliance with the principles of sustainable design [3].

Emphasis on human dignity, individuality and unique personal features on the one hand, and understanding that we can act effectively and survive in our physical environment only as a community on the other, lead to the conclusion that housing environment must be seen in all its numerous aspects and treated in a holistic manner. Our perception of housing environment should be based on recognition of the dynamic co-dependencies between physical and social environment and individual needs of each person [4]. It should take into account complex dependencies of biogenetic, psychological, behavioural, environmental (geographic and architectural), technological and socio-cultural nature, and the efforts aimed at designing healthy housing environment should be directed both towards individuals and populations, and coordinated on multiple levels. State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results.
2. Healthy housing environment – people’s needs and expectations

Concepts such as human living environment or housing environment have been developing slowly alongside the evolving perception, growing more discerning in the process, of the co-dependencies operating between people and places they live in.

The subject of health in the context of housing environment was addressed at the conference in Vancouver on human settlements in 1976. The Declaration adopted by the conference participants stated that nothing influences the quality of life and satisfaction from fulfilling the needs related to housing, health, education and recreation more than the conditions of human settlements. It was stated in this document that health is an essential element in the development of an individual and improving environmental health should be one of the goals of human settlement policies.

The Cologne Recommendations contained a statement that physical surroundings, just as the dwelling place itself, are the condition of well-being, they can promote social integration and positively influence children's mental development, but – if inappropriate – they may be the reason for poor concentration and memory, anxiety and difficulties in fostering inter-human relations.

The World Health Organisation listed several definitions of concepts related to human health and here are some of them:

- **health** – in the context of health promotion it is understood as the ability of an individual to use their potential and react positively to the challenges of the environment, it is seen as a repertory of possibilities rather than just a condition for living; it is a positive concept emphasising social, personal and physical abilities; health is also described as complete physical, mental and social well-being, and not only as an absence of disease or infirmity;
- **positive health** – a state going beyond the absence of symptoms of a disease; it includes the quality of life and the human condition potential as well as self-fulfilment, vitality and creativity;
- **quality of life** – a state in which individuals and groups are aware that their needs may be fulfilled, and the said individuals are not denied the possibility of achieving happiness and fulfilment [5].

Three groups of health aspects may be distinguished on the basis of the analysis of academic materials and research results: **physical health** – and here belongs health seen from the perspective of physiology and psychiatry, absence of disease symptoms or defects, genetic and reproductive health; **mental and emotional well-being**, including the sense of personal competence and fulfilment, little emotional disturbance, a sense of personal identity and creativity; and **social coherence on the organisational and local community level** achieved through a high level of social contact and cooperation, acceptance of and satisfaction from the community organisation, a high level of perceived quality of life, predominance of pro-health and environment-friendly behaviour [6], [7].

As has already been mentioned, housing areas are not uniform. Different parts of the city offer their residents different benefits related to living there rather than somewhere else. They are – for example – functional variety and a general diversity of programme in the city centre, easy access to basic services in typical housing districts or a wide range of recreational activities and contact with nature in suburban zones. However, all areas where there is compact and dense housing development feature spaces and functions as well as relations between them, which affect the quality of the environment and also the opinion of the residents. These are relations between the housing development and its residents on the one hand, and the surrounding areas, urban enclosures and public spaces on the other. They could be labelled as: **what is inside, what is in between and what is outside** [5]. All of them affect the residents’ health, well-being and sense of social coherence to a greater or lesser extent.

Choices that every person must make in their life, including the choice of place to live, are rooted in three areas: biological evolution, history of culture and personal experience. An intuitive selection of housing environment boils down to verification whether a place has the features that would enable survival – whether it has enough greenery, there is a water reservoir or a watercourse and the land is
slightly corrugated [8], [9]. The above features used to be essential for survival, but even now, they promote healthy lifestyle. Elements of nature turn out to be desirable for preserving good physical and psychological health as areas for sport and recreation and as areas improving the quality of air, but they are also indispensable for psychological and mental well-being. The last role of natural elements seems to be of particular importance for people living in big cities in the information age, where the number of stress inducing factors continues to grow. At the same time, making the urban structure denser, often in order to stop the city from sprawling out, results in building up the existing green areas.

Abundant research on the influence of greenery, water and natural landscape on recovering from stress and intellectual fatigue shows that the role these factors play is absolutely invaluable [7]. The question that should be asked now is whether the research, which is to examine the quality of housing environment, has taken into account the above facts.

The Interim Report published by the European Commission in 2002 contained 10 researched problem groups: citizens' satisfaction with the local community, local contribution to global climate change, local mobility and passenger transportation, availability of local public open areas and services, quality of air, children's journeys to and from school, sustainable management by local authorities and local enterprises, noise pollution, sustainable land use and products promoting sustainability [10]. The first researched indicator: satisfaction with the local community, included standards of housing, quality and size of natural environment, quality of built environment, amount and quality of services related to culture, recreation and leisure, opportunities to participate in decision-making processes, level of personal safety. The indicator that was directly related to human health was indicator no 4: availability of local public open areas and services. One of the units of measurement was the percentage of inhabitants living within the radius of 300 m from an open green area of minimum 5,000 m². Access to open green areas and services was considered fundamental for the quality of life and local sustainability. Public open spaces were defined as public parks, gardens and open spaces for the exclusive use of pedestrians and cyclists, open-air sports facilities and private areas accessible to the public free of charge.

The conclusion stemming from the analysis of the detailed questions featured in the above survey is that they did ask about some pro-health elements, yet in an indirect and rudimentary way.

A question could be asked at this point whether health promoting characteristics of housing environment are important for the residents themselves. It seems that people’s expectations as regards their place of residence have not changed drastically over time. However, popularisation of information technologies, increased awareness of the possibility of having a better quality of life and the trend for healthy lifestyle may have potentially brought on some changes in behaviour patterns or preferences, so it would be interesting to monitor this process. Research carried out by Ipsos MORI company for RIBA provides certain guidelines as to people’s invariable and variable needs, which, although indirectly, give some information also in the context of the healthy housing environment [11]. The research focused primarily on the expectations and evaluation of flats/houses, yet in some parts, it presented a wider – urban and social – perspective. Respondents often pointed out to the ‘feel’ of home as a reason for selecting a given place of residence. They also considered flexibility of a home as an asset, because it allows adjusting the interior to the changing needs of its users and promotes both the development of individual persons and the creation of family and social bonds. The research participants emphasised the significance of private outdoor space, which was particularly important for families with children, and of a convenient access to a public green area. The chapter on outdoor space covered the following issues: living space and well-being, private outdoor space and families and outdoor space. Most participants in the research felt that access to open space was important. They were seeking contact with open public spaces of recreational character, especially when their home had no private outdoor space. Although it was more of a concern for Londoners, open outdoor space – whether a part of the home or a public area – was felt to be generally important for well-being.

3. Sustainable development
Concepts such as sustainable development or sustainable design have emerged as a result of processes continuing for many years. The processes, phenomena and events listed below are well known, yet they must be invoked here for preserving the logic of the argument. The list presented below, naturally incomplete, characterises well the accumulation and co-dependency of the hazards, opportunities and expectations that came with the last century.

Processes and phenomena: overpopulation – famine – insufficient amount of drinking water – diseases – global warming – shrinking non-renewable resources – urban sprawl – exclusion – disability – shrinking cities – information as a product for sale – information noise – migrations – living in the Net – spatial chaos – kitsch.

Facts and events: 1933 – the Athens Charter; 1969 – U Thant’s Report The Problems of Human Environment; 1972 – the United Nations Conference on the Human Environment – Stockholm, The UN Conference Declaration on the Human Environment; 1978 – the Emscher Park programme; 1992 – the Earth Summit in Rio – a global action plan – Agenda 21; 1998 – the New Charter of Athens; 2003 – the New Charter of Athens – Vision for Cities in the 21st century.

It is characteristic and clearly visible that at certain point the events related to hazards posed by global changes tended to concentrate in time. As a result of the processes and events listed above, the term ecological was more and more often replaced with sustainable, which has a broader meaning and better reflects the essence of the tasks facing the people and institutions responsible for shaping human living environment. The universally accepted definition of sustainable development – a term used in Polish official documents – is that it is a type of social and economic development which integrates political, economic and social activities while preserving natural equilibrium and lasting character of basic natural processes so that it is possible to satisfy the basic needs of individual communities or persons both in the present and future generations. The European Union zone has adopted a holistic approach to sustainable development, which is expressed in three basic elements – three pillars of sustainability: PEOPLE, PLANET, PROFIT. They correspond to the ‘well-being’ model and its three components: social, environmental and economic prosperity.

The European Spatial Development Perspective towards balanced and sustainable development of the territory of the European Union lists the following among the goals the Community policies strive to achieve: economic and social cohesion, conservation and management of natural resources and the cultural heritage and more balanced competitiveness of the European territory [12]. The perspective also emphasises the role of urban areas in social and spatial development. The following issues have been considered to be of particular importance for the sustainable development of towns and cities: control over their physical expansion by implementation of the compact city concept, mixture of functions and social groups, adequate management of the urban eco-system (which refers particularly to water, energy and waste management), better accessibility by different types of transport, which are not only effective but also environmentally friendly, and finally – conservation and development of the natural environment and cultural heritage.

The issue of social and spatial development of towns and cities discussed in the document refers largely to their housing areas, since their location as well as social and spatial structure are directly related to the phenomena of urban sprawl or shrinking cities. The housing function prevails in the urban fabric of any town or city. It is then legitimate to ask a question about the extent to which the goals, tasks and methods of sustainable development and sustainable design satisfy the needs and expectations related to designing a housing environment that could be called healthy.

4. Principles of sustainable design

The consequence of sustainable development is sustainable design based on the principles applied irrespectively of the adopted formal aesthetics. There are numerous lists of principles and methods of assessing the sustainability of individual structures, whole complexes or areas.
South East England Development Agency (SEEDA) presents the components of a housing development, which are taken into account in assessing whether it may be considered sustainable: how it blends with the existing development and the surrounding urban fabric; its land use, urban and architectural form; transportation, energy, how the building affects the environment; comfort of living; how the infrastructure affects the environment; natural resources; biodiversity; community; economy [13].

The Code for Sustainable Homes. A step-change in sustainable home building practice – the document developed by the Department for Communities and Local Government in London in 2006 – suggests a rating system taking into account the benefits for the environment, for the builder/construction company, the owner/investor and the direct user. The following categories have been subject to assessment: energy/CO₂ emission, water, materials, surface water runoff, waste, pollution, health and well-being, management and ecology. A number of other well-known methods of evaluation, such as the GBC-Handbook of the D-A-CH (German, Austrian and Swiss) Brick and Tile Industry, the LEED or BREAM methods, take into account primarily the influence of a given development project on the environment, the use of technologies reducing consumption of natural resources (energy, land, water, materials), safety, the quality of the design and construction process, the quality of services and – more and more often – how the new development relates to its spatial context. R. Rogers presents his own definition of sustainable design, convergent with the universally accepted formula, and says that it is a design method satisfying contemporary needs in a way allowing future generations to use the preserved natural resources. It is also social and economic equilibrium [14].

A. Baranowski addressed two important aspects of sustainability in design when he wrote in 1998 that sustainable design in architecture involves harmonising the processes of development and transformation of spatial structures with the principle of rational management of resources as well as full integration of social, cultural, economic, ecological and spatial aspects of design processes [15]. A practical set of sustainable design principles has been presented in a clear and exhaustive manner by B. and R. Vale. They have summarised the rules for sustainable design in five points, the hierarchy of which clearly reflects the preferences prevailing in highly developed countries [16]. The principle of energy efficiency, which must be observed in many aspects, has been enumerated as the first one. It involves both returning to methods known from traditional building craft and using the latest technologies of insulation. The principle of using alternative sources of energy requires installation of high-quality appliances for obtaining solar, wind, water or geothermal energy. The third principle, called the 3R principle: reduce, reuse and recycle, means economical use of the available land, reasonable size of the building, rational use of materials, water reuse and use of rainwater, use of materials, which are easy to recycle, rational management of solid waste and sewage. The fourth and fifth principles prescribe respect for the user and respect for the place. They entail consideration for the needs of all people, including the use of healthy materials, social participation, increasing the level of social cohesion. Respect for the place signifies integration with the landscape, increasing the amount of biologically active surfaces, taking into account the cultural context and using local materials and building traditions.

According to D. Farr, sustainable spatial development must be based on three elements: smart growth, new urbanism and green building. He enumerates the features necessary for achieving sustainable development: creation of a wide range of housing options and choice; creation of a neighbourhood all parts of which are accessible on foot; improving social bonds and opportunities for cooperation; fostering distinguishing features, attractive places of distinctive character; making development-related decisions predictable and financially effective; multi-functional use of the land; protection of open countryside of natural beauty; using the potential of various means of transport; strengthening and development of the existing communities; exploiting the benefits of compact building design [1], [17].
The principles listed above in many parts repeat the recommendations known from other publications, yet they have been formulated in a way that seems to express most precisely the factors encouraging the design of sustainable housing environment rather than any environment “in general.” These are primarily: the wide range of housing options to choose from, bonds within the neighbourhood and pedestrian accessibility, protection of open areas, strengthening the existing communities and, finally, predictable financial effectiveness.

5. Results and discussions

The presented concepts, principles and methods refer to all types of design activity. Author, however, refers solely to the housing environment. She suggests three basic features that should characterise a housing environment so that it could be called sustainable: it should be economical, pro-social and beautiful [5].

We should recall at this point the three essential components of health that were mentioned in the previous subchapter: physical health, mental and emotional well-being as well as social coherence. If we refer them to the three features of sustainable housing environment listed above, we will be able to find in all the activities affecting the shape of housing environment these elements of sustainable design, which particularly influence the pro-health characteristics of a dwelling place. Both the features of sustainable housing environment and the listed components of human health are of a multi-aspect character and they operate as clusters of features and factors, which are inseparable one from another. In many cases, they dovetail with one another or overlap. Hence, the selection of the interrelations that are going to be presented below is undoubtedly incomplete, yet it is representative.

An important element of the broadly understood recommendation of economical use of resources is the rational use of water and making use of rain water in the form of the traditional open rainwater drain channels, small watercourses and reservoirs. They constitute minor elements of the water retention system, but they also help create systems of green areas, enabling healthy lifestyle. Presence of water improves the quality of housing environment and the microclimate. It encourages residents’ contact with nature, fosters vegetation growth, improves residents’ health, positively affects their sense of well-being and, consequently, helps reduce medical treatment costs. Using the saved water in the housing environment promotes physical health, affects psychological well-being through contact with water and creates conditions for community members to spend time on the water together, thus strengthening social bonds. The significance of rational use of the available land should certainly be emphasised as well. It consists, inter alia, in leaving a possibly large biologically active area on the site that is to be developed, increasing this area where possible and compensating for losses. As has already been demonstrated, green areas, besides providing a place for active recreation, offer direct contact with nature, so recommended for reinforcing the effect of psychological relaxation or recovery from stress.

Pro-social and health-promoting housing environment should be able to satisfy the needs of various groups of residents, offer security and a sense of identity, encourage social integration and participation, eliminate spatial and social barriers. The above conditions may be summarised in three words: mix, connection, security [18]. The principle of respect for the user, implemented by providing a complete programme for all groups of users, promotes the programme of recreation, sport and access to the basic services related to health. The aforementioned INTERIM REPORT considers important that the basic services should be accessible within the distance of a 15-minute walk. It is approximately 500 metres for elderly people, reduced to 300 metres, should the immediate return walk be necessary [19]. Clarity of the development layout and a certain hierarchy of space also has pro-health significance for its residents. They promote social organisation and cooperation as well as a better care for the technical quality of appliances, which contributes to the increased sense of security. Absence of social space results in a lower safety standard and indicates ailing inter-human relations, whereas arranging development around a common space in human scale promotes pro-social behaviour. Participation of users, or future residents, in the process of planning, designing and, naturally, using the housing
environment certainly promotes giving it pro-social character. Social participation is the keystone among all the other phenomena or elements. Undoubtedly, it serves achieving social cohesion.

Certainly, it is most difficult to interpret the efforts for creating a beautiful housing environment. If there is an area where designers’ aesthetic opinions and users’ expectations are the most divergent, it is the housing environment. P. J. J. Penartz and M. G. Elsinga have demonstrated that when asked about the hierarchy of importance, respondents placed formal diversity only at the third to fifth positions, pointing out to presence of natural elements as the first, whereas architects considered size and scale the most important, followed by visual diversity [20]. People respond quickly to the structural composition of the environment, which fundamentally affects its evaluation regarding cohesion, level of complexity and quality of arrangement. Certain groups of components, which affect visual quality, such as water and vegetation, trigger immediate reaction, preceding the process of cognition. Increasing the environment’s formal complexity or non-typical character, we increase the general interest but the number of people who declare they would choose this place as suitable for living decreases, whereas a more orderly arrangement reduces interest but promotes selection as a place of residence. It could be said that the beauty of a housing environment is hidden in the life of this environment, and the evaluation of its aesthetic quality is significantly affected by its urban structure, presence of universally desired natural elements, such as water, greenery and land forms, but also the character of architectural forms, colour, light, texture of the ground surfaces, selection of materials or architectural detail. Certainly, local connections with the microclimate, natural resources or respect for the cultural heritage – in line with the principles of sustainable design – correspond directly to the expected cohesion and homeliness, arrangement clarity and presence of natural elements.

![Figure 1. Different aspects in sustainable design of healthy housing environment (Author)](image)

Requirements that a healthy housing environment must meet in the context of human health are most comprehensively expressed in an inscription placed in the housing estate of Kirsta, near Stockholm in Sweden: You are not only to live here, but to feel good. When we evaluate a housing environment or a housing estate, we tend to say: it’s so nice here or it’s so beautiful here rather than it is so beautiful.
We express our opinion or describe our reaction to the whole set of features, such as: scale, aesthetic climate, a special ambience created by good proportions, adequate relations between buildings, the type of development and presence of natural elements, the cared-for look, homeliness, but also people and their behaviour. The influence of the beauty factor or the aesthetic factor on the quality of sustainable housing environment is not properly appreciated in the commonly applied principles of sustainable design. Yet, it is of absolutely fundamental importance for the pro-health character of human living environment.

6. Conclusions
The previously presented principles of sustainable design contain a whole range of technological solutions and social actions, which already affect the shape of urban spaces and the form of designed of buildings and which will undoubtedly continue.

Summarising, we could say that a number of references to elements and factors affecting human health are to be found among the principles of sustainable design. It seems, however, that they need to be articulated more forcefully. This aspect of urban shape of housing areas remains overshadowed by the issues of energy efficiency, water and sewage management or waste management. Yet, the three aforementioned areas of human health: physical health, mental and emotional well-being as well as social coherence do require a whole range of actions, which may be precisely defined by enumerating detailed needs, such as:

for physical health: adequate proportion of biologically active area, the area of playgrounds and sports fields/1 flat, distance to recreation and sports areas enabling pedestrian access, appropriate mesoclimate: temperature oscillations, air humidity, insolation time, use programme enabling healthy lifestyle, ventilation hygiene and absence of draughts;

for mental and emotional well-being: clear urban structure, adequate development density and distances between buildings, lighting of urban enclosures, presence of elements of nature in the form of high and low greenery, water features and land forms, moderate diversity of spatial and aesthetic forms, spatial forms discouraging strangers’ intrusion, view from windows on elements of nature, at least in a part of the flat;

for social coherence: population density, the social space size/1 flat, clear spatial and use structure, delimitation of private, social and public spaces, clear arrangement and accessibility of social spaces, social programme allowing contacts, semi-open configuration of urban structure, participation in the management and use process, good information flow and communication on the local level, including electronic communication.

Correct and effective combination of all the above aspects in sustainable design requires assiduous efforts in several areas: education and awareness-building among designers, officials and users as well as adequate policy and promotion of solutions which will encourage shaping a healthy housing environment in the urban scale.

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