

Diagnosis of Transformation in Architecture and Construction of the Housing Stock in the Years 1848-2013 in Selected Cities Of Upper Silesia

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Abstract. Despite extensive and valuable literature and a series of activities over the past several years of scientific studies, there's lack of work presenting a comprehensive inventory of housing shaped over the centuries in terms of the assessment of the users' needs based on suitability and real modernisation. Such coverage of the subject, based largely on research methods using statistical reports on the changes carried out in the substance subject to research, would enable the assessment – as close to the reality as possible – of the housing stock and the potential associated with its further use. The subject of the work is the state of residential architecture resources of the period 1848-2013 in selected cities of Upper Silesia, changes carried out in the architecture and construction. Changes to the architecture and construction carried out in the housing stock subject to research constitute an important means of evaluation of the housing resources by their users. The changes occur three aspects: technical, functional and aesthetic. The main objective of the work is the presentation of a detailed assessment and comprehensive picture of the state of the housing stock of selected cities in Upper Silesia, based on statistical tests, numerous spatial solutions in terms of the evolutionary development of forms of residential architecture in Upper Silesia. The premise of the work is on the one hand, the expansion of knowledge of housing resources in Upper Silesian cities. On the other hand, it is an attempt to formulate a method of the comprehensive assessment of the housing stock in general, using the elements of statistics, analysis of spatial solutions and macrosocial determinants that shape human residential space. For greater clarity and precision of the obtained information, the performed assessment is connected with a direct private space of a dwelling place. It discusses to a limited extent the modernisation and transformation of the neighbourhood or the so-called backyard area.

1. Introduction

The literature dedicated to residential architecture most commonly takes into consideration issues such as the built environment as well as new trends and design forms, often in the context of sustainable development. Increasingly, there is also the development of prospects describing and analysing the residential sociological issues. Against a background of years of publishing and research, national and foreign, there are also scattered and often interdisciplinary compact works and articles, concerning social phenomena in the context of the architecture and its environment. Apart from P. Szafer's publications showing considerable achievements of Polish housing and detailed course books of designing residential architecture by authors such as W. Korzeniewski, there appeared further works and articles dedicated to the analysis of architectural forms, among others, by A. Błażko and M. Skrzypek-Łachińska as well as



J. Pallado. The above-mentioned monographs analysed in detail the built residential environment of the regions of Lower and Upper Silesia in selected historical epochs. The following titles constitute a powerful voice in the discussion of urban space and housing, namely J. Gyurkovich's "Architecture in Urban Space. Selected Issues", which addresses the topic of health and hygiene in this environment, Sławomir Gzell's "On Architecture. Drafts Written and Drawn" published by Wydawnictwo Blue-Bind, 2014, and Anna Agata Kantarek's work "On Privacy", 2007. Many scattered and interdisciplinary compact works and articles concerning social phenomena in the architectural and environmental context were published by authors such as: B. Komar, M. Chmielewski, J. Giecwicz, B. Gronostajska and G. Wojtkun. As far as foreign literature is concerned, the publications of a research group S.A.R. (Stichting Architecten Research - founded in 1964) are undoubtedly worth mentioning. They addressed issues of participation of the society in the process of designing flats, which was further extended to the exploration of the processes of industrialisation and typification of housing construction. Their publications include "Brief Outline of the SAR Principles and Methodology" as well as "Dimension and Position of Material: Modular Coordination"[1]. The solutions developed by the S.A.R. architects proposed a precise system of zoning which put the dwelling space at the dwellers' disposal. It was only the position of the entrance, kitchen and bathroom that was determined. Further information on this subject as well as on the *Frankfurt School*, Dutch models and the S.A.R. typology of dwelling space can be found in B. Leupen et al.: "Design and Analysis"[2] which explores the diversity of analytic methods used by architects and designers. In 1928 due to an all-European protest of architects responding to the annulment of Le Corbusier's winning in the competition for the design of the Palace of the League of Nations in Geneva, a new organisation was founded, namely the International Congress of Modern Architecture CIAM (Congrès International d'Architecture Moderne). The chief purpose of the CIAM was mutual consultation and consolidation of the development and promotion of modern architecture. "Athens Charter" created in 1933 as a result of the fourth CIAM congress was a collection of postulates concerning urbanism and housing architecture, which became a generally acknowledged standard in many European countries. What is also worth mentioning is the work of the representatives of the *Frankfurt School* along with its co-founder Theodor W. Adorno and his manifesto "Aesthetic Theory" [3].

Just before the outbreak of the Second World War, a German engineer and architect Ernst Neufert published a significant book "Architects' Data" (Bauentwurfslehre, 1936), which is still up to this day a compendium of information on the spatial requirements in building design and site planning. This publication has been continually updated since the 1950s and become a classic of its own in architectural designing. "On the Process of Civilisation" by Norbert Elias, "Mimesis. The Representation of Reality in Western Literature " by Erich Auerbach, "Space, Time and Architecture" by Sigfried Giedion or "Pioneers of Modern Design" by Nikolaus Pevsner constitute also fundamental publications giving a new insight into the issues of new architecture from an interdisciplinary perspective. In the 1950s and 1960s, the designing was more and more influenced by social and natural sciences as well as statistics. Christopher Alexander in his book "Notes on the Synthesis of Form"[4] seeks abstract rules to solve designing issues defined as *requirements which have to be satisfied*. In spite of such extensive and valuable literature and numerous studies conducted over the past decades, there is lack of work presenting a comprehensive inventory of housing stock which has been shaped over centuries in terms of the assessment of the users' needs based on suitability and real modernisation. Such coverage of the subject, based largely on research methods using statistical reports on the changes carried out in the substance subject to research, would enable the assessment – as close to the reality as possible – of the housing stock and the potential associated with its further use. This work encompasses and sums up a vast scope of research activities undertaken by the authors in their numerous so-far articles and publications [5].

This work is also connected with designing activity and draws on the experience obtained in designing practice and during implementation of architectural and construction projects. The subject of this work deals with the inventory of the housing stock from the period between 1848 and 2013 of the selected cities of Upper Silesia in terms of implemented architectural and construction changes. Such

changes introduced in the housing resources subject to research constitute an essential means of assessment of such resources by their users. These changes occur in three aspects: technical, functional and aesthetic.

2. Time of research

Time of the research covers the period from 1848 to 2013. Such a broad framework allowed the researchers to recognize the vast majority of the existing housing stock and provide a larger spectrum of evaluation of the transformations. The opening date is year 1848. In the mid-19th century the awareness of the need for a comprehensive resolution of the growing housing problems began to shape. It was initiated many years earlier by the industrial revolution and the rapidly changing socio-economics in Europe. A massive lack of satisfactory living space associated with the migration of the population from the countryside to the cities forced the search for mass solutions. The industry initiated the process of the development of a number of contemporary cities. Year 1848 was a landmark date in many cases, events and processes not only in the political arena of Europe. An outbreak of mass protests and demonstrations, commonly called the Spring of Nations, coupled with an exceptionally severe winter (1847/1848), an epidemic of cholera in many parts of Europe (mainly in the Upper Silesia region, the records can be found in the archives of the towns of Racibórz and Bytom) became a moment of climax to take administrative decisions underlying the improvement of the social welfare of the local population. It was exactly in 1848 that peasants' serfdom was abolished in Silesia, creating thus the opportunity of transformation of the peasantry into a working class. It is in this period that the first working class housing estates were built in Upper Silesia (in the cities of Zabrze, then Bytom and Gliwice). They were the first attempts to find a complex solution to an increasing shortage of dwelling spaces. The date which closes the research span is year 2013 – as it is the date which most closely relates to a contemporary period of implementation of further housing resources subject to assessment.

3. Place of research

The territorial scope of the studies includes seven Silesian cities, namely: Gliwice, Zabrze, Bytom, Racibórz, Ruda Śląska, Katowice and Tychy. The choice has been dictated by the need to analyse the factors that contribute to various urban centres. We are dealing with the cities of a medieval genesis (Gliwice, Bytom, Racibórz), an agglomerate settlement and industrial colonies (Ruda Śląska, Zabrze, Katowice) and finally, ever-developing cities built on the basis of urban planning decisions (the so-called New Tychy). The fact that the above-mentioned areas are located in close vicinity makes it possible to analyse the permeation of architectural and urban planning concepts with construction solutions. What is also interesting is the juxtaposition of housing resources constructed between 1919 and 1945 under a different jurisdiction: German (Gliwice, Zabrze, Bytom, Racibórz) and Polish (Ruda Śląska, Katowice, Tychy). The very selection of the cities located in Upper Silesia was based largely on the authors' knowledge of the issues and characteristics of this region being the subject of the authors' extensive research, analysis and many years of designing practice. Moreover, the selected examples of Upper Silesian cities constitute invaluable research material due to considerable diversity of the implemented housing resources as well as concentration of various factors within a relatively small area.

4. Methodology of research

This work applies methods used in architecture as well as in social sciences, i.e. literature research (the literature on the subject, iconographic sources), the research and exploration of architectural systems (on-site visits, preparation of photographic documentation and analysis of selected architectural solutions), comparative studies and surveys (case studies based on the conducted surveys). The structure of the research is similar to a group of qualitative tests POE – more precisely the Building Performance Evaluation BPE (evaluation of the building performance; assessment of workmanship and construction of the object relating to all life phases, beginning from planning, through the phase of using, then the phases of introducing adaptation changes and further to demolition and utilisation). In addition to the above-mentioned methodology, methods of the descriptive and comparative analysis were applied. The

case study method was chosen in this research due to versatility of its use in architecture, possibility of conducting the research on many different levels as well as its flexibility in the interpretation of test results. The application of the case study method is recommended in a situation of searching for the answer to the questions "how", "where" and "why" a certain process or phenomenon occurs. In this way the research is focused on the understanding of the phenomenon and the causes of its occurrence, and not on the data analysis. The survey conducted from 2013 to 2014 attempted to obtain answers to three essential questions: What was the course of transformation of the existing housing resources? What changes was it subjected to during their use? What was the scope of changes in the adopted time periods? In the authors' opinion, it is the direct users of the housing environment who are the most sensitive markers highlighting their requirements, needs, durability of architectural and sociological assumptions as well as aesthetic and technological awareness. The range of changes introduced by the users within their dwelling space (being a selected fragment of the built environment) includes all positive and negative solutions typical of a given period until the present day. The structure of the conducted research was based on Stewart Brand's theses announced in 1995 in the publication entitled: *How Buildings Learn. What Happens After They're Built*. 181. In his book Brand presents theories of the transformation of the building and six test markers represented by the layers of the building: plot, structure, skin, sanitary and wiring systems, functional zoning and furnishings. Brand's theory recognizes the subjectivity of an individual – being a user of the built environment, which fact caused a lot of controversy in architectural circles. He emphasizes the ancillary nature of architecture being the applied art subordinated to the recipient (in this case to users, i.e. lodgers). Moreover, he refuses to acknowledge buildings as masterpieces of art, which are to bring splendour and recognition to their creators. Brand thinks that the building is an organism subjected to continuous changes and transformations taking place along with variable needs of human beings under the influence of continuous technical and technological progress, alterations in the lifestyle and fashion as well as orthogenetic changes 182. Below there is a modified version of Brand's drawing showing the relation between the times of use of particular layers, defined as "the life cycle of the building".

Table 1. Building layers acc. to Stewart Brand



0 > > > **LIFE CYCLES OF BUILDING LAYERS** > > > > > > > ∞

FURNISHINGS	SPATIAL LAYOUT	SANITARY AND WIRING SYSTEMS	SKIN	STRUCTURE	PLOT
6 MONTHS	3-5 YEARS	8-10 YEARS	10-25 YEARS	50-100 YEARS	"ETERNAL"

Brand defines also in a very precise way dependencies between different trades and a multidisciplinary formula of an architectural and construction design as well as interactions between direct recipients, i.e. users, and the object being used. All these issues are presented in the tables below, which have been developed for the purposes of this research and show time diagrams along with the processes affecting, in a natural way, the housing substance. They also show the significance of the subject in the context of different life cycles influencing new branches of science, such as *facility management* or *building development*, sustainable designing as well as credit (loan) sectors in banking.

On the grounds of the described life cycles of the use, a conclusion can be drawn that no savings should be made on the most durable elements of the building, such as the structure, which constitutes the most permanent element just after the plot. It is advisable to design the building structure in a flexible and adaptable way enabling the introduction of such functional changes that are hard to predict in the phase of the investment implementation. The majority of the facts and cycles described in this work has been confirmed in the research conducted on the housing substance area.

5. Purpose of research

The work attempts to answer the question: what were the changes in the substance of the housing stock? In which periods were these changes most intense or largest (both in historical terms and in terms of the use)? Are the recorded changes consistent with the ones developed by other authors subject to the values of sustainability and time (in terms of: equipment, interior partitions, installations, the façade, the design)? And finally, which systems - in the users' opinion - are timeless, subject to no changes whatsoever, and which have the greatest possibility of adaptation? Potential differences in the results obtained in different urban centres of the research areas will be also relevant, as they can demonstrate specific circumstances of the housing site or specifics and priorities of selected users.

6. Research

6.1. Technical changes in buildings

The above diagram presents the scope and type of technical changes implemented in the set of examined dwelling units in particular time periods. What draws attention is the number of replacements especially of the wiring as well as water and sewage (plumbing) systems in the buildings constructed in the years 1946-1989, that is relatively new buildings. In older periods, technical wear and tear of the buildings seems to be natural as well as modernisations conducted within functional changes.

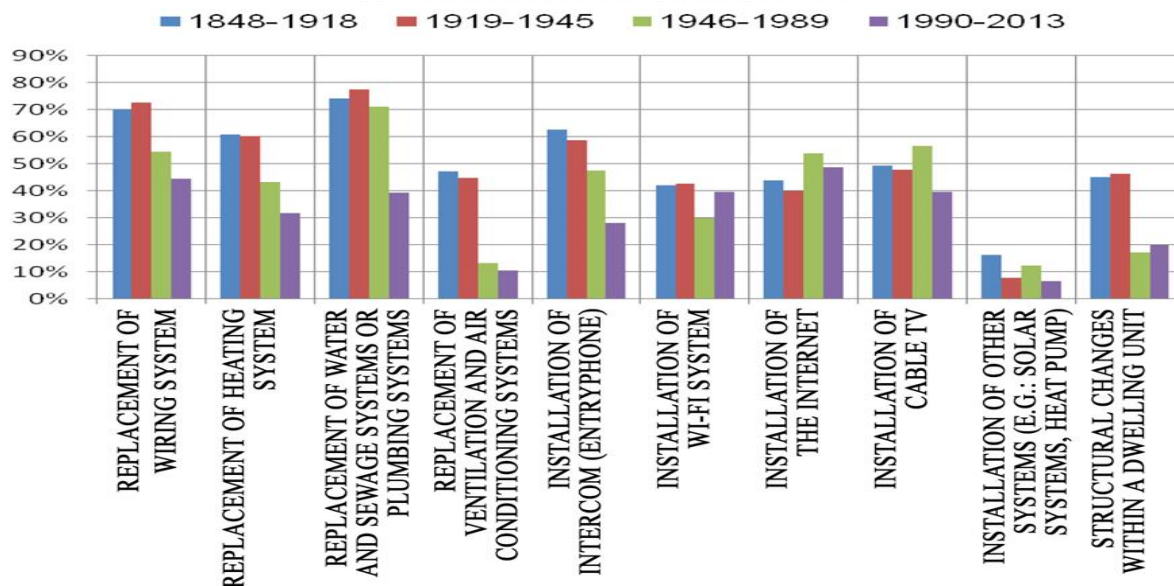


Figure 1. Percentage number of indications of technical changes in buildings, in total, in selected years

Also changes in the ventilation system can be accounted for by the same fact of technical wear and tear of older objects. A balanced number of indications in the scope of the installation of the Internet, wi-fi or cable TV reflects a continuous process of equipping the flats with low voltage installations used for the transmission of visual and acoustic information as well as digital data. All this aims to increase the standard of dwelling places to the current level of trends in furnishings and equipment. What is surprising is the fact of providing the dwelling places with ecological energy sources, especially in the buildings constructed between 1848-1918 and 1945-1989. In the first case, it refers to period objects of

historical value which were acquired by wealthy investors and subjected to a thorough process of regeneration within the framework of current trends or fashion. They often have an excellent location being vintage buildings. The second case refers to the pursuit of alternative forms of obtaining energy for large clusters of dwelling places, which is dictated by the economics of use and justified from a technical point of view [6].

6.2. Functional changes in buildings

The below listed indications of respondents show the scope of their unfulfilled expectations in relation to their dwelling unit, which is reflected in the range of changes introduced by them during their living in a given place or just after the purchase of the flat.

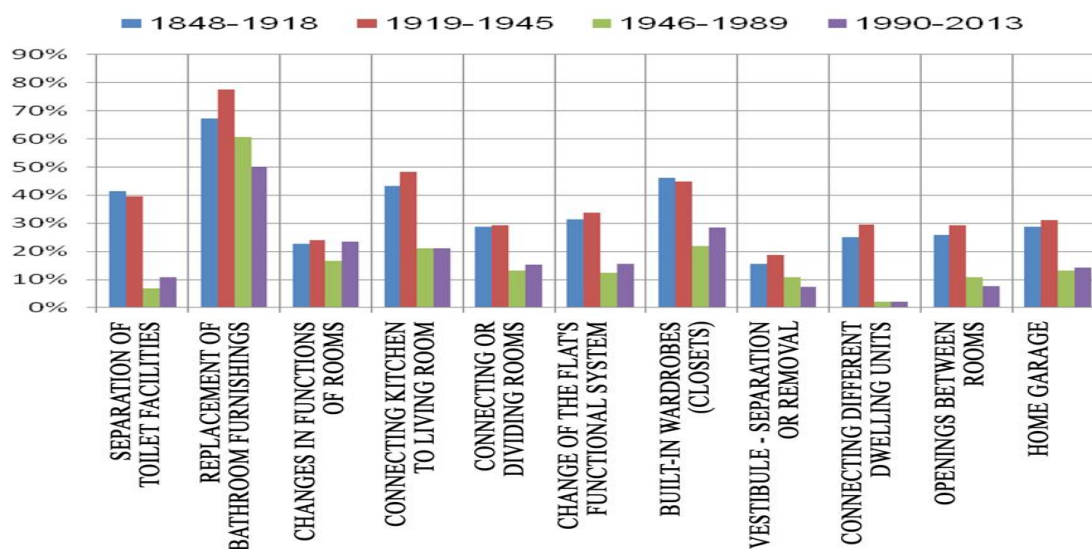


Figure 2. Percentage number of indications of functional changes, in total, in selected periods

The prevailing changes are those implemented in the sanitary facilities of flats, which is connected with archetypes used in a given period of the construction of a dwelling unit or caused by inadequate equipment or an improper functional system. Separation of toilet facilities refers to dwelling units built between 1848-1918, where very often the toilet was located outside the building or in later years on the landing (between the flights of stairs). In the years 1919-1945 it was a standard procedure to situate sanitary facilities along with a utility room on the landing outside the flat. The alteration of the function of rooms as well as connecting different rooms refer also to the dwelling units of this period. They often had a low standard of the dwelling surface resulting from the fact that such flats were intended for the rural population migrating in those days to the cities due to the development of heavy industry (the so-called industrial colonies or earlier "Siedlung"). The most common change in the sphere of functional alterations in the daily zone is the fact of connecting the kitchen (which used to exist in the past only in a form of a separate closed space) to the daily zone, namely the living room or dining room, which more and more often exists nowadays as a separated functional space. Initially, in the 1980s such a connection was made in a form of a serving window between the kitchen and the living room, later it developed into a full integration of these two functions on the basis of foreign housing models. The construction of extensions for home garages and parking spaces results from higher car affordability and the increase in society's wealth.

6.3 Aesthetic changes in housing resources

The diagram of indications of aesthetic changes taking place in the dwelling structure reveals the dwellers' aesthetic awareness as well as way of perception of their direct environment, including its aesthetic and visual shortages. Depending on the degree of the

flats' technical use, the majority of works relate to maintaining aesthetic comfort and they encompass the replacement of the doors and windows as well as the whole roofing or roofing materials.

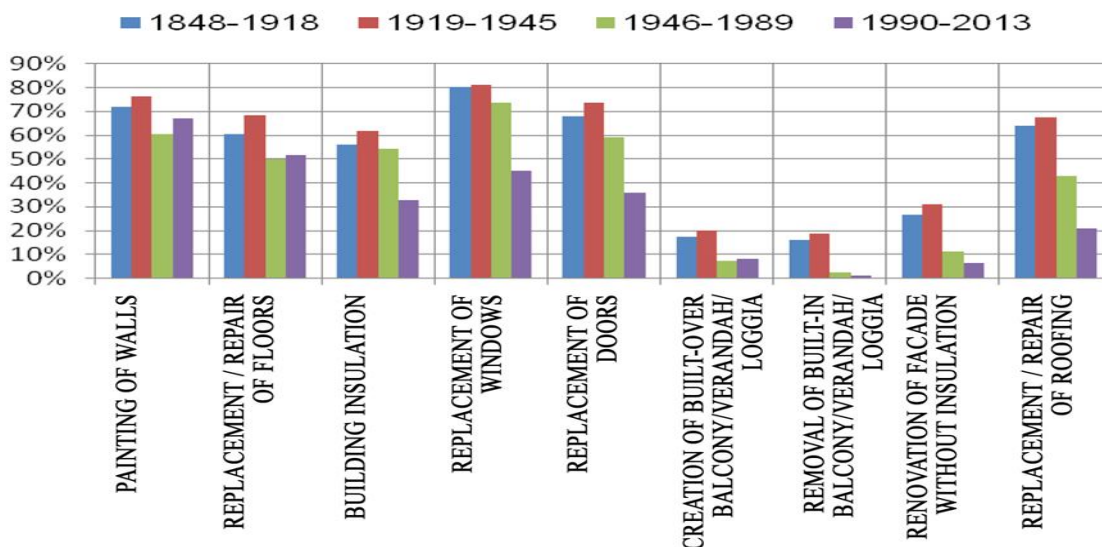


Figure 3. Percentage number of indications of aesthetic changes, in total, in selected periods

Inside the dwelling units there are most often works connected with a normal wear and tear of technical layers, that is the repair and replacement of the floors and painting of the walls. Also actions conducted on the building facade (an external layer of the flat) seem to result from a normal use of the dwelling unit and more restrictive heat parameters set for the housing according to energy conservation policy in the whole economy. An increased activity in the zone of loggias and verandas in older objects (the years of 1848-1918 and 1919-1945) results from their bad technical quality, adaptation for winter gardens or thermal buffers as well as a possibility of expanding the daily zone in line with current trends and aesthetic standards of the more and more aesthetically aware community of residents. The below collective comparisons constitute graphic representation of the research results obtained on the grounds of the conducted survey. They constitute the basis for the formulation of final conclusions which are of a comparative character in order to define characteristic features of each set of data on the basis of the adopted periods of the housing resources construction as well as on the grounds of the scope of modernisation actions for the examined time span. The adoption of the time structure as the basis of the research enables the differentiation of elements characteristic of each set subject to investigation. As far as technical changes are concerned, the housing resources built in the years 1848-1918 were first of all subjected to modernisation works in the scope of the replacement of different systems due to their natural wear and tear and the introduction of new systems replacing outdated technical solutions and due to a complex range of repair and redecoration works for this part of the housing substance [7]. The second group of modernisation actions, which often occurs in this set, is upgrading the technical aspects of the flats and providing them with installations typical of contemporary housing, such as: intercom (entryphone), the Internet, wi-fi, cable TV and green energy sources.

The reasons for that may be found in the fact that more and more often wealthy people become owners of the dwelling units of this period due to their location in the city centres or downtown quarters, which makes them attractive on the real estate market. The group of functional modernisation changes of this period is dominated by works in the sanitary facilities of the flats, separation of a built-in wardrobe (closet) as an individual function in the entrance space. Prevailing aesthetic changes relate to works done on horizontal and vertical layers, that is the replacement, repair and redecoration of the floors, walls, roofing as well as the doors and windows.



Figure 4. Collective comparison of the examined modernization actions in the years 1848-1918



Figure 5. Collective comparison of the examined modernization actions in the years 1919-1945

Also the housing resources of the years 1919-1945 were subjected to technical modernisation in the scope of the replacement of different systems due to their natural wear and tear, introduction of new systems replacing the old technological solutions and due to a complex range of repair and redecoration works for this part of the housing substance. The second group of modernisation actions encompassed technical upgrading of the flats and providing them with installations typical of contemporary housing, such as: intercom (entryphone), the Internet, wi-fi, cable TV and green energy sources. The reasons for that may be found (as above) in the fact that more and more often wealthy people become owners of the dwelling units of this period due to their location in the city centres or downtown quarters, which makes them attractive on the real estate market. The group of functional changes includes first of all works in the sanitary facilities of the flats as well as the alteration of functions within individual rooms and connecting the kitchen with the living room. Dominant aesthetic changes refer to works done on horizontal and vertical layers, that is the replacement, repair and redecoration of the floors, walls, roofing as well as the doors and windows. Years 1946-1989 are dominated by *prefabricated buildings*, which is reflected in all groups of works. In the technical sphere one can distinguish the repairs and replacement of the wiring (the exchange of the aluminium wiring for the copper one) and the plumbing system (most often the exchange for PVC and PE pipes and fittings) as well as technical upgrading providing the flats with installations typical of contemporary housing, such as: the Internet, intercom, wi-fi, cable TV. There are hardly any structural changes due to technical problems with any kinds of wall perforations. The activities in the functional scope are limited to sanitary facilities, while the aesthetic sphere is narrowed down to current repair and redecoration works inside the flats (painting the walls, replacing the floors), the replacement of wooden windows (typical of that epoch) with PVC windows (so-called "plastic windows") as well as the replacement of typical doors most often made of millboard and painted over in white.

Housing resources dated 1990-2013, as can be seen above, also undergo modernisation processes. However, their character is connected with the use of the housing and the maintenance of the existing technical and aesthetic status of the dwelling unit. It is also more and more often connected with a functioning type of ownership in the form of rent.

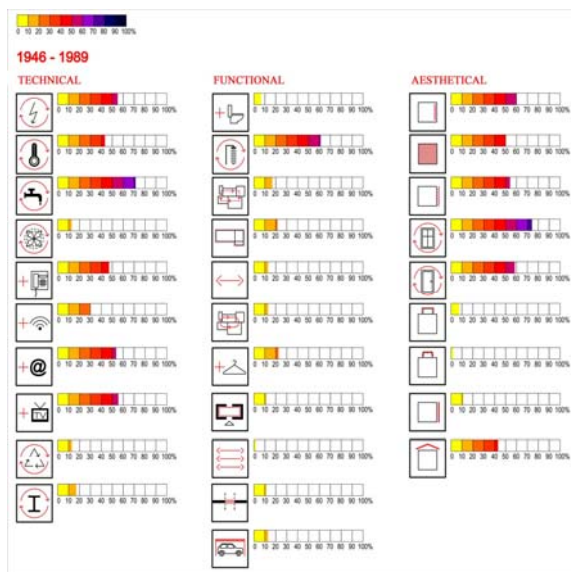


Figure 6. Collective comparison of the examined modernization actions in the years 1946-1989

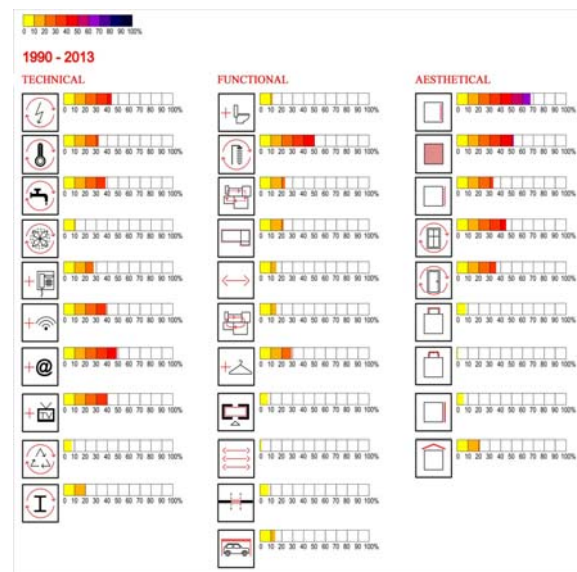


Figure 7. Collective comparison of the examined modernization actions in the years 1990-2013

This fact results from the increasing migration of the population to major urban areas in search of work, the variable-in-time family status (the birth of a child, society enrichment, social advance and improved material status), treating flats as a form of a capital investment (profits from the rent, investment of the free capital) and the lack of financial instruments for young couples and singles who start their independent living (low-interest residential real estate loans, residential programmes for young people). Alterations of the technical infrastructure of the flats consist mainly in the connection of new, more and more complicated household appliances chiefly in the area related to the kitchen zone, such as the wiring and plumbing (water and sewage systems). Also the entrance zone undergoes some changes, namely in a built-in form (such as built-in entrance wardrobes, closets, overhead cupboards) or in an open form. The group of aesthetic changes encompasses most often works connected with current repairs and redecorations resulting from the natural wear and tear of the flats (painting the walls and replacing the floors) or from the intense use of the flat caused by a frequent exchange of owners of tenants (the rental for business or residential purposes).

7. Results and discussions

While analysing the results obtained in the previous section, an attempt can be made to define the character and scope of modernisation actions which were and will be conducted in the housing resources typical of each examined time period. A comprehensive comparison of all modernisation works done in the housing tissue (by administrators, owners and/or tenants) was adopted as the basis for the analysis. The first 13 indications of works which occur the most often in the whole examined period include first of all activities providing basic physical properties of the flat, namely heat, light, sanitary facilities, the roof over the head and the floor under the feet. Therefore, the first group is connected with the activities performed on the "shell" of the flat both on horizontal and vertical levels. On the grounds of the above-mentioned Maslow's pyramid and the hierarchy of needs resulting from physiological functions and the sequence of needs, this group refers to the provision of basic conditions necessary for the living in a dwelling unit. It corresponds to the needs of a lower level of Maslow's pyramid, i.e. the provision of security and satisfaction of human physiological needs. This group encompasses mainly the range of actions in the technical sphere, namely the repair and replacement of the plumbing (water and sewage systems), wiring and heating systems, works on vertical and horizontal partitions such as wall painting, building insulation, repair and replacement of floors and roofing. This group of activities most often occurs collectively in older objects constructed at the turn of centuries due to a complex character of

renovation and modernisation actions because of considerable technical use of both building tissue and technological furnishings of the object. Due to the location of the buildings (often in the city centres or downtown districts) as well as their aesthetic and historical values, they constitute considerable worth on the real estate market as objects of high investment potential. The second group of indications corresponds to the needs of a higher level, i.e. satisfying the needs of affiliation, social acceptance as well as knowledge and aesthetics. In the mental sphere it refers to the relations of a human being with their surroundings, in this case a lodger and a flat, on the basis of a behavioural system of stimuli and responses. It encompasses modernisation actions in the functional and aesthetic spheres. Such actions mainly aim at upgrading of technical aspects of the flats up to current standards, improvement of the functionality of the use of flats as well as flexible adaptation to the variable-in-time needs of lodgers and increase of the dwellers' social status. It refers to activities concerning the changes of the functional system, changes of the functions of individual rooms, connection of the kitchen with the living room, increase of the standard of the kitchen and sanitary facilities, alterations in technical aspects of the flat, built-in wardrobes / closets (separation of new functions) and connections of different dwelling units. The group of aesthetic actions is dominated by energy-saving trends.

8. Conclusions

Taking into account current high requirements of the residents and expectations of the residential real estate market as well as increasing and variable needs of the users, a contemporary architect should be both a designer and a researcher of the subject he/she deals with. The authors hope that the above deliberations will influence and change the perception of modernisation and renovation processes offering a new insight into continuous changes occurring in the existing housing substance. The proposed model of a designer-researcher – who is equipped with adequate knowledge, skills and tools, uses them in daily designing practice, enriches them with methods of obtaining direct information from the built environment and its users – may have a considerable impact on the quality of designing of a given object and success of the whole investment. The examples presented in this article encompass buildings which are deeply rooted in the local residential housing tradition and are typical of the place and time of their construction in the context of various political, sociological and historical conditions. As such, they open a window on the full value of semiotics of signs, materials, details and functional systems contributing to the qualities of the local built environment in a historical aspect.

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