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COMPARISON OF CERTIFIED „GREEN BUILDINGS" IN THE CONTEXT OF LEED CERTIFICATION CRITERIA

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PORÓWNANIE CERTYFIKOWANYCH "ZIELONYCH BUDYNKÓW" W KONTEKŚCIE KRYTERIÓW CERTYFIKACJI LEED

Abstract
The paper deals with the problem of "green building certification" compared with LEED certification criteria. The first part of the paper presents the need to use environmentally sensitive design and sustainability concepts today. Objectives for building certification such as minimizing energy consumption during building use, are explained. In order for the decisions of the architect and engineer to be aligned to this purpose in the building design process, appropriate values must be given to the design variables at various scales. According to these criteria, a large number of green building certification systems have been developed in the construction sector internationally and nationally in order to contribute to increasing the environmental performance of buildings. In the second part, selected buildings such as the Konya Science Center (2014) and the ArtScience Museum in Singapore (2011) are discussed. In this study, the concept of energy efficient green building design is questioned, information is given about Green Building certification systems and two examples have the same function and same certificate are examined in terms of LEED certification criteria. In the conclusion a comparative summary of data regarding the analyzed buildings is presented to show their common features regardless of the type of certification in a tabular comparison. The topic of the study is elucidated by using written sources, internet database and the information taken by state institutions. Furthermore, visual elements such as photos and tables have been used. The purpose of the study is to reveal that Green Building certification systems are used for annuity and prestige purposes. The importance of the assessments based on evaluation criteria and evaluation methods are highlighted in line with the definition of green building.

Streszczenie
Artykuł dotyczy problemu certyfikacji „Zielonych budynków" w porównaniu z kryteriami certyfikacji LEED. Pierwsza część artykułu przedstawia potrzebę zastosowania koncepcji projektowych wrażliwych na środowisko i zrównoważony rozwój. Wyjaśniane są cele certyfikacji budynku takie jak zminimalizowanie zużycia energii podczas jego użytkowania, bez wyrzeczeń w zakresie komfortu oczekiwanego przez użytkownika, co często jest problemem. Aby je osiągnąć wiele kryteriów i zmiennych o różnych wartościach i skalach powinno być uwzględnianych w procesie projektowym, zarówno przez architektów jak i przez inżynierów. Z uwagi na te kryteria w sektorze budowlanym opracowane zostały systemy certyfikacji dla „zielonych budynków" na poziomie krajowym i międzynarodowym. Mają one przyczynić się do podniesienia wrażliwości ekologicznej budownictwa. W części drugiej rozpatrywane są budynki takie jak Konya Science Center (2014) oraz ArtScience Museum w Singapurze (2011). Te dwa przykłady mają tę samą funkcję i ten sam certyfikat, co jest rozpatrywane pod kątem kryteriów certyfikacji LEED. Zweryfikowano koncepcję energooszczędnego projektowania budynków ekologicznych, podano informacje na temat systemów certyfikacji Green Building. W konkuzji przedstawiono zestawienie porównawcze danych dotyczących analizowanych budynków, aby wykazać ich wspólne cechy bez względu na rodzaj certyfikacji. Do porównań wykorzystano źródła pisane, internetową bazę danych i informacje podawane przez instytucje państwowe. Ponadto wykorzystywane są elementy wizualne, takie jak zdjęcia oraz tabele. Celem badania było wykazanie, że systemy certyfikacji Green Building są wykorzystywane do celów renty i prestiżu. Znaczenie ocen dokonanych na podstawie kryteriów oceny i metod oceny zostało podkreślone zgodnie z definicją zielonego budynku.

Keywords: energy efficiency; certification system; green building design

Słowa kluczowe: efektywność energetyczna; system certyfikacji; green building design

INTRODUCTION

As environmental pollution increases in the world, the main goal of all sectors has been to ensure that people can live healthily and improve the quality of the environment [A.B. Gültekin et al. 2006, p.2]. 50% of the energy consumed throughout the world is spent in the process of constructing and using buildings. Therefore, local authorities and professional groups constructing sector have a great responsibility in this regard. In this context, the concept of green building has been raised in the construction sector in recent years. Many certification systems are developed around the world, including LEED (America), BREEAM (Britain), Green Star (Australia), and these systems are also starting to be using in Turkey.

Konya Science Center, with the support of TUBITAK (The Scientific and Technological Research Council of Turkey) design, is an environmentally friendly, economical and healthy project that was built with regard to Green Building criteria. The Konya Science Center, designed with the criteria of LEED NC (Leadership in Energy and Environmental Design New construction) certification, is the first and only LEED NC Gold certified Science Center in Turkey.

Another green building is explored in this study which is the Singapore Artscience Museum. This building is another science building co-designed by Safdie Architects and Moshe Safdie and the same certified with LEED NC Gold. The ArtScience Museum is the first museum in the region to get this certificate in reducing environmental impact.

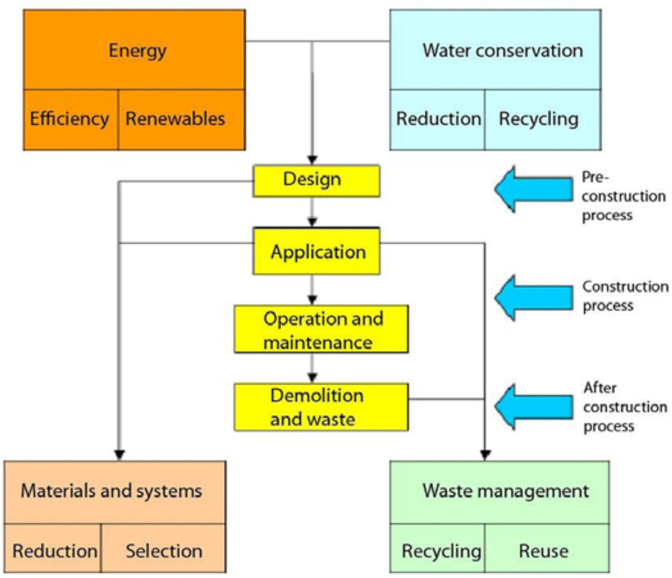


Fig. 1. Lifetime flow chart for buildings; source: J. Langmad 2004, B. Yılmaz 2009

1. GREEN BUILDINGS

Green buildings are constructed in order to reduce the whole effect of the built environment on human health and natural environment by efficiently using energy, water and other resources [S.B. Erdede et al. 2014, p.3]. Based on this goal, green buildings can be defined as energy-efficient structures that are respectful to nature and that are self-sufficient in order to benefit from nature at the highest level by using an infinite amount of resources.

Green buildings are part of the global response, an awareness of the growing role of human activity in causing global climate change. In addition many of the green buildings are high-tech real estate that takes into account the effects of buildings on the environment and human health. Besides, these buildings are structures that are directed towards renewable energy sources, providing recycling of waste water, benefiting from daylight as much as possible, having effective thermal insulation and producing the necessary energy. These goals can be achieved through better session (orientation of the building), design, material selection, construction, operation, maintenance, transport and possible reuse [J. Yudelson 2008, p.242], (Fig.1). Green buildings are built for these purposes:

- to protect the health of the inhabitants;
- to increase the efficiency of employees;
- using water, energy and other resources more efficiently;
- to minimize the negative environmental effects that may occur.

The World Commission on Environment and Development defined: *“Sustainability is to meet today’s needs and expectations without jeopardizing the possibilities for future generations to meet their own needs”* in the Brundtland report [S.B. Erdede et al. 2014, p.5]. The concept of green building is more of a labelling task, apart from the concept of sustainable building. A sustainable building needs to meet certain criteria in order to become a green building. The concept of green building has been identified with certification systems. In addition, energy efficient building and high performance building concepts are used in the same sense as green building.

2. GREEN BUILDING CERTIFICATION SYSTEMS AND LEED CERTIFICATION SYSTEM

The environmental performance of a building can only be determined by a measuring system. Green Building certification systems can be defined as a type of rating system that seeks to provide a measurable reference in revealing the effects of building-based projects on the environment and their sensitivity to protecting natural resources [E. Çelik 2009, p.13].

BREEAM (Bre Environmental Assessment Method) was created in the UK in 1990 and also this certification method is the first of its certification systems. Then, LEED was created in America, in 1998. In Canada SBTOOL, and in Hong Kong HK-BEAM, in Australia GREEN STAR, in Japan CASBEE are some of the other Green Building Assessment Systems [M. Anbarci et al. 2016, p. 378], (Fig.2).

The Energy Performance regulation in buildings was published in Turkey in 2008. It is aimed to use energy resources effectively and efficiently in buildings, to prevent energy waste and to protect the environment. BEP-HY(BEP Computing Method) is developed by the Ministry of Environment and Urbanism and this method shows how to calculate the amount of energy consumption per m^2 into per year and how to calculate CO^2 emissions of buildings covered by the energy performance in buildings (BEP) regulations. Using this calculation method, internet-based software called BEP-TR produces the appropriate energy Identification Certificate for the building as of 2010 [Energy Performance Regulation in Buildings 2008]. However, Breeam and Leed certification systems are the most common of these certification systems in the construction sector in Turkey. Table 1 shows the values of these two certificate systems [M. Sleeuw 2011, p.7].

- **LEED certification system**

LEED's goals are to develop a building design method by establishing measurement standards to identify Green Building, creating environmental leadership in the building industry, promoting green competition and also to raise consumer awareness about the benefits of green building.

The LEED green building rating system, which defines high-performance buildings that are economical with reducing operating costs by providing energy savings and respecting the environment by increasing the use of green space, maintaining low CO^2 emissions and keeping environmental pollution low in construction activities, is a voluntary standard and is provided by the Green Building Council of America (USGBC). These ratings are performed in the following 6 categories with different scoring weights (Fig 3).

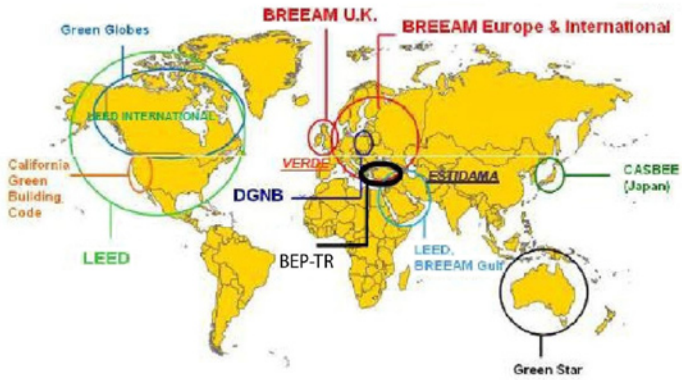


Fig. 2. International Green Building Assessment Systems; source: E.P. Şimşek 2012, p.34

Fig. 3. LEED Credit Categories; source: www.clearwaterhomesutah.com/micah-peters-leeds-the-way-in-green-building-strategies-in-utah

Tab.1. Rating benchmarks

BREEAM 2011	% Points	LEED 2009	Points
Outstanding	≥85%	Platinum	≥80
Excellent	≥70%	Gold	60-79
Very Good	≥55%	Silver	50-59
Good	≥45%	Classified	40-49
Pass	≥30%	Unclassified	<40
Unclassified	<30%		

Source: data: M. Sleeuw 2011, p.7, prepared by the author

Fig. 4. A range of Certification;
source: www.clearwaterhomesutah.com/micah-peters-leeds-the-way-in-green-building-strategies-in-utah

LEED is a points-based system, and each building project earns LEED points to meet certain Green Building criteria. LEED Green Building rating system has 4 basic levels:

- LEED Certified, 40-49 points
- LEED Silver, 50-59 points
- LEED Gold, 60-79 points
- LEED Platinum, 80-+ points (Fig.4).

Under the six main categories given above, two design examples are evaluated. The reason for selecting these examples, both of these buildings, Konya Science Building and Singapore ArtScience Museum building, has LEED Gold Certified category and the same function. In this context, all related activities and strategies are described below.

3. COMPARING OF CERTIFIED GREEN BUILDINGS IN THE CONTEXT OF LEED CERTIFICATION CRITERIA

In order to make the correct comparison, two different examples of energy efficient design, one of them located in Turkey and the other one abroad, belonging to the same function and the same LEED certificate group are chosen as the sample area.

3.1. Konya Science Center in Turkey, Evaluation in terms of LEED Criteria

Konya Science Center project is implemented in Konya, which is the largest city in Asian part of Turkey and is the first and only Science Center in Turkey with LEED NC Gold certification (Fig.5). The construction process of the project is finished and it was inaugurated April 2014. The certification process also is deemed appropriate to be examined in terms of completion. Architectural Design A is owned by the project company and the project owner is Konya Metropolitan Municipality [N. Yanar 2015, p. 957].

The project realized with the support of Tübitak is located on a land area of approximately 100,000 m²; 26.250 m² covered area, 14.000 m² open parking area and vehicle roads, 11.000 m² walkways, 47.000 m² green area. And besides, this building has thematic exhibits, outdoor exhibits, observation and cruising tower, planet house (Planetarium), lecture

Fig. 5. Location of Konya Science Center, 2014, general view, 2014; source: www.konya.bel.tr/haberbasin.php?haberID=4111&hDurum=FOTO

Fig. 6. Konya Science Center steel mesh shell system and geodetic shell; source: www.yenihaberden.com/bilim-merkezi-konyanin-markalarindan-biri-olacak-31967h.htm

Fig. 7. Use of green space on the land; photo by the author

halls, laboratories, and a library [E. B. Burkut 2018, p.1022,1023].

The main building is constructed with a steel mesh shell system of 110 meters in diameter and 30 meters in height. The planetarium building is built with a geodesic shell system approximately 24 meters in diameter, 12 meters in height [www.kamuprojeleri.com/yeni/Haber/HaberAyrinti.aspx?HaberId=10, Konya Bilim Merkezi Projesi Çelik Örgü Kabuk Çatısı], (Fig.6.).

Konya Science Center is a LEED Gold certified project developed by the American Green Buildings Council with 66 points awarded. Ecobuild undertook the consultancy service during the certification process. The decisions taken in terms of LEED categories for this building are listed below:

- **Sustainable sites**

Konya Science Center is positioned as environmentally sensitive in terms of the location selection. By selecting the Organized Industrial Zone as the building construction area, both green areas and fertile farmland are protected.

Public transportation (transportation by bus), bicycle parks and change rooms were tried in order to reduce to individual vehicle usage and thus prevent environmental pollution (CO^2 emissions) and fossil-based fuel usage. An intensive greening application has been carried out on an area of 47.000 m^2 (Fig.7), [N. Yanar 2015, p. 959].

Konya Science Center earned 22 points out of a possible 26 points as a result of measurement and evaluation in terms of sustainable sites (Tab.2).

Tab. 2. Konya Science Center, sustainable sites point.

SUSTAINABLE SITES		AWARDED: 22 / 26
SSc1	Site selection	1 / 1
SSc2	Development density and community connectivity	5 / 5
SSc3	Brownfield redevelopment	0 / 1
SSc4.1	Alternative transportation - public transportation access	6 / 6
SSc4.2	Alternative transportation - bicycle storage and changing rooms	1 / 1
SSc4.3	Alternative transportation - low-emitting and fuel-efficient vehicles	3 / 3
SSc4.4	Alternative transportation - parking capacity	2 / 2
SSc5.1	Site development - protect or restore habitat	1 / 1
SSc5.2	Site development - maximize open space	1 / 1
SSc6.1	Stormwater design - quantity control	0 / 1
SSc6.2	Stormwater design - quality control	0 / 1
SSc7.1	Heat island effect - nonroof	1 / 1
SSc7.2	Heat island effect - roof	1 / 1
SSc8	Light pollution reduction	0 / 1

Source: E. B. Burkut 2018, p.213

Fig. 8. Rainwater channel and high efficiency sensor battery; photo by the author

- **Water efficiency**

In the Konya Science Center, where rainwater management is conducted, roof rainwater is transferred in to two separate warehouses by using rain channels around the building and reused in the building. The building's water consuming equipment with reservoir is efficient (Fig. 8). Plants which are used in landscaping are selected because of the water-efficient plants that require a low level of water consumption.

This system saves more than 446,000 litres of water per year, with 53% less water consumption than normal equipment buildings. The Konya Science Center earned 10 total points as a result of measurement and evaluation in terms of water efficiency (Tab. 3).

- **Materials and resources**

Within the context of the protection of resources and the environment, recycled materials are collected and construction wastes are evaluated in accordance with the construction waste management plan. The building is documented to have recycled structural steel and concrete contents with 45% of the total of its materials. 100% of building structural materials are manufactured and local to Turkey. Thus, fuel consumption and environmental pollution caused by material transportation are minimized. The use of local materials can be characterized as an advantage considering that it is an input to the country's economy. 75% of solid waste is collected and recycled.

In order to prevent the heat island effect generated by the sun's rays on the roof of the building, 90% of the solar radiation reflecting material is used in the roof and exterior areas of Konya Science Center (Fig. 9). The building's greenhouse gas emissions are 39% less than other buildings.

The Konya Science Center earned 5 points out of 14 points available as a result of the measurement and evaluation in terms of material and resources (Tab. 4).

Fig. 9. Facade material that reflects the sun's rays by 90 % and using steel materials; source: photo by the author; http://ogm.meb.gov.tr/www/konya-bilim-merkezinde-fen-liseleri-matematik-zumre-baskanlarina-yonelik-uygulamali-egitim-programlari-basliyor/icerik/775

Tab. 3. Konya Science Center, water efficiency point.

WATER EFFICIENCY		AWARDED: 10 / 10
WEc1	Water efficient landscaping	4 / 4
WEc2	Innovative wastewater technologies	2 / 2
WEc3	Water use reduction	4 / 4

Source: E. B. Burkut 2018, p.213

Tab. 4. Konya Science Center, material and resources point.

MATERIAL & RESOURCES		AWARDED: 5 / 14
MRc1.1	Building reuse - maintain existing walls, floors and roof	0 / 3
MRc1.2	Building reuse - maintain interior nonstructural elements	0 / 1
MRc2	Construction waste Mgmt	0 / 2
MRc3	Materials reuse	0 / 2
MRc4	Recycled content	2 / 2
MRc5	Regional materials	2 / 2
MRc6	Rapidly renewable materials	1 / 1
MRc7	Certified wood	0 / 1

Source E. B. Burkut 2018, p.213

- **Energy and atmosphere**

As a result of measurement thermal comfort assessment, mechanical renewable energy systems, building shell performance calculation, this building gained 5 points out of a possible 35 points (Tab.5).

- **Indoor environmental quality**

The Konya Science Center provides 30% better quality air than other buildings according to ASHRAE 62.1 norms. Thermal comfort is designed according to ASHRAE 55 standards and it is a higher level compared to other buildings. Considering the sensitivity of human and environmental health, no carcinogenic building materials are used in the buildings. All adhesive, sealant and paint are used with low VOC (Volatile organic Component) amount (Tab.6).

- **Innovation in operations and regional priority**

The Konya Science Center meets Turkey's green building priorities. The building received extra points in areas where it performs more than threshold values [N. Yanar 2015, p.961]. When examined in terms of innovation in Operations and Regional Priority criteria, the building received a score of 5 points out of a possible 6 points (Tab. 7).

Tab. 5. Konya Science Center, energy and atmosphere point.

ENERGY & ATMOSPHERE		AWARDED: 18 / 35
EAc1	Optimize energy performance	15 / 19
EAc2	On-site renewable energy	0 / 7
EAc3	Enhanced commissioning	0 / 2
EAc4	Enhanced refrigerant Mgmt	2 / 2
EAc5	Measurement and verification	1 / 3
EAc6	Green power	0 / 2

Source: E. B. Burkut 2018, p.213

Tab. 6. Konya Science Center, indoor environmental quality point.

INDOOR ENVIRONMENTAL QUALITY		AWARDED: 4 / 15
EQc1	Outdoor air delivery monitoring	0 / 1
EQc2	Increased ventilation	0 / 1
EQc3.1	Construction IAQ Mgmt plan - during construction	1 / 1
EQc3.2	Construction IAQ Mgmt plan - before occupancy	1 / 1
EQc4.1	Low-emitting materials - adhesives and sealants	1 / 1
EQc4.2	Low-emitting materials - paints and coatings	1 / 1
EQc4.3	Low-emitting materials - flooring systems	0 / 1
EQc4.4	Low-emitting materials - composite wood and agrifiber products	0 / 1
EQc5	Indoor chemical and pollutant source control	0 / 1
EQc6.1	Controllability of systems - lighting	0 / 1
EQc6.2	Controllability of systems - thermal comfort	0 / 1
EQc7.1	Thermal comfort - design	0 / 1
EQc7.2	Thermal comfort - verification	0 / 1
EQc8.1	Daylight and views - daylight	0 / 1
EQc8.2	Daylight and views - views	0 / 1

Source: E.B. Burkut 2018, p.213

Tab. 7. Konya Science Center, innovation in operations and regional priority quality point.

INNOVATION		AWARDED: 5 / 6
IDc1	Innovation in design	4 / 5
IDc2	LEED Accredited Professional	1 / 1
REGIONAL PRIORITY		**AWARDED: 2 / 4**
EAc1	Optimize energy performance	1 / 1
EQc7.2	Thermal comfort - verification	0 / 1
SSc7.2	Heat island effect - roof	1 / 1

Source: E.B. Burkut 2018, p.213

3.2. ArtScience Museum in Singapore. Evaluation in terms of LEED Criteria

The innovative lotus-shaped ArtScience Museum is created by architect Moshe Safdie and transformed the art into the overall design of the building with sustainability. The main sustainable features of the museum include the uninterrupted integration of a rainwater collection system into the building, as well as the natural daylight that illuminates the museum's interiors [N. Tan et al. 2014, p.1-3]. The ArtScience Museum secured the prestigious LEED Gold certification under the existing buildings, called Marina Bay Sands Hotels. Also, this building is the first museum in Asia Pacific to obtain the globally recognized sustainability achievement [www.3blmedia.com/News/ArtScience-Museum-Marina-Bay-Sands-Retains-Prestigious-LEEDr-Gold-Certification], (Fig.10).

Fig. 10. ArtScience Museum in Singapore, 2011, views; source: www.marinabaysands.com/company-information/directions-to-marina-bay-sands.html, https://thehoneycombers.com/singapore/artscience-museum-singapore-late-night-things-to-do-in-march/

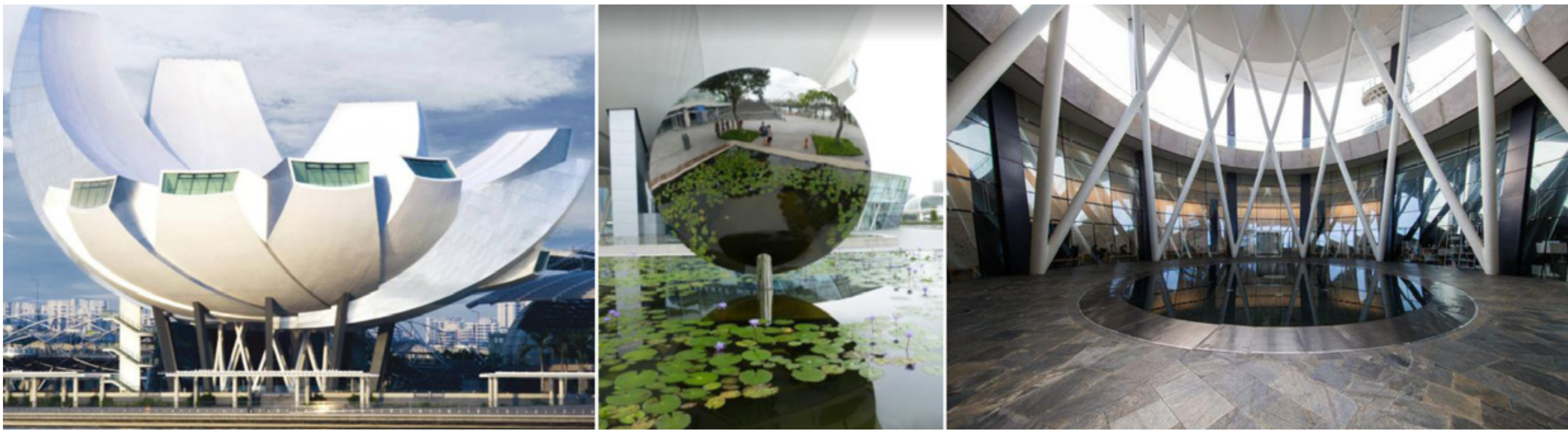


Fig. 11. A flower-like structure made of 10 petals and water element; source: Url: 11, https://thepeakmagazine.com.sg/lifestyle/artscience-museum-facts/?slide=4-4--It-has-a-Rain-Oculus-and-recycles-rainwater---W.

The design of the museum is composed of two principle parts. The base, which is embedded in the earth and surrounded by the Bay's water and a giant lily pond, and a flower-like structure made of 10 petals, generated by the geometry of spheroids of varying radii that seemingly floats above the landscaped pond base. The petals or fingers as some refer to them, rise towards the sky with varying heights, each crowned by a skylight which draws in daylight penetrating the base and illuminating the galleries within https://www.archdaily.com/119076/artscience-museum-in-singapore-safdie-architects, (Fig. 11). The museum is entered through a free-standing glass pavilion. Large elevators and escalators convey the public to the lower and upper galleries. In total, there are three levels of galleries with a total area of 6,000 square meters [www.area-arch.it/en/artscience-museum/].

As a museum that explores the intersection of art, science, technology and culture, ArtScience Museum is also home to the wild. This virtual reality experience welcomes visitors into a lush digital world of Southeast Asian rainforests, where pangolins, tapirs, tigers inhabit, encouraging visitors to take action to help preserve natural wildlife and plants through planting of a virtual tree [www.3blmedia.com/News/ArtScience-Museum-Marina-Bay-Sands-Retains-Prestigious-LEEDr-Gold-Certification], (Fig. 12).

The following are the decisions taken in terms of the LEED categories of the museum which has LEED NC Gold certification with 77 points.

- **Sustainable sites**

ArtScience Museum is located within the integrated resort of Marina Bay Sands, which has a luxury hotel concept, in the Downtown Core of the central area

Fig. 12. Natural wildlife and plants through planting of a virtual tree; source: www.marinabaysands.com/museum/future-world.html, https://archive.adcn.nl/archives/artscience-museum-into-the-wild

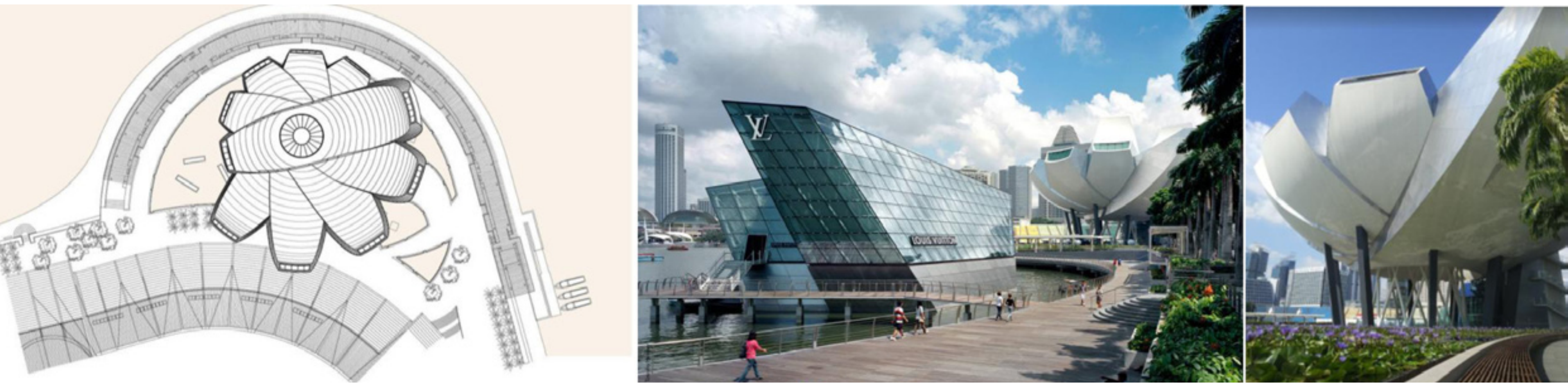


Fig. 13. The location of the building on the land and the use of green space; source: https://archello.com/project/the-artscience-museum-at-marina-bay-sands

in Singapore. It is located in the corner parcel overlooking the ocean and close to the bridges which connect the city. The hotel's facilities are available to prevent CO^2 emissions and fossil-based fuel use through individual vehicle use. A 75% reduction in conventional commuting trips is shown [www.gbig.org/activities/leed-100006652]. Besides, it is very important in terms of the perception of local and foreign visitors who come to the hotel. The use of green space and water elements in the land is achieved (Fig. 13).

The ArtScience Museum was awarded 21 points out of a possible 26 points as a result of measurement and evaluation in terms of sustainable sites (Tab. 8).

- **Water efficiency**

Key sustainable features of the museum include natural daylight illuminating the interiors of the museum, as well as the seamless integration of a rainwater harvesting system into the building. Featuring ten petals, each housing different gallery spaces, the building fea-

Tab. 8. ArtScience Museum, sustainable sites point.

SUSTAINABLE SITES		AWARDED: 21 / 26
SSc1	LEED certified design and construction	0 / 4
SSc2	Building exterior and hardscape Mgmt plan	1 / 1
SSc3	Integrated pest Mgmt, erosion control, and landscape Mgmt plan	0 / 1
SSc4	Alternative commuting transportation	15 / 15
SSc5	Site development - protect or restore open habitat	1 / 1
SSc6	Stormwater quantity control	1 / 1
SSc7.1	Heat island effect - nonroof	1 / 1
SSc7.2	Heat island effect - roof	1 / 1
SSc8	Light pollution reduction	1 / 1

Source: www.usgbc.org/projects/marina-bay-sands-artscience-museum

Fig. 14. The dish-like roof form collects rainwater; source: https://artthescience.com/blog/2016/01/19/spaces-artscience-museum/, https://archello.com/project/the-artscience-museum-at-marina-bay-sands

Tab. 9. ArtScience Museum, water efficiency point

WATER EFFICIENCY		AWARDED: 12 / 14
WEp1	Minimum indoor plumbing fixture and fitting efficiency	REQUIRED
WEc1	Water performance measurement	2 / 2
WEc2	Additional indoor plumbing fixture and fitting efficiency	5 / 5
WEc3	Water efficient landscaping	5 / 5
WEc4	Cooling tower water Mgmt	0 / 2

source: www.usgbc.org/projects/marina-bay-sands-artscience-museum

tures purposeful design to embody the natural world within a manufactured landscape. Each gallery is lit with natural skylights, and when it rains, the roof's unique shape channels rainwater through a central atrium to create a 35 meters waterfall at the building's centre. Water drained from the central pool is also recycled for use in the building [N. Tan et al. 2014, p.1-3]. The dish-like roof form collects rainwater and drains it through an oculus, creating a waterfall through the center of the museum that feeds an interior pond [N. Tan and friend 2014, p.1-3] efficiency achieved through the museum's Rain Oculus feature, where nearly 1,400,000 liters of rainwater is recycled each year. The water is reused for landscaping, water feature maintenance and toilets. This results in a 30% reduction in indoor potable water use (Fig. 14), [www.marketwatch.com/press-release/the-artscience-museum-at-marina-bay-sands-retains-the-prestigious-leedr-gold-certification-2018-11-28].

The ArtScience Museum is entitled to 12 points out of available 14 points as a result of measurement and evaluation in terms of water efficiency (Tab. 9).

- **Materials and resources**

The museum's envelope is composed of double-curved fiber reinforced polymer skin typically used at such a scale in the construction of boats and yachts. The vertical sides of each petal are sheathed in bead-blasted stainless steel panels. The unprecedented use of FRP is made possible the joint-less, continuous skin for each of the sail-like surfaces achieving a sense of lightness with their gleaming petals (Fig. 15). As elsewhere in Marina Bay Sands Hotel, the building aims

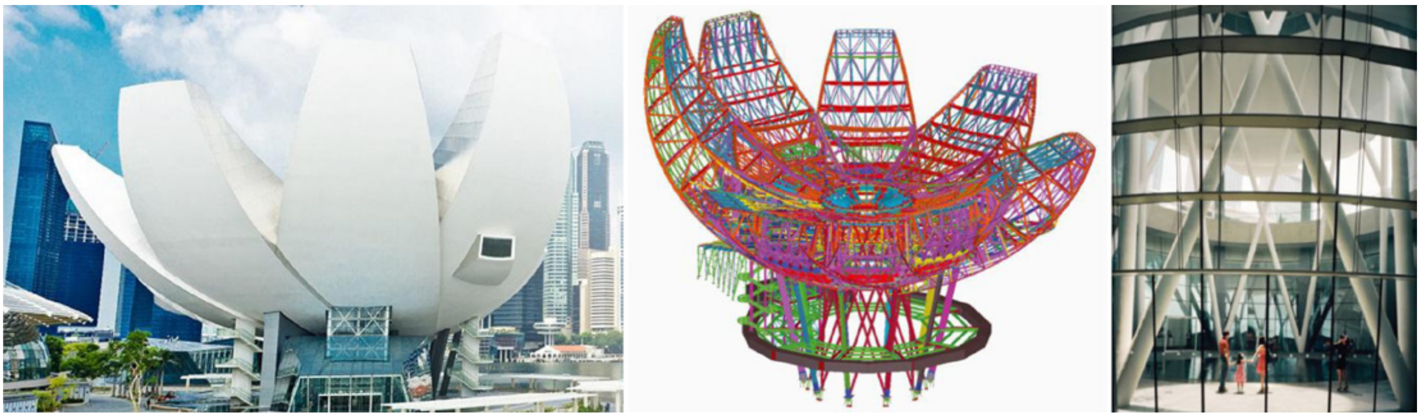


Fig. 15. ArtScience Museum, using steels and composed materials; source: https://archello.com/project/the-artscience-museum-at-marina-bay-sands, www.tekla.com/sg/references/artscience-museum

Tab. 10. ArtScience Museum, material vs resources point.

MATERIAL & RESOURCES		CONTINUED
MRc7	Solid waste Mgmt - ongoing consumables	1 / 1
MRc8	Solid waste Mgmt - durable goods	1 / 1
MRc9	Solid waste Mgmt - facility alterations and additions	0 / 1

Source: www.usgbc.org/projects/marina-bay-sands-artscience-museum

and achieves the highest levels of sustainability [https://archello.com/project/the-artscience-museum-at-marina-bay-sands].

The building meets the following factors in terms of the sustainability:

- 60% sustainable purchasing of ongoing consumables;
- 50% reuse, recycle or compost of ongoing consumables;
- 75% reuse or recycle of durable goods;
- a rigorous waste management strategy, which resulted in over 50 percent of all operational waste - such as paper, cardboard and plastics - is recycled;
- more than 50 percent of the museum's office and cleaning supplies are certified sustainable [www.3blmedia.com/News/ArtScience-Museum-Marina-Bay-Sands-Retains-Prestigious-LEEDr-Gold-Certification];
- the ArtScience Museum is entitled to 1 total score as a result of measurement and evaluation from the point of view of material and resources (Tab. 10).

- **Energy and atmosphere**

As a design concept, the „Lotus-Shaped" Singapore Museum collects light and rain (Fig. 16). Energy saving initiatives such as the use of LED lights and a programmable lighting system, which enables the museum to be 47 percent more energy efficient than similar rated [www.marketwatch.com/press-release/the-artscience-museum-at-marina-bay-sands-retains-the-prestigious-leedr-gold-certification-2018-11-28]. The building meets the following factors in terms of energy saving:

- 77 Energy Star Performance Rating;
- 6% or 50% onsite renewable energy or offsite renewable energy.

The ArtScience Museum is earned 16 points out of possible 35 points as a result of measurement and evaluation in terms of energy and atmosphere (Tab. 11).

- **Indoor envronmental quality**

The building meets the following factors in terms of the indoor environmental quality:

- 40% sustainable purchasing of electric equipment;

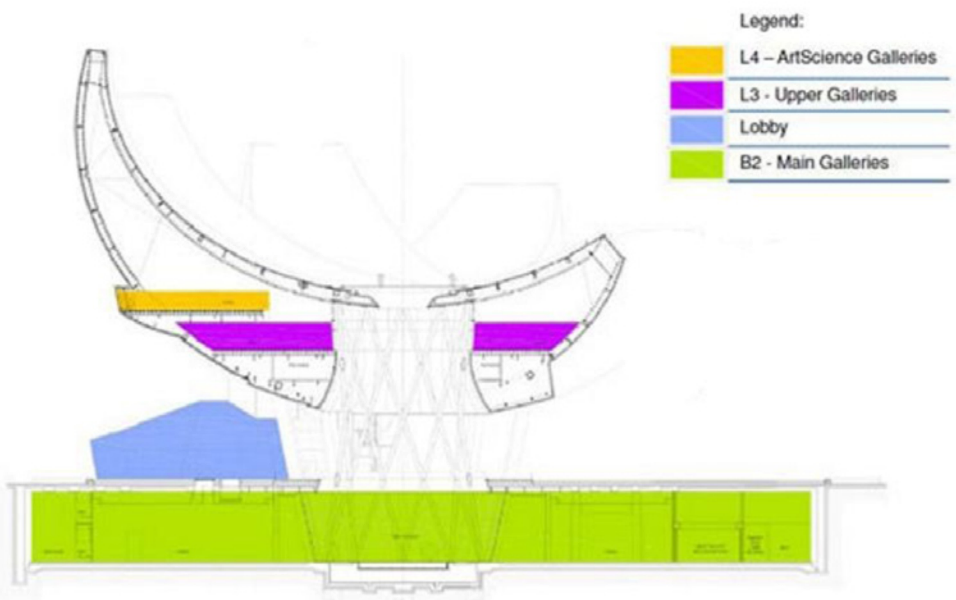


Fig. 16. ArtScience Museum, collecting sun and rain water with design concept; source: https://inhabitat.com/lotus-shaped-singapore-artmuseum-collects-rain-and-light/

Tab. 11. ArtScience Museum, energy and atmosphere point.

ENERGY & ATMOSPHERE		AWARDED: 16 / 35
EAp1	Energy efficiency best Mgmt practices -	REQUIRED
EAp2	Minimum energy efficiency performance	REQUIRED
EAp3	Fundamental refrigerant Mgmt	REQUIRED
EAc1	Optimize energy efficiency performance	6 / 18
EAc2.1	Existing building commissioning - investigation and analysis	2 / 2
EAc2.2	Existing building commissioning - implementation	2 / 2
EAc2.3	Existing building commissioning - ongoing commissioning	2 / 2
EAc3.1	Performance measurement - building automation system	0 / 1
EAc3.2	Performance measurement - system-level metering	0 / 2
EAc4	On-site and off-site renewable energy	3 / 6
EAc5	Enhanced refrigerant Mgmt	0 / 1
EAc6	Emissions reduction reporting	1 / 1

Source: www.usgbc.org/projects/marina-bay-sands-artscience-museum

Tab. 12. ArtScience Museum, indoor environmental quality point.

INDOOR ENVIRONMENTAL QUALITY		AWARDED: 10 / 15
EQp1	Minimum IAQ performance	REQUIRED
EQp2	Environmental Tobacco Smoke (ETS) control	REQUIRED
EQp3	Green cleaning policy	REQUIRED
EQc1.1	IAQ best Mgmt practices - IAQ Mgmt program	1 / 1
EQc1.2	IAQ best Mgmt practices - outdoor air delivery monitoring	0 / 1
EQc1.3	IAQ best Mgmt practices - increased ventilation	0 / 1
EQc1.4	IAQ best Mgmt practices - reduce particulates in air distribution	1 / 1
EQc1.5	IAQ best Mgmt practices - IAQ Mgmt for facility additions and alterations	1 / 1
EQc2.1	Occupant comfort - occupant survey	1 / 1
EQc2.2	Controllability of systems - lighting	1 / 1
EQc2.3	Occupant comfort - thermal comfort monitoring	1 / 1
EQc2.4	Daylight and views	0 / 1
EQc3.1	Green cleaning - high performance green cleaning program	1 / 1
EQc3.2	Green cleaning - custodial effectiveness assessment	1 / 1
EQc3.3	Green cleaning - purchase of sustainable cleaning products and materials	1 / 1
EQc3.4	Green cleaning - sustainable cleaning equipment	1 / 1
EQc3.5	Green cleaning - indoor chemical and pollutant source control	0 / 1
EQc3.6	Green cleaning - indoor integrated pest Mgmt	0 / 1

Source: www.usgbc.org/projects/marina-bay-sands-artscience-museum

– 40% sustainable purchasing of furniture;
– 25% sustainable food and beverage purchasing;
– 90% sustainable purchasing of reduced mercury lamps.

The ArtScience Museum is entitled to 10 points out of an available 15 points as a result of measurement and evaluation in terms of indoor environmental quality (Tab. 12).

- **Innovation in operations and regional priority**

The overall form of the ArtScience Museum is compared to a lotus flower and is dubbed, "The welcoming hand of Singapore" by Sheldon Adelson, chairman of Las Vegas Sands Corporation which developed Marina Bay Sands Hotels (Fig. 17). The ArtScience Museum is the first museum in the region to receive this award in reducing environmental impact and also the first LEED certificated museum building in Asia Pacific region.

The ArtScience Museum is entitled to 6 total points as a result of measurement and evaluation in terms of innovation in operations and regional priority (Tab. 13).

Tab. 13. ArtScience Museum, innovation in operations and regional priority point.

INNOVATION		**AWARDED: 6 / 6**
IOc1	Innovation in operations	4 / 4
IOc2	LEED Accredited Professional	1 / 1
IOc3	Documenting sustainable building cost impacts	1 / 1
REGIONAL PRIORITY		**AWARDED: 4 / 4**
EAc1	Optimize energy efficiency performance	0 / 1
EAc3.1	Performance measurement - building automation system	0 / 1
EAc3.2	Performance measurement - system-level metering	1 / 1
WEc1	Water performance measurement	1 / 1
WEc2	Additional indoor plumbing fixture and fitting efficiency	1 / 1
WEc3	Water efficient landscaping	1 / 1
INTEGRATIVE PROCESS CREDITS		**AWARDED: 0 / 2**
IPpc89	Social equity within the community	REQUIRED
IPpc90	Social equity within the operations and maintenance staff	REQUIRED

Source: www.usgbc.org/projects/marina-bay-sands-artscience-museum

CONCLUSION

Sustainable architecture has become an important concept in this period in which we seek solutions in order to compensate for the damage caused to the environment, to produce environmentally friendly buildings and even to improve existing building stock. Although international Green Building certification systems are accepted widely in the world, they have started to be demanded in Turkey recently. The number of green certified buildings are increased day by day in Turkey.

The case studies of this study are science center buildings, which have an important place in terms of bringing together science with society. These buildings from around the world and from Turkey are examined in the context of LEED criteria.

The study is carried out at the Konya Science Center, one of the science centers in Turkey. The Konya Science Center is the first and only LEED NC Gold certified science center in Turkey. It has an important mission in terms of being the first science center supported by TUBITAK (The Scientific and Technological Research Council of Turkey). The spaces colour design and lighting designs affect visitors and children. Also, it has been awarded LEED-Gold certificate with 66 points for its environmentally sensitive design, uses water efficiently, is environmentally sensitive, recycles waste and minimizes waste, takes care in the use of materials and resources.

However, when compared to the Singapore ArtScience Museum, it appears that it was not as awarded a design concept when it received the LEED certificate. Only, the building reached the score required by the LEED criteria with integrated mechanical renewable energy systems and tools (Tab. 14).

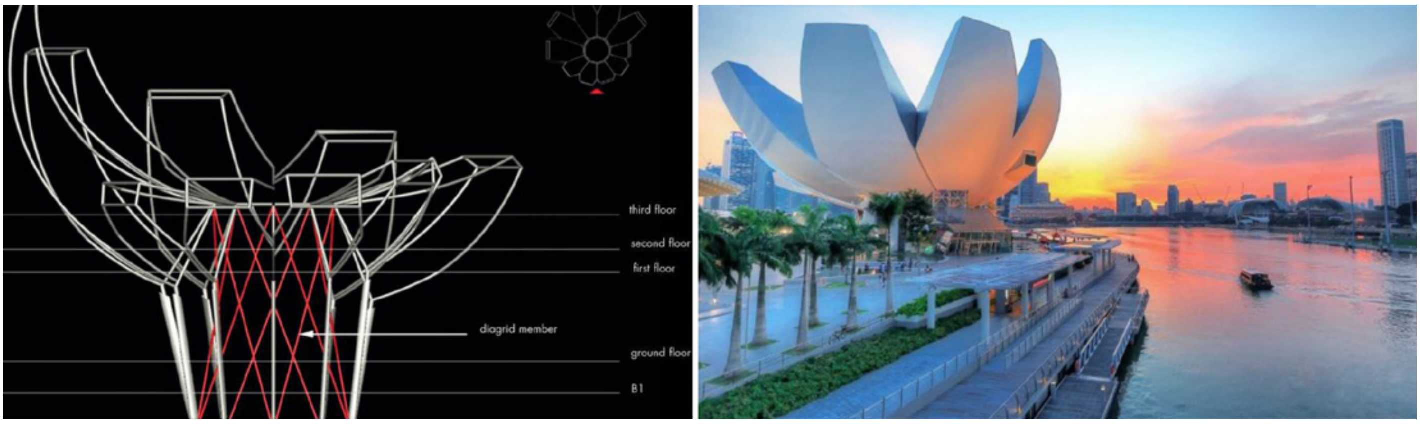
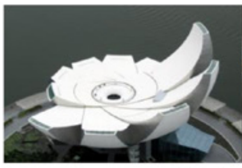
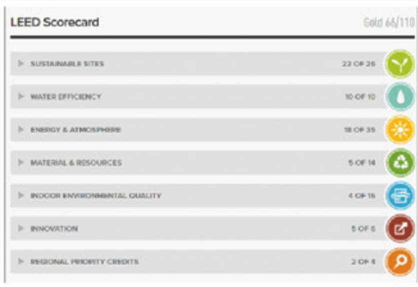
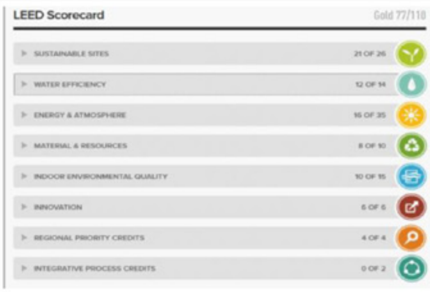


Fig. 17. ArtScience Museum, "The welcoming hand of Singapore" shape; source: Url: 7, www.visitsingapore.com/see-do-singapore/arts/museums-galleries/artscience-museum/

Tab 14. Comparing of certified example buildings in the context of LEED certification

LEED Criteria	Konya Science Center, Turkey	Artscience Museum, Malezya
Sustainable Sites	 By selecting the Organized Industrial Zone, both green areas and fertile farmland are protected. - **22 point**	 Located within the integrated resort of Marina Bay Sands hotels - **21 point**
Water Efficiency	  Rain channels and water consuming saving equipment with pressurized and unpressurized reservoirs - **10 point**	  As a design consept, "Lotus-Shaped" Singapore Museum collects rain - **12 point**
Materials and Resources	  -The use of recycled steel and concrete - Use of materials that reflect 90% solar radiation in all areas except the roof - **5 point**	   - Double-curved Fiber Reinforced Polymer skin typically used - Blasted stainless steel panels continuous skin for each of the sail-like surfaces achieving a sense of lightness with their gleaming petals - **12 point**
Energy and Atmosphere	 Mechanical renewable energy systems - **18 point**	  Lotus-Shaped Singapore Museum collects light - **16 point**
Indoor Environmental Quality	- Thermal comfort designed according to ASHRAE 55 standards - No carcinogenic building materials have been used - **4 point**	40% sustainable purchasing of electric equipment 40% sustainable purchasing of furniture 25% sustainable food and beverage purchasing 90% sustainable purchasing of reduced mercury lamps - **10 point**
Innovation in Operations and Regional Priority	 Turkey's first and only Leed Gold certified Science Center - **5 point**	 The first LEED certificated museum building in Asia Pacific Region - **6 point**
LEED Certificate Point	 66 point	 77 point

Source: prepared by the author; sources of pictures as of the previous pictures

For prestige and publicity purposes, a design is thought to have taken place in the name of obtaining a LEED certificate. In terms of its distance from the city center, it does not receive many visitors, it remains generally dormant. This building which is financially challenged should carry out activities for attracting to attract people and develop new functions in order to prevent dead investment. However, the Konya Science Center is an important example both in terms of being a public building and in terms that the Konya Metropolitan Municipality owns the Project. Also, it leads the market in terms of applications.

Although the Singapore ArtScience Museum has a LEED certificate (GOLD) of 77 points, it is on its way to being an energy efficient green building as a design concept. The building shell is shaped in order to collect rain water and sunlight. An effect is created that integrates science and people and takes on the role of the Science Museum in modern culture. The aim of the study is to contribute to the other studies interested in science centers.

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INVENTORY PHOTOGRAPHS AND DRAWINGS OF AN OLD FARMHOUSE (BUILT CA. 1922) IN OSTRA GÓRA, KORYCIN COMMUNE, BIAŁYSTOK REGION, N-E POLAND

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INWENTARYZACJA DOMU Z 1922 ROKU W OSTREJ GÓRZE W GMINIE KORYCIN NA BIAŁOSTOCCZYŹNIE

Abstract
The objective of the paper is to contribute to the knowledge of vernacular architecture in N-E Poland, especially concerning interiors of country houses in the region of Białystok. The apparent abundance of previously published contributive works, relevant to the subject matter, is elusive, as this subject has not been studied exhaustively yet. In particular, both the diversity of interior arrangements and their accumulative nature still seem very promising research issues. In this article, inventory illustrations of a timber house dated 1922 in Ostra Góra, Korycin commune, N-E Poland, are presented to the public, with the aim to record and preserve the relevant cultural heritage information. Since its erection, the interior of the surveyed house has been accumulating pieces of furniture, different equipment items and various adornments that have eventually amounted to a unique conglomeration, an amalgam of things, forms and patterns. Surprisingly, the final aesthetics of the interior have proven complex but quite uniform, being the astonishing result of old aesthetics, lore and patterns supported by new technologies. The conclusion has been drawn that one of the distinctive features of the region of Białystok is the cumulative nature of its country houses whose interiors can be perceived as a sort of a legacy transcript of great cultural value.

Streszczenie
Artykuł ma w zamierzeniu autorów być wkładem w poznanie i dokumentowanie wernakularnej architektury wiejskiej północno-wschodniej Polski, a w szczególności Białostocczyzny. Ten ogólny kierunek badawczy, mimo wielokrotnego przywoływania w szeregu publikacji naukowych, stanowi zagadnienie dalekie od wyczerpania, co poniekąd wynika ze specyfiki ludowej kultury materialnej regionu (w szczególności wiejskiego budownictwa i wystroju wnętrz mieszkalnych), mianowicie jej różnorodności i akumulatywności. Przykładem akumulatywności jest tytułowy, omawiany tu budynek, czyli drewniany dom we wsi Ostra Góra w gminie Korycin, wzniesiony w 1922 roku. Od tego czasu stale nawarstwiały się w nim, zwłaszcza w jego wnętrzu, estetyki właściwe kolejnym upływającym dekadom, a wraz z nimi wnętrze domu akumulowało wzory ornamentalne, elementy wyposażenia i umeblowania, itp. Oczekiwać można byłoby więc wizualnego chaosu, tymczasem wnętrze badanego domu wydaje się estetycznie spójne i dojrzałe (więc tym bardziej interesujące jako wytwór ludowego rozumienia przestrzeni), co zresztą ukazano tu na wybranych ilustracjach dokumentacyjnych: fotografiach i rysunkach inwentaryzacyjnych, wykonanych jesienią 2018 roku. Wywód oparty na materiale inwentaryzacyjnym zwieńczono wnioskiem o addytywnej akumulatywności jako specyficznej cesze wnętrz wiejskich domów Białostocczyzny. Wnętrza takie, w których współczesność łączy się z pozornie minionymi tradycjami, można uważać za cenne jako rodzaj zapisu czasu, a zarazem zapisu dziedzictwa kulturowego.

Keywords: vernacular architecture; vernacular houses; vernacular home interiors; Podlasie region; Białystok Region

Słowa kluczowe: architektura rodzima; domy wiejskie; ludowe wnętrzarstwo domów; Podlasie; Białostoccyzna

INTRODUCTION

Rural areas of North-Eastern Poland are still abundant in vernacular architecture. It could be said that the eastern part of the region has become the most interesting area of the whole country in terms of preservation of old timber-constructed houses, barns and granaries. Thousands of 80-, 90- or even 100-year-old log-constructed buildings are still in existence there, with the houses often inhabited and relatively well maintained, while in the other parts of the country old timber houses have already ceased to exist.

Nevertheless, even in this conservative region, social aspirations have been gradually affecting architecture for many decades, and the growing demand for better living conditions has strongly influenced home interiors: their layouts, arrangement patterns, aesthetics, furniture, etc. Besides, natural ageing and deterioration of old buildings impend the remnants of the past material culture, threaten vernacular architecture and transform cultural landscape.

In the 1990s, at the Faculty of Architecture, Białystok University of Technology, a program of student participation in the assessment of regional vernacular architecture was initiated. During the first decade it resulted in collecting ca. 11000 photographs of old houses, barns, granaries and other farmstead buildings, as well as of their external adornments and interior arrangement.

Since 2011, students have also been engaged in more advanced and significant stages of vernacular architecture assessment, being not only just data collectors, but also genuine researchers and authors of dozens of published works. In 2011, a student of the Faculty of Architecture, Białystok University of Technology, contributed to two research papers; in 2012, five students contributed to three papers; then there was a gap in 2013, but in 2014 eight students contributed to three publications; in 2015, twelve students contributed to eight works; in 2016, seventeen students contributed to eleven research papers and one book [P. Marzec et al., 2016]; in 2017 and 2018 the ratios were 10 to 6 and 10 to 8, respectively. At present, about a dozen other students are to be engaged in preparing research publications.

Such progress has had a threefold benefit. Firstly, the collection of raw survey data has gradually increased, consisting of about 22000 photos or inventory drawings in 2018. Secondly, the essential survey data have been assessed and presented to the academic audience more efficiently. And thirdly, thanks to the students' artistic skills, the methods of visual presentation have been developed, tested and polished. For example, in 2014, the students started to develop improved methods of visual depictions of the survey data, i.e. of the interiors of vernacular houses [A. Biernacka et al., 2014; J. Perkowska et al.; M.Remiszewska et al.]. They drew technical plans and sections of the surveyed buildings first, and then they used these drawings as backgrounds for a kind of minute "ethnographic drawings", made in very elaborate detail, thus displaying not only the construction information, but also recording all the data concerning interior arrangements, even including all the accidental disorder or mess. Then, they canvassed the indwellers' reminiscences and opinions, as well as the neighbors'.

The most effective and clear structure of such complex research documentation was also discussed. In 2015, such a method enabled the development of thematic works, related to vernacular stove systems in the country houses of the region [M. Daniszewska, 2015; B. Drągowska et al., 2015].

In 2016, a breakthrough was achieved in terms of structuring survey data, with the idea that two-dimensional polychromatic 'ethnographic drawings' should constitute a sort of framework not only for pictorial material, but also for all the other pieces of survey information related to architectural objects. Consequently, this method was applied in preparing the vividly expressive documentary papers published in "Biuletyn Konserwatorski Województwa Podlaskiego" [A. Woszczenko &J. Szewczyk, 2016; H. Aramowicz et al., 2017; A. Bednarska et al., 2017; A. Depczyńska, 2018; D. Dakowicz, 2018].

In 2018, a student-discussed consensus was reached at the Faculty, resulting in a shift to write and publish in English in order to present research content to the international academic audience. As of December 2018, the new rationale resulted in two research papers to which students had contributed essentially. This work is one of them.

The objective of this study is to apply advanced depiction methods to document *cumulative nature as a specific feature of country houses in the region*, on the example of an old house in Ostra Góra, whose photos and drawings were made in November 2018 and are presented in the paper to serve as the source material for future studies and as a platform for current critical cogitation and analysis.

1. THE EXAMINED OBJECT

The house was built in 1922 as a simple timber-made farmhouse with a glassed front porch (fig. 1). In spite of some subsequent major repairs, it still preserves a variety of its initial features in terms of construction, architectural form, external adornment, layout, interior equipment, furniture, internal decoration, etc. Nevertheless, it has also gained a large number of newer artifacts and adornments. However, the subsequent changes and additions have not replaced the original equipment, but have been mixed with the existing items to create a kind of unique eclectic interior.

After some preliminary assessment, we claim that the house in Ostra Góra reflects the regionally-specific *cumulative nature of country houses.* Although not listed as a heritage monument, the house is a kind of *legacy transcript* of great cultural value in terms of vernacular architecture and vernacular material culture. This statement is the formal thesis of the paper.

1.1. The village

Ostra Góra (53°24′10,46″N 23°09′48,50″E) is a small hamlet of about 30 farmsteads in Korycin commune, Podlaskie Voivodeship, 40 km north of Białystok, NE Poland. For the last six decades the hamlet has been partially depopulated like many other villages and hamlets of the region.

The uniqueness of the hamlet consists in the subtle balance between the old and the new in its vernacular architecture. While the local farmhouses and other farm buildings are of various forms, materials and constructions, most of them were built in the 1960s and are still in use with all their original equipment, subsequently supplemented with more recent pieces of furniture, adornment and devices. The farmhouses are neither too old (and thus neglected), nor too modern to preserve the old vernacular aesthetic patterns.

1.2. The farmstead

The farmstead reflects the cumulative nature of space as well. The house is only one of a number of buildings tightly located on a small farm plot perpendicular to the street. The characteristic feature of the farmstead is the coexistence of modern spacious stables with older barns and two farmhouses, aside from a dozen or so minor outbuildings – all those structures placed on the same farm plot. The farmstead also extends on the opposite side of the street (fig. 2).

1.3. The house and its external aesthetics

A similar cumulative nature can be seen in the architecture of the house. Originally, it had a simple rectangle-based layout with a glassed front porch (fig. 1), having all walls made of timber. Another porch-like annex was later added at the back (fig. 3). The back porch was constructed of hollow bricks.

Apart from the porches, the house has its original plank-made adornments, characteristic of the region (fig. 4-7). Traditionally, places of adornment accumulation were corners, windows and cornices of residential houses. Usually, only front façades were highly ornamented. But in this case all the four façades are adorned: the windows are garlanded with floral ornamentation; the corners are covered with geometric patterns and the upper cornices and eaves are fringe-like, covered with patterns inspired by textile fringes.

Fig. 1. The house in Ostra Góra: façade view; photo by the authors, 2018
Ryc. 1. Widok od strony drogi (od frontu) badanego domu w Ostrej Górze; fot. autorzy, 2018

Fig. 2. The house in Ostra Góra (side view towards the street); photo by the authors, 2018
Ryc. 2. Dom w Ostrej Górze – widok od podwórza ku ulicy; fot. autorzy, 2018

Fig. 3. The house in Ostra Góra (back view towards the street); photo by the authors, 2018
Ryc. 3. Dom w Ostrej Górze – widok od podwórza ku ulicy; fot. autorzy, 2018

Fig. 4. Wood plank ornamentation (called kożuchowanie, i.e. sheepskin) of the house in Ostra Góra; photo by the authors, 2018
Ryc. 4. Dom w Ostrej Górze – deskowe zdobienia (tzw. kożuchowanie); fot. autorzy, 2018

Fig. 5. Wood plank ornamentation of a cornice; photo by the authors, 2018
Ryc. 5. Dom w Ostrej Górze – deskowe zdobienia węgła; fot. autorzy, 2018

Fig. 6. Eave decoration; photo by the authors, 2018
Ryc. 6. Zdobienia podokapowe badanego domu; fot. autorzy, 2018

Fig. 7. Gable window decoration; photo by the authors, 2018
Ryc. 7. Zdobienie okna szczytowego; fot. autorzy, 2018

Fig. 8. Window shutters, removed and stored in an outbuilding; photo by the authors, 2018
Ryc. 8. Okiennice składowane w dobudówce; fot. autorzy, 2018

Originally, blue shutters supplemented the external ornamentation of the house. Yet recently they have been removed and are stored in an outbuilding (fig. 8).

In the studied region only the wealthiest families ordered carpenters to add glassed-in porches to a house façade wall. Such porches were sometimes highly ornamented with cut planks, or alternatively, they were decorated with stained glass instead of timber cuttings. The house in Ostra Góra represents the latter case (fig. 9, 10).

Fig. 9. The front porch glazed with stained glass; photo by the authors, 2018
Ryc. 9. Frontowa weranda szklona witrażowo; fot. autorzy, 2018

Fig. 10. The front porch glazed with stained glass; photo by the authors, 2018
Ryc. 10. Frontowa weranda szklona witrażowo; fot. autorzy, 2018

1.4. Functional structure and layout of the house

In the past, ancient log cabins of Polish peasantry consisted of one main living space *(izba)* with a large multi-purpose stove, and adjoining two or three minor rooms for storage *(sień*, i.e. an unheated hall, and *komora*, a storeroom). In the homes of poor peasantry, such a layout prevailed until the 1950s, and a number of similar old log cabins can even still be found today.

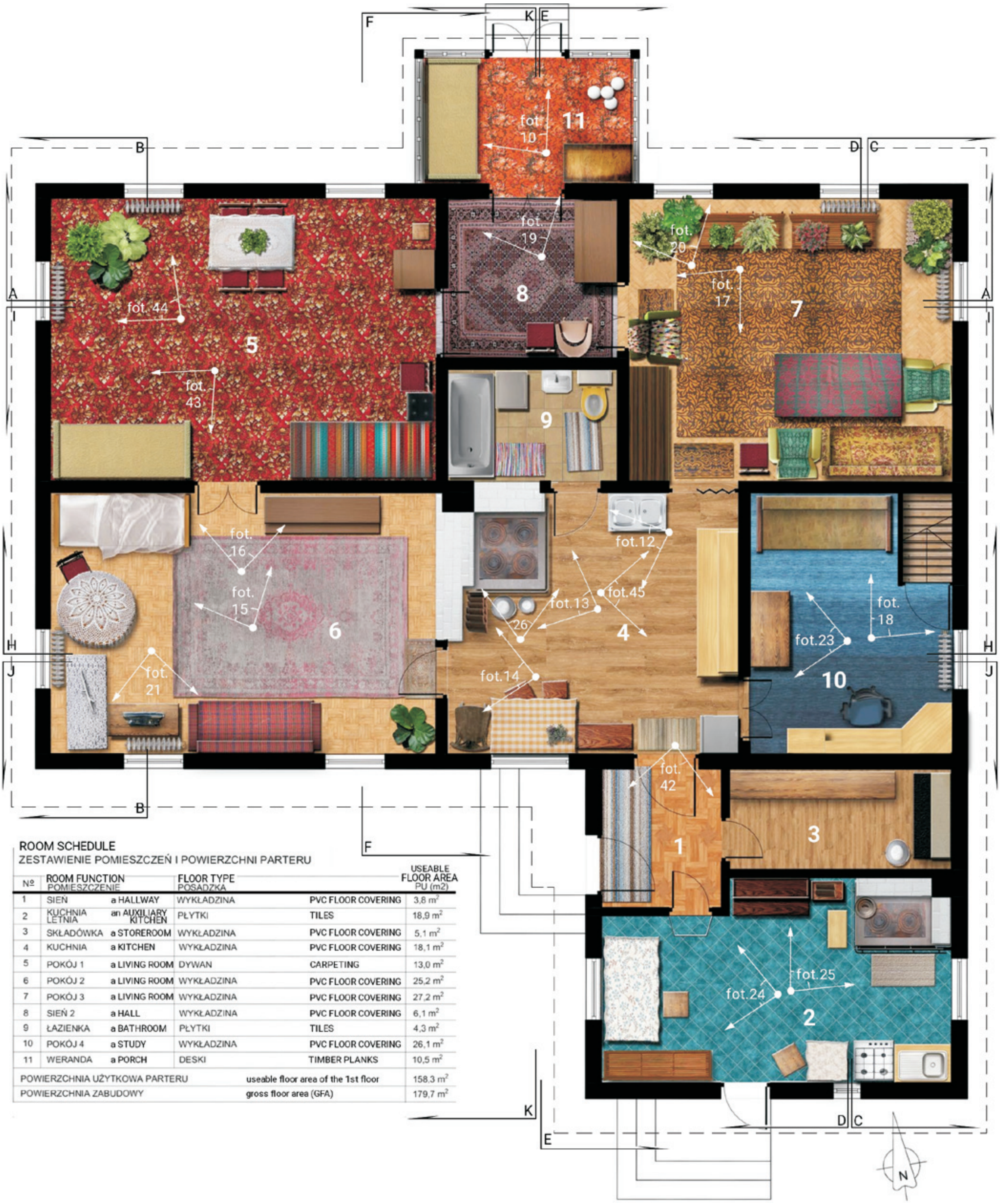
In contrast, the wealthiest peasantry and petty gentry (a class that was prevailing in some territories) tended to develop much more complex plans of their homes. Nevertheless, even in such cases, houses were genetically related to their ancient prototypes in terms of layout, stove systems, etc. Similarly, the house in Ostra Góra reveals its affinity to the oldest log houses of local peasantry (fig. 11).

Firstly, the most important room in the very center of the house is the kitchen, which inherits many functions of the old *izba*, serving as the room for everyday activities of the whole family and adjoined by 5 other rooms (fig. 12).

An essential element of the kitchen, and of the whole house, is a massive multi-purpose stove and oven (fig. 13), located in the center of the house to enable the heating of the four adjoining rooms directly. Nevertheless, an indirect central heating system was also added in the 1980s. The central heating system is fed by a multi-purpose kitchen stove with an adjoining bakery oven.

Thirdly, the multi-purpose stove is surrounded by an enfilade of rooms. Admittedly, a layout where the stove organizes all the surrounding enfilade spaces seems relatively common for vernacular dwellings in many regions or even countries of the cold climate; nevertheless, the placement of the stove and its functional and aesthetic significance in the home interior are still somehow unique, allowing the role of the stove as the dominant, the center, the „heart" of the house, the organizer of space, the symbolic and physical boundary between the rooms and spaces, etc. (fig. 14).

For many decades (at least between 1850 and 1960) a specific feature of country houses in some regions of Poland was the bipolar symbolic and aesthetic opposition between the kitchen and the adjoining living rooms, the former acting as the space for common daily activities, whilst the latter group (living rooms) being of purely festive nature. The living rooms were presentable and clean and served as spaces for



ROOM SCHEDULE
ZESTAWIENIE POMIESZCZEŃ I POWIERZCHNI PARTERU

№	ROOM FUNCTION POMIESZCZENIE		FLOOR TYPE POSADZKA		USEABLE FLOOR AREA PU (m2)
1	SIEŃ	a HALLWAY	WYKŁADZINA	PVC FLOOR COVERING	3,8 m²
2	KUCHNIA LETNIA	an AUXILIARY KITCHEN	PŁYTKI	TILES	18,9 m²
3	SKŁADÓWKA	a STOREROOM	WYKŁADZINA	PVC FLOOR COVERING	5,1 m²
4	KUCHNIA	a KITCHEN	WYKŁADZINA	PVC FLOOR COVERING	18,1 m²
5	POKÓJ 1	a LIVING ROOM	DYWAN	CARPETING	13,0 m²
6	POKÓJ 2	a LIVING ROOM	WYKŁADZINA	PVC FLOOR COVERING	25,2 m²
7	POKÓJ 3	a LIVING ROOM	WYKŁADZINA	PVC FLOOR COVERING	27,2 m²
8	SIEŃ 2	a HALL	WYKŁADZINA	PVC FLOOR COVERING	6,1 m²
9	ŁAZIENKA	a BATHROOM	PŁYTKI	TILES	4,3 m²
10	POKÓJ 4	a STUDY	WYKŁADZINA	PVC FLOOR COVERING	26,1 m²
11	WERANDA	a PORCH	DESKI	TIMBER PLANKS	10,5 m²
POWIERZCHNIA UŻYTKOWA PARTERU				useable floor area of the 1st floor	158,3 m²
POWIERZCHNIA ZABUDOWY				gross floor area (GFA)	179,7 m²

Fig. 11. Floor plan of the house in Ostra Góra (with location of sections and photos, as numbered in the article); source: drawing by the authors, 2018

Ryc. 11. Rzut przyziemia domu w Ostrej Górze (zaznaczono lokalizację ujęć fotograficznych zgodnie z numeracją ilustracji w tekście; zaznaczono też przekroje); źródło: rys. autorzy, 2018

Fig. 12. The kitchen; photo by the authors, 2018
Ryc. 12. Kuchnia; fot. autorzy, 2018

Fig. 14. A view from the kitchen towards the living room, with kitchen stove as the boundary; photo by the authors, 2018
Ryc. 14. Widok z kuchni na jeden z pokoi (granicą obu pomieszczeń jest piec); fot. autorzy, 2018

Fig. 13. The main kitchen stove and oven; photo by the authors, 2018
Ryc. 13. Piec kuchenny wielofunkcyjny; fot. autorzy, 2018

occasional ceremonies, being unused on weekdays, or serving as sleeping rooms at night only. This is also the case for rooms nos. 5, 6 and 7, of which only room no. 6 serves for sleeping, if needed (fig. 15). All three rooms are embellished with devotional souvenirs and ornamental textiles, as well as wallpaper (rooms nos. 5 and 6) or plentiful potted plants (room no. 7). As a rule, almost every aesthetically important piece of furniture is covered with a piece of textile: a doily, a tablecloth, a lace curtain, a drapery, a carpet or a coverlet (compare [Marzec P. et al, 2016]; fig. 16, 19 and 25). Even tile stoves, or at least their hoods, tend to be adorned with lace curtains (fig. 13 and 23).

Devotional souvenirs are usually placed near sleeping beds (fig. 15) or above tables (fig. 16).

Owing to the specific „stove-oriented" enfilade-spaced layout, the plan of the house, like in other country houses of that type, has some additive nature, being easy to extend around its peripheries, thus being periodically developed and modified. Adding and multiplying annexes and outbuildings was in fact common practice in Polish countryside.

For example, study room no. 10 (fig. 11) achieved its present-day function a couple of decades ago, being originally a hallway or a storeroom. To transmute its nature and to improve its aesthetics, a simple ladder which had originally been exposed there was furnished into an enclosed staircase (fig. 18) and embellished with devotional pictures.

The front porch was the original annex of purely festive nature and showy aesthetics (fig. 19, 20). Although comprising a sofa inside, it does not serve for sleeping. According to the inhabitants, the porch, being the most exposed towards the public street, should also be the most showy of all the rooms. Its aesthetic uniqueness was achieved thanks to large stained-glass windows, a white lace curtain and vividly painted pieces of woodwork and clapboarding outside.

On the opposite side of the house there is another penthouse, a larger porch (fig. 3 and 11) comprising a small hallway, a storeroom and an auxiliary kitchen called *letnia kuchnia* (a "summer kitchen"; fig. 24 and 25). Placed at the back of the house, it is assigned for workday activities only, with relatively little attention to aesthetic value. After all, this space is intended for auxiliary farming activities and seems arranged to enhance working comfort rather than to enable the inhabitants to enjoy life.

Fig. 15. A "festive room", serving for sleeping at night and for ceremonial needs occasionally; photo by the authors, 2018
Ryc. 15. Pokój służący nocą za sypialnię, faktycznie zaś stale utrzymywany w odświętnym wystroju; fot. autorzy, 2018

Fig. 16. A "festive room"; photo by the authors, 2018
Ryc. 16. Pokój odświętny; fot. autorzy, 2018

Fig. 17. A "festive room"; photo by the authors, 2018
Ryc. 17. Pokój odświętny; fot. autorzy, 2018

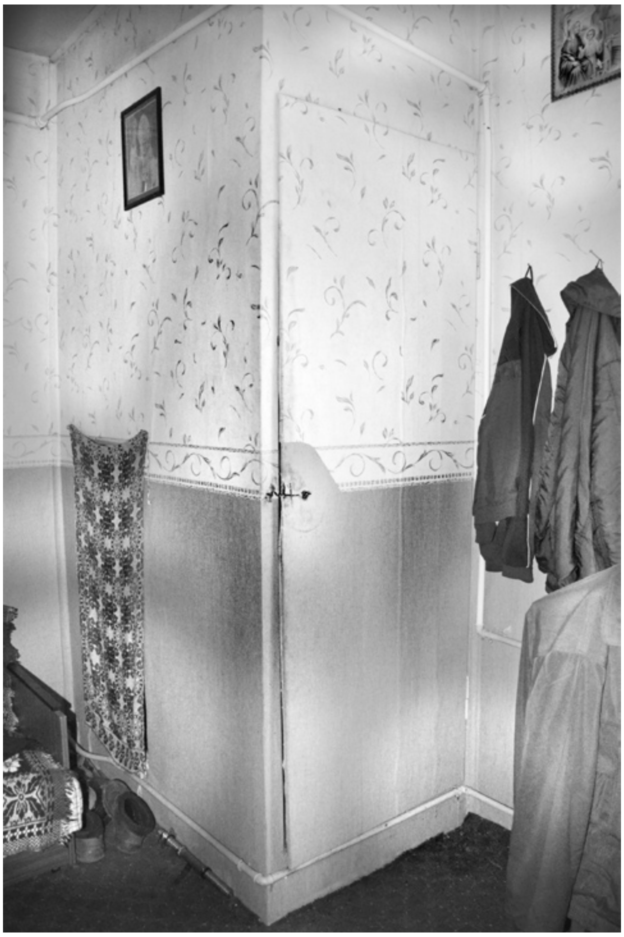


Fig. 18. An enclosed staircase in a studio; photo by the authors, 2018
Ryc. 18. Wtórnie zabudowane schody w gabinecie, będącym przebudowaną sienią; fot. autorzy, 2018

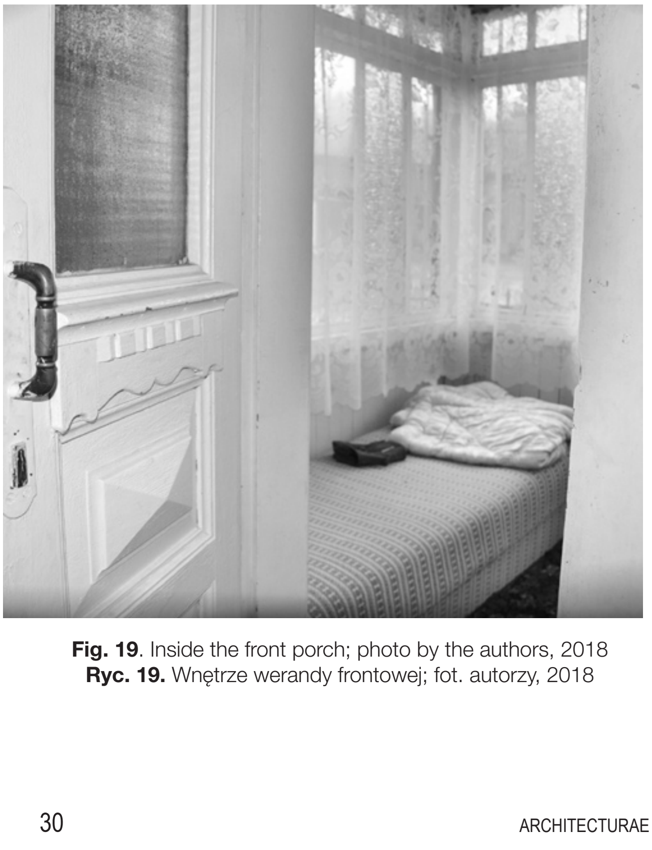


Fig. 19. Inside the front porch; photo by the authors, 2018
Ryc. 19. Wnętrze werandy frontowej; fot. autorzy, 2018

Fig. 20. The front porch; photo by the authors, 2018
Ryc. 20. Widok na werandę; fot. autorzy, 2018

Apart from functional zoning ("everyday zones" *vs.* "festive zones"), there are also micro-zones determined by functionally important pieces of furniture or devices, such as an old sewing machine (fig. 21), which designates a "utilitarian inclusion" into the "festive space" of living room no. 6.

1.5. Aesthetics of the house

The old pieces of furniture or utility devices, such as the sewing machine (fig. 21) or the old wardrobe (fig. 23), bear witness to the continuous transition between the old and the new, because while aging, such devices, though ceasing to serve as tools or practical pieces of furniture, still acquire new aesthetic mellowness and are gradually becoming purposeful elements of the internal aesthetics of the house.

Furniture and devices are movable. However, there is also a system of immovable locations and items that adorn the house and its interior. On the external façade, there are corners, windows and cornices that accumulate adornments. Similarly, there are also some aesthetically pivotal places inside; namely, windows (decorated with a surplus of lace curtain), tables (fig. 16), tops of wardrobes (fig. 17), wall friezes (fig. 15) and doors (fig. 15-17, 19 and 22).

However, notwithstanding the fact that adornments accumulate in some places, there is a common vernacular practice to cover all surfaces, both walls

Fig. 21. An old sewing machine (PFAFF model 31, manufactured in G.M. PFAFF A.G. Kaiserslautern between 1916-1933); photo by the authors, 2018
Ryc. 21. Stara maszyna do szycia (PFAFF model 31, produkowana w latach 1916-1933 w zakładach G.M. PFAFF A.G. Kaiserslautern); fot. autorzy, 2018

Fig. 22. A piece of decorative door woodwork; photo by the authors, 2018
Ryc. 22. Drzwi ozdobnej stolarskiej roboty; fot. autorzy, 2018

Fig. 23. The old wardrobe in room no. 10; photo by the authors, 2018
Ryc. 23. Stara szafa ubraniowa w pokoju nr 10; fot. autorzy, 2018

and floors, with ornamental patterns achieved by various means, namely, textile patterns, carpets, wallpaper, wainscoting, etc. Such a devotion to ornaments can even be seen in purely utilitarian rooms, such as the auxiliary kitchen, where there is a similar trend to cover surfaces with pieces of tablecloth, tapestry, wallpaper, tiles, etc., as well as to add devotional souvenirs (fig. 24).

At present, contemporary materials and aesthetics are still accumulating and enriching the home interior. The studied case reveals the owners' sense of aesthetics that seems relatively delicate, as the owners try to consciously compose the old and the new, while owners of other country houses are evidently overwhelmed with various fashions, trends, materials, technologies, gadgets, utilities, tools, etc. The resulting aesthetic medley is a common feature of most country homes in the region. The main difference is that artistically-skilled owners try to subdue the aesthetic chaos at least in the rooms used for entertaining (compare fig. 15-17 and fig. 24, 25), while those not so skillful just add new things with no sagacity.

Fig. 24. The auxiliary kitchen in the back porch annex (room no. 2); photo by the authors, 2018
Ryc. 24. Dobudówka gospodarcza („letnia kuchnia", oznaczona numerem 2 na rzucie przyziemia); fot. autorzy, 2018

Fig. 25. The second multi-purpose stove in the auxiliary kitchen in the back porch annex; photo by the authors, 2018
Ryc. 25. Drugi z pieców wielofunkcyjnych we wzniesionej później dobudówce gospodarczej (w „letniej kuchni"); fot. autorzy, 2018

Auxiliary rooms (marked as nos. 2, 3, 10 and 11 on the floor plan, fig. 11) are often used as storage spaces for pieces of old furniture and equipment that were expelled from the more presentable parts of the house. Therefore, auxiliary rooms are a sort of 'buffers' for the management of the home in terms of its aesthetics and functions, as well as buffers between the home interior and the surrounding farm (fig. 3).

The key role of the kitchen stove as a 'functional node', i.e. an assembly of functions and equipment for heating, cooking, baking, storage, organizing space – reflects the aesthetics of the stove, as well, and sometimes makes it the most carefully adorned element of the interior. Here, it is not the case; nevertheless, there are still some remnants of textile ornamentation on both the main kitchen stove (fig. 13 and 26) and on the auxiliary one (fig. 25). Their white tile cladding became an aesthetic standard of the past decades, and in a number of villages and small towns, stove fitters purposefully assembled enormous stoves because stoves used to testify to the wealth and prestige of their owners and were associated with glamour. Here, stoves are not so huge, but there are two of them.

1.6. Construction of the house

We have not verified the construction of the house with invasive methods; instead, it has been superficially recognized and also assessed on the basis of the inhabitants' retrospective declarations. Therefore, the construction-related research has eventually resulted in only a rough estimation of assembly nuances, materials, etc. Nevertheless, the findings strongly support the thesis that the house, whilst being erected just before the peak of the evolutionary development of traditional (vernacular, mainly) carpentry craft in Poland (*ca*. 1930), well before the essential and dramatic turn towards progressive engineering methods in architecture and construction (*ca*. 1960-1970), still reflects astonishing perfection in carpentry.

Fig. 26. The main kitchen stove; photo by the authors, 2018
Ryc. 26. Główny piec kuchenny; fot. autorzy, 2018

The house, being supported with massive stone foundations, has timber walls made of 18x22 cm logs, sawed up and joined with full dovetail corner notches. The walls were then clapboarded with profiled 20-cm-wide planks (clapboarding and its ornamental additions are called *kożuchowanie*, i.e. *a sheepskin of the house*).

The porches present another type of construction: the front porch (fig. 1, 9 and 10) has a „post-and-beam" lightweight construction with large stained-glass windows and fine wood plank clapboarding; at the back of the house there is another porch (fig. 3), made of foamed concrete bricks. This porch is actually a newer annex, added in the late 1970s.

The gable roof has a pitch of 42°. The roof structure consists of „close couple" rafters with collar ties. The rafters are neither raised directly on the wall nor on the wall plate, but are joined to eave purlins which are shifted towards the eaves and lay upon the end of the ceiling beams. Such an indirect support system used to be very common in this region.

2. PICTORIAL MATERIAL

More than 100 photographs were taken during the survey. Eventually, 72 of them have been selected as part of the pictorial documentation of the house, 25 being included in this article. Draft sketches served as the basis for the set of final drawings, 16 of which are included in the article; namely, the ground floor plan (fig. 11), four façades (fig. 28-31) and eleven sections (fig. 27 and 32-41).

The section drawings include depictions of all the home equipment, adornments, as well as the temporary furnishings and all the other objects that were present at the time of the survey. The only exception was the attic, which, serving as storage space, was so abundant in small items that depicting all of them would be virtually impossible.

Fig. 27. Longitudinal section A-A;
source: drawing by the authors, 2018
Ryc. 27. Przekrój podłużny A-A; źródło: rys. autorzy, 2018

Fig. 28-29. Façades; source: drawing by the authors, 2018
Ryc. 28-29. Rysunki elewacji; źródło: rys. autorzy, 2018

Fig. 30, 31. Façades; source: drawing by the authors, 2018
Ryc. 30, 31. Rysunki elewacji; źródło: rys. autorzy, 2018

Fig. 32. Section B-B;
source: drawing by the authors, 2018
Ryc. 32. Przekrój B-B; źródło: rys. autorzy, 2018

Fig. 33. Section C-C;
source: drawing by the authors, 2018
Ryc. 33. Przekrój C-C; źródło:
rys. autorzy, 2018

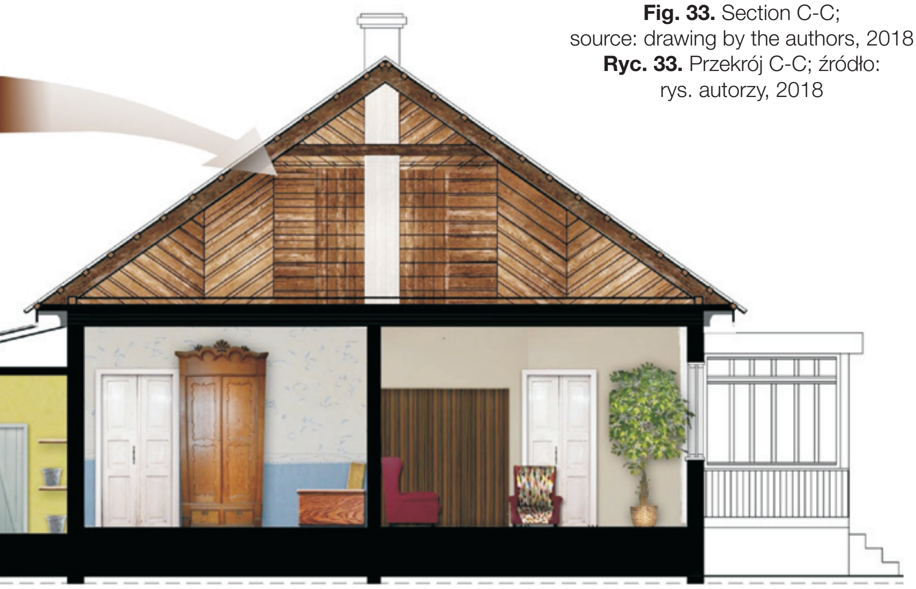


Fig. 34. Section D-D; source: drawing by the authors, 2018
Ryc. 34. Przekrój D-D; źródło: rys. autorzy, 2018

Fig. 35. Section E-E; source: the authors, 2018
Ryc. 35. Przekrój E-E; źródło: autorzy, 2018

Fig. 36. Section F-F; source: the authors, 2018
Ryc. 35. Przekrój F-F; źródło: autorzy, 2018

Fig. 37. Section G-G; source: the authors, 2018
Ryc. 37. Przekrój G-G; źródło: autorzy, 2018

Fig. 38. Section H-H; source: the authors, 2018
Ryc. 38. Przekrój H-H; źródło: autorzy, 2018

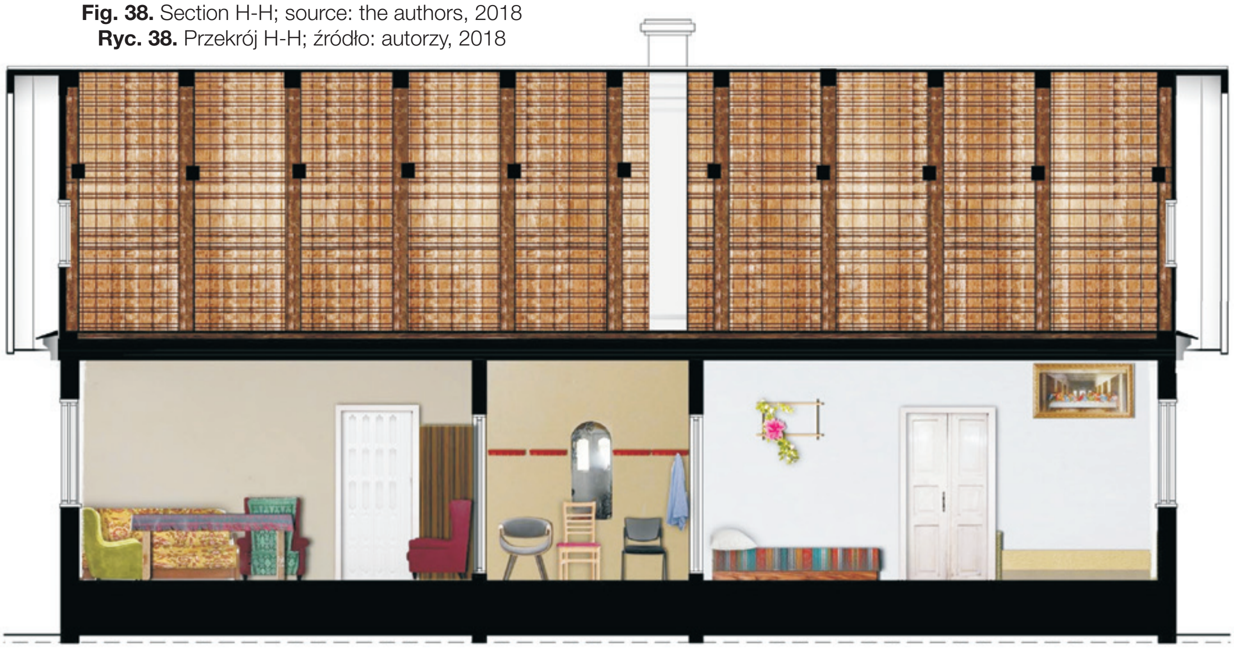


Fig. 39. Section I-I; source: the authors, 2018
Ryc. 39. Przekrój I-I; źródło: autorzy, 2018

Fig. 40. Section J-J; source: the authors, 2018
Ryc. 40. Przekrój J-J; źródło: autorzy, 2018

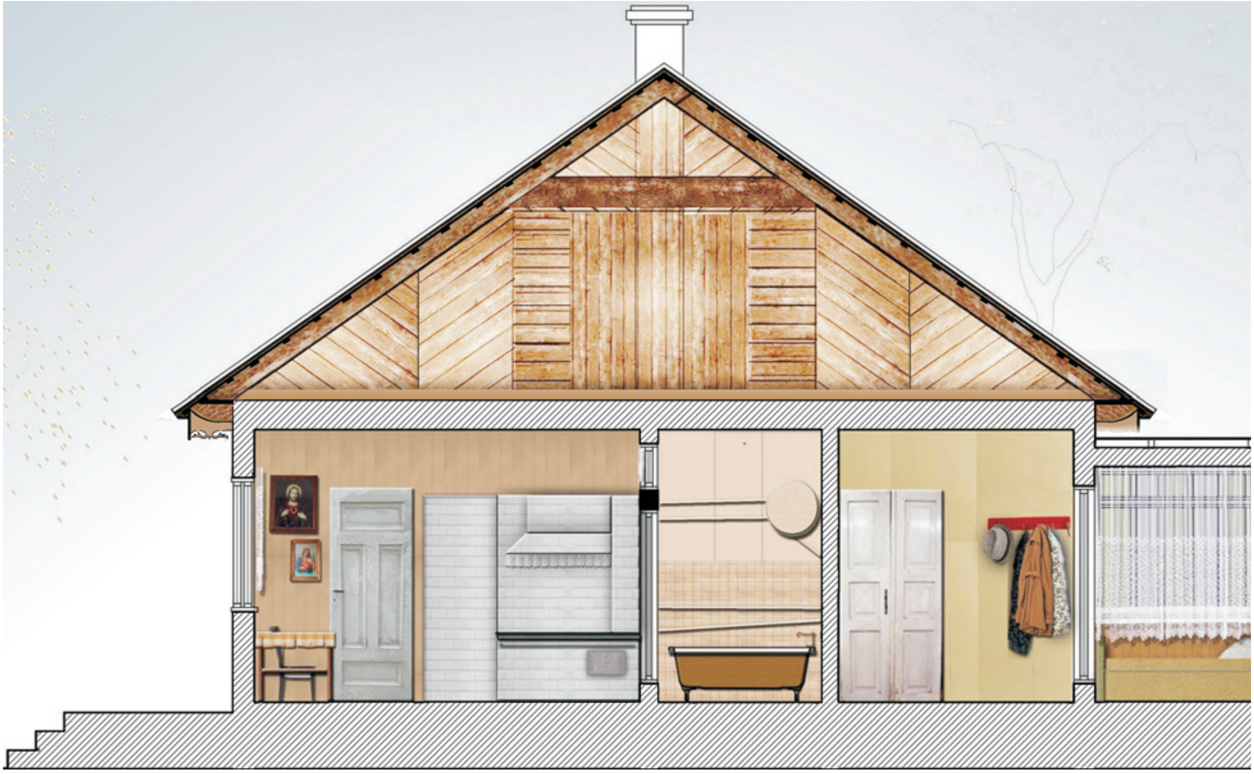


Fig. 41. Section K-K; source: drawing by the authors, 2018
Ryc. 41. Przekrój K-K; źródło: rys. autorzy, 2018

3. DESCRIPTIVE AND MULTIMEDIA MATERIAL

The pictorial data have been complemented with descriptive and multimedia material.

3.1. Documents

The inhabitants possess family documents and old photographs which have not been included in the final survey documentation; however for future research on other homes such a category is proposed to be taken into consideration and incorporated into final research documentation, depending on the content of such family documents. In similar future cases, the objective will be to recognize a wider cultural context of the history of the researched homes.

3.2. Interview recordings

An MPEG-4 (.m4a) file that contains recordings of interviews with the owners has been preserved and included in the final research documentation. The recordings do not seem essential in terms of architectural cognition; nevertheless, they reveal some cultural context and help to understand some social aspects of the *culture of habitation*.

3.3. Interview transcripts

The interview transcripts have been prepared. A few interview passages seem interesting. Firstly, the owners said that a number of pieces of furniture had been hand-made[1]. Secondly, the house used to have a much more developed stove system, which originally included three additional heating columnar stoves. In the 1970s, this stove system was reduced and partially replaced with central heating; a bathroom was also arranged at that time[2]. Moreover, the owners recollected that the external façade adornments had been hand-made during winter season when local carpenters ceased to erect timber constructions[3].

4. INTERPRETATION

The collected material justifies the statement that a traditional country home can be assessed as a sort of *cumulative recording* of the history of its inhabit-

[1] The owner recollects: *„Drewno, fundament to z kamienia, znaczy ta prepa z cementu był taki składany. Ale tak to drewno wszystko, wszystko z drzewa i stolarka z drzewa i nawet ta taka szafa czy trochę meble było wszystko robione, znaczy swoje. (…) I jeszcze takie ławki były porobione"*(November 2018; untranslated; the original style has been preserved).

Fig. 42. The entrance hall of the house in Ostra Góra; photo by the authors, 2018
Ryc. 42. Sień wejściowa ostrogórskiego domu; fot. autorzy, 2018

Fig. 43. Fragment of carefully laid out permanent artistic arrangement in a representative "festive room" (room no. 5); photo by the authors, 2018
Ryc. 43. Reprezentacyjny „odświętny" pokój (nr 5 na załączonym rzucie parteru) – fragment stałej aranżacji odzwierciedlającej semi-ludowy lecz współczesny artyzm mieszkania, będący pochodną niedawnych mód; fot. autorzy, 2018

ants, as well as a transcript of relevant social culture, especially if related to *homeness culture* (J. Szewczyk, 2018).

Similar statements have also been made and emphasized by a number of Polish researchers since the 19th century up to the present, but recently, there has also emerged a common opposite belief that the modern era has completely reversed the ideas of "house" or "home", thus making homes non-cumulative, but fashion-dependent, even ephemeral in their aesthetics or arrangement. Are local country homes actually no longer cumulative? Or conversely, maybe they are still "traditional" with respect to their old arrangement, even if *passé*? To what extent can human culture be attributed to a house? How, and how constantly, are *incidents of culture* becoming engraved upon a house by their nature?

Such pondering includes a tint of subjectivity, but we discern some support for these reflections in our findings.

And paradoxically, the house in Ostra Góra reflects both the opposite trends. Its interior is, in general, highly cumulative, but its owners tried to exclude some rooms and minor spaces, maybe unwittingly, as either *enclaves of tradition*, or – true or alleged, recent or obsolete – *enclaves of modern fashion* (fig. 43, 44, 45).

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[2] *„Były trzy słupki było w tym domu, do ogrzewania takie. A tak no ani wody nie było ani centralnego, nic centralne to przerobione już jakieś chyba z trzydzieści lat temu, jak przerobione jest, bo remont robiony był. (…) I łazienka też. Woda…"*(the owner's recollection - the original style).

[3] *„To i z tymi majstrami trudno było też, bo nie umieli roboty. A te rozmaite ozdoby to całą zimę ich ten majster robił. Kręcił wszystkie te o powycinane i to ręczną piłką. (…) opowiadali, że tego kleju nie było, robił, robił, coś się później odpadnie kawałek i cała robota mu przepadła. (…) Bo dzisiaj wszystko na klej robią, a to nie było wtedy jeszcze tego kleju"* (*ibid*.).

Fig. 44. Room no. 5; photo by the authors, 2018
Ryc. 44. Tenże sam pokój; fot. autorzy, 2018

Fig. 45. The kitchen; photo by the authors, 2018
Ryc. 45. Kuchnia; fot. autorzy, 2018

CONCLUSIONS

The 97-year-old house of timber log construction in Ostra Góra, Korycin commune, NE Poland, is a *legacy transcript* in terms of architecture, interior arrangement and visual aesthetics. For the past 97 years its old vernacular aesthetic patterns and old furniture and equipment have been evolving continuously, being rearranged and enriched with newer materials, aesthetics, adornments, utilities as well as the newest home electronics and other devices. Nevertheless, some old concepts of home space have never been abandoned. Such concepts include, for example, the complexity of the stove system and its role in the arrangement of the rooms, the social role of the kitchen as the main multi-purpose space, the essential role of textiles as the main adornments and determinants of internal aesthetics, etc.

We insist that such a category of country houses in the region should be taken into consideration for future systematic research. Namely, we mean the houses built in the inter-war period (1918-1939), as well as the ones that were built up to the 1960s. If still inhabited, they often reveal a deep concern of their owners on how to merge tradition and modernity, sometimes with surprising results that deserve research attention.

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”CONSERVATIVE PROGRESSION”. THE INFLUENCE OF THE MODERN MOVEMENT ON HUNGARIAN ARCHITECTURAL EDUCATION DURING THE INTERWAR PERIOD

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Abstract

The influence of the Modern Movement was increasingly felt in Hungary from the end of the 1920s. As time passed, architectural education also needed to respond to these changes. How did the professors, who designed in historical styles, react to the new situation, and how did the students respond? Who were the people who first stimulated interest in modern architecture, and who did they inspire? What kind of institutional or structural modifications did all these initiatives bring about at the Architectural Faculty of Budapest Technical University?

There are three noteworthy episodes in the history of introducing modern approaches at the Faculty. The first event of great significance was the establishment of the Department of General Building Design in 1922 besides the three long-standing historical departments: the Departments of Ancient, Middle and Modern Ages. This began a disengagement with the era of historicism. However, students in the older years continued to receive their design assignments from the historical departments, and were expected to design in historical styles taught by the professors. Thus architectural education could be considered conservative even by the end of the 1920s.

On the other hand, some students were able to bring progressive modernism directly to the University. At the student exhibition held in 1927, a few “brave” drawings independent of any department appeared among the designs in historical styles. These included a design by György Rácz inspired by Le Corbusier that was showcased thanks to the curator, a student named György Masirevich. Farkas Molnár – who returned from the Bauhaus school – submitted a design influenced by modern German architecture. Within a few years Masirevich, Rácz and Molnár joined CIAM, and then its subgroup: CIRPAC.

It was not only students, but also some professors who played an indisputable role in ushering in modern architecture, even if their work and teaching methods could generally be regarded as examples of “conservative progression”. The third and most important date of the investigated period was 1930, when architectural education began to be given high priority. That year another student exhibition was organised by a professor, Iván Kotsis, which was linked to the 12th International Congress of Architects held in Budapest. Plans designed by students in the modern spirit constituted the majority at that exhibition. It was in the same year that professor Hültl as the Rector of the University voiced his opinion on modern architecture: according to him, modernism should not be used for certain types of buildings; however, he did not want to oppose all new directions in architecture. This duality of approach can well be detected in his private practice.

Therefore it was the so-called “other modern” rather than progressive modernism that became institutionalized at the Faculty due to the influence of some professors whose aim was to comply better with local circumstances and materials. To achieve this it was indispensable to get the knowledge of the past, so teaching history of architecture remained a significant part of the curriculum. It was Professor Kotsis and his colleagues who laid out this path and their heritage was still prevalent after WWII.

Keywords: architectural education; “other modern”; Interwar period

INTRODUCTION

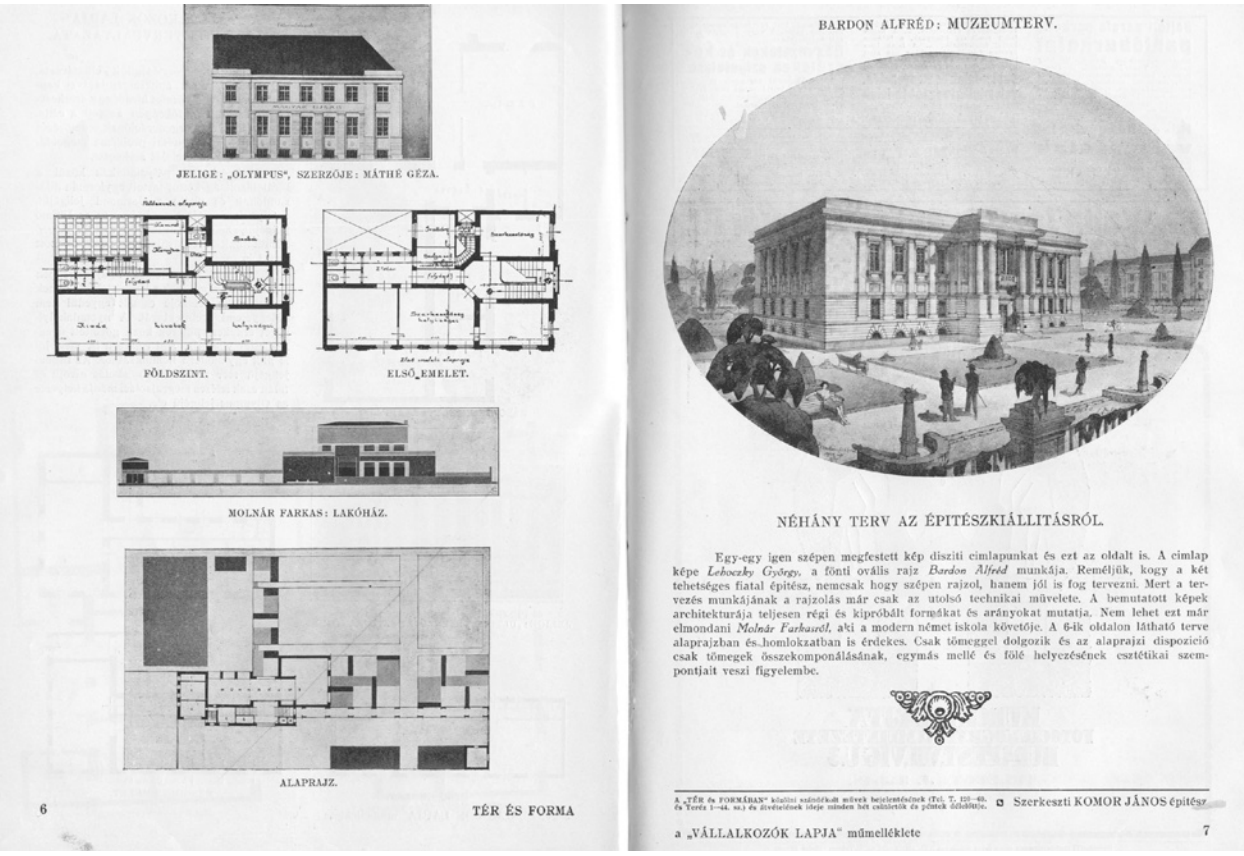
This paper investigates the changing character of Hungarian architectural education around 1930. During that time, due to the influence of the Modern Movement, several alterations took place in the curriculum adopted by the Architecture Faculty at Budapest Technical University (BTU)[1], which was the only institution in Hungary where one could become a certified architect during the Interwar period.

Although those changes could be considered small steps at first sight, they were unquestionably important in having contributed to the emergence of modern architectural trends at the university. They concurrently enabled gradual disengagement from designing in historical styles and helped place the subject of *Architectural design* in the centre of the curriculum, partly by increasing the number of corresponding classes and additionally by introducing the subject into the third semester.

Some students, a number of representatives of the architectural profession outside the university, and even some professors at BTU played a significant role in reforming architectural education. Who were the ones urging radical changes? Who were against the new directions and how could the concept of the so-called "conservative progression" finally evolve at the Architecture Faculty of BTU? The aim of this paper is to answer these questions by investigating the professional architectural press of the era. Furthermore, its purpose is to highlight the characteristics of the teaching method "conservative progression". This teaching method must have been effective in the 1930s and 1940s, and may be worth considering even in our times.

THE ROLE OF ARCHITECTURE STUDENTS

Some students got acquainted with the principles of the Modern Movement and the Bauhaus on their own; however, it was in 1927 at the university that they found opportunities to draw attention to the modern architecture through their own work. From 1920 onwards student exhibitions were organised at BTU almost every year [K. Héberger 1979, 627.], but the ex-


JELIGE: „OLYMPUS", SZERZŐJE: MÁTHÉ GÉZA.

FÖLDSZINT.

ELSŐ EMELET.

MOLNÁR FARKAS: LAKÓHÁZ.

ALAPRAJZ.

6 TÉR ÉS FORMA

BARDON ALFRÉD: MUZEUMTERV.

NÉHÁNY TERV AZ ÉPITÉSZKIÁLLITÁSRÓL.

Egy-egy igen szépen megfestett kép disziti cimlapunkat és ezt az oldalt is. A cimlap képe *Leboczky György,* a fönti ovális rajz *Bardon Alfréd* munkája. Reméljük, kogy a két tehetséges fiatal épitész, nemcsak hogy szépen rajzol, hanem jól is fog tervezni. Mert a tervezés munkájának a rajzolás már csak az utolsó technikai művelete. A bemutatott képek architekturája teljesen régi és kipróbált formákat és arányokat mutatja. Nem lehet ezt már elmondani *Molnár Farkasról,* aki a modern német iskola követője. A 6-ik oldalon látható terve alaprajzban és homlokzatban is érdekes. Csak tömeggel dolgozik és az alaprajzi dispozició csak tömegek összekomponálásának, egymás mellé és fölé helyezésének esztétikai szempontjait veszi figyelembe.

A „TÉR és FORMÁBAN" közlési szándékkal művek bejelentésének (Tel. T. 120—40. és Teréz 1—44. sz.) és átvételének ideje minden hét csütörtök és péntek délelőttje. Szerkeszti KOMOR JÁNOS épitész

a „VÁLLALKOZÓK LAPJA" műmelléklete 7

Fig. 1. Publication of the student exhibition of 1927. © Credit: "Néhány terv az építészkiállításról" (1927), Tér és Forma, a Vállalkozók Lapja melléklete, Vol. 48, No 5, 6–7.

[1] Royal Joseph Technical University (1871–1934); Joseph University of Technology and Economics (1934–1949)

hibition of 1927, put on by one of the students, György Masirevich (1905–1989), turned out to be a special one: several students displayed designs and artworks that had been created independently of any university assignments. Such, for instance, was the entry called *Villa le Corbusier* submitted by the second grade student György Rácz (1907–1988), inspired by the writings of the famous architect: *Towards a New Architecture* [M. Rácz 2006, 3.]. Another student, Farkas Molnár (1897–1945), showcased a design of a dwelling house made around 1924–25 in Germany during his former studies[2] (Fig.1). Molnár decided to join the Bauhaus School in 1921 after his disrupted studies at BTU, but in 1925 he returned to Hungary and went back to university to obtain his degree and be able to work as an architect [A. Ferkai 2011, 66, 172.].

Molnár and his two younger fellow students, Rácz and Masirevich, soon became members of the CIAM's subgroup (CIRPAC), which promoted progressive modern architecture [A. Ferkai 1998, 255–56.]. However, in 1927, their progressive designs, exhibited against other student drawings executed in historical styles such as Neo Baroque, were considered by most of the visitors as "foreign" and the authors called "outsiders" [K.L. 1927, 188.]. Why were these drawings too brave?

Around 1927 the historicist approach was still prevalent at BTU. *Architectural design* started with theoretical classes only in the 4th semester and then continued with an additional 6 hours of practice workshops through the 5th and 6th semesters[3]. In the final year students only had 15 hours per week of design and then were required to do their diploma project at one of the three long-standing [G. Salamon 2016, 192–213] historical departments (Departments of Ancient, Middle and Modern Ages) in a historical style. Studying history of art and architecture as well as practising architectural forms made up a significant portion of the curriculum all the way from the very first semester, because – according to the historicist approach – these subjects were indispensable to *Architectural design.*

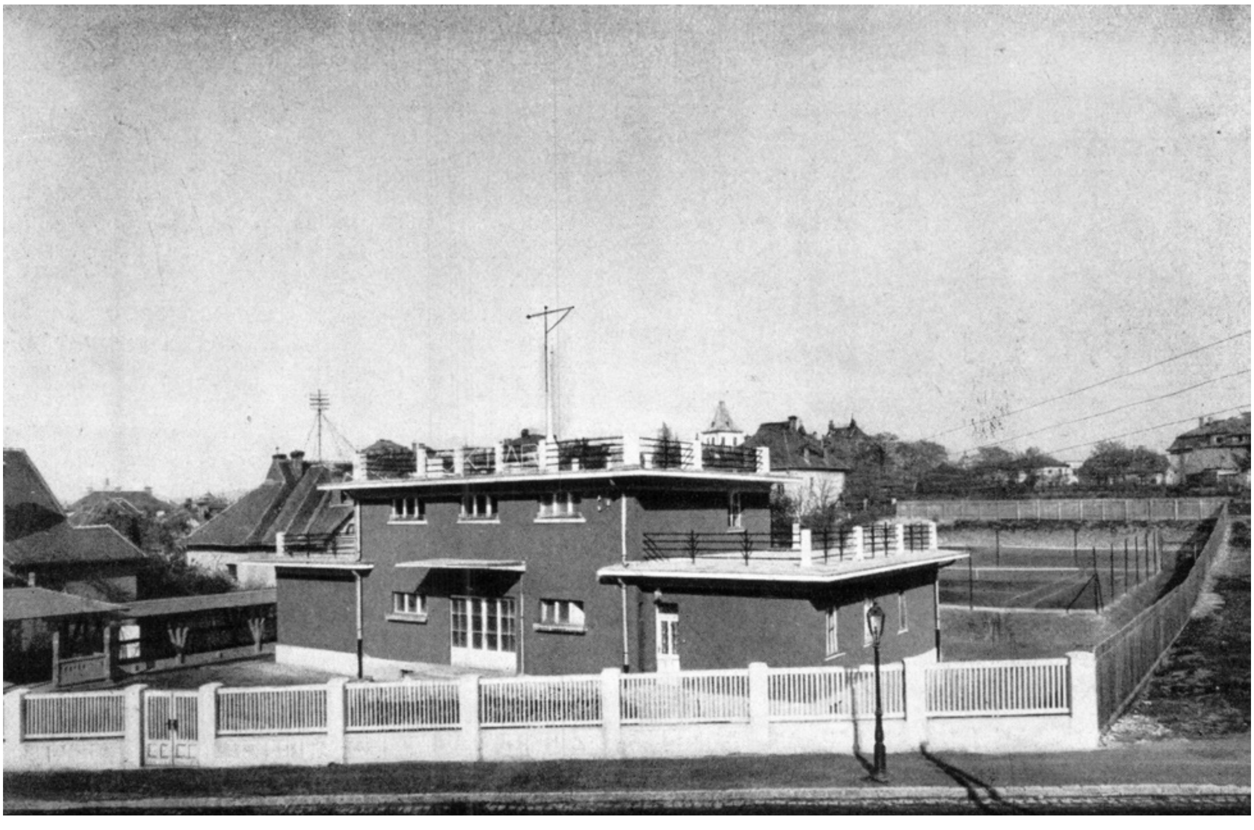


Fig. 2a. The latest building of Professor Hültl in 1929. © Credit: Komor, M. (1929), Az építész tanárok hivatásáról, Tér és Forma, Vol. 2, No 3, 92.

[2] Published in 1927. ["Néhány terv az építészkiállításról" 1927, 6.]
[3] Schedules of the Architecture Faculty in 1926/27. BUTE Archives http://public.omikk.bme.hu/bme_evkonyv/weblap.php?step=2&cat=orarendek&konyvtar=./orarendek/1926_27_2/&alcim_id=863
[4] For example Professor Hültl ran his office at the Modern Ages Department between 1913 and 1940.

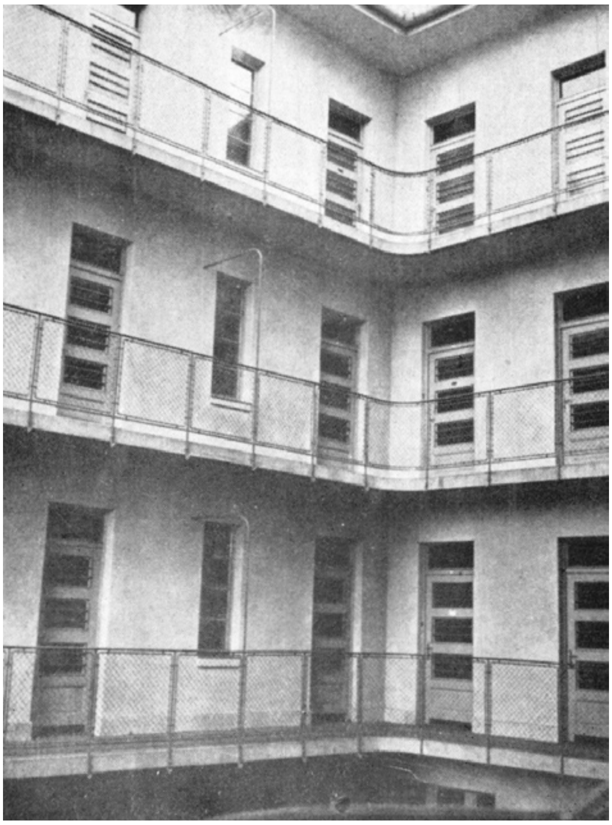


Fig. 2b. The latest building of Professor Kotsis in 1929. © Credit: Komor, M. (1929), Az építész tanárok hivatásáról, Tér és Forma, Vol. 2, No 3, 96.

THE ROLE OF ARCHITECTS OUTSIDE THE UNIVERSITY

It was not only the students mentioned above (the "outsiders") who were active in making way for radical changes through their own work during the second half of the 1920s; some other members of the architectural profession also made significant contributions towards accomplishing up-to-date standards of education in Hungary. These included Pál Müller [P. Müller 1926, 295–98.] and Marcell Komor [M. Komor 1929, 92–98.], who both considered the practice of teaching historic architectural styles exaggerated at BTU. Marcell Komor (1868–1944) referred to historical studies as obstacles hindering the spread of modern architecture both in the field of education as well as in the professors' private practice. He pointed out that professors should open up to the new trends of architecture in their own work, and mentioned the recent buildings by Professor Iván Kotsis (1889–1980) and Professor Dezső Hültl (1870–1945) appreciatively as positive examples (Fig.2a; Fig.2b). Private practice was strongly related to teaching architecture during the interwar period because heads of departments were allowed to run their own offices at the university [P. Granasztói 1965, 202.], so students had the opportunity to be informed of the actual designs and even to work there as draftsmen[4].

In 1930 the international architecture profession could also form an opinion about architectural education in Hungary. The current state of education was one of the main topics of the 12th International Congress of Architects held in Budapest ["A XII. Nemzetközi Építészkongresszus tárgyalási anyaga", 1930, 29.], so the Architecture Faculty of BTU decided to organise a special student exhibition under the direction of professor Iván Kotsis. The expo took place in the assembly hall of the university. It was only three years after the exhibition of 1927, but this time the majority of student designs were more or less related to the modern approach ["A Budapesti M. Kir. József Műegyetem építész hallgatóinak kiállítása 1930" 1930, appendix] (Fig.3a; Fig.3b; Fig.3c). Despite that, Kotsis himself was not fully satisfied with the compilation: for example, he was missing the floor plans of the exhibited designs and claimed that in most of the cases the modern approach was only adopted in the sense of abandoning the forms of historic architecture. That is why he could accept a critique by a foreign journalist, who referred to the drawings as ones "grown under glass" [I. Kotsis 2010, 199–200.].

Indeed, those student designs were a far cry from progressive modernism: some of them continued to use historical forms, while some others rather resembled the German style of premodern industrial architecture from the 1910s. Despite all these, the changes that took place in Hungarian architecture education between 1927 and 1930 were definitely

Fig. 3a. Student design displayed at the Budapest Technical University in 1930. © Credit: "A Budapesti M. Kir. József Műegyetem építész hallgatóinak kiállítása 1930"(1930), *Technika*, Vol. 11, No 7, appendix

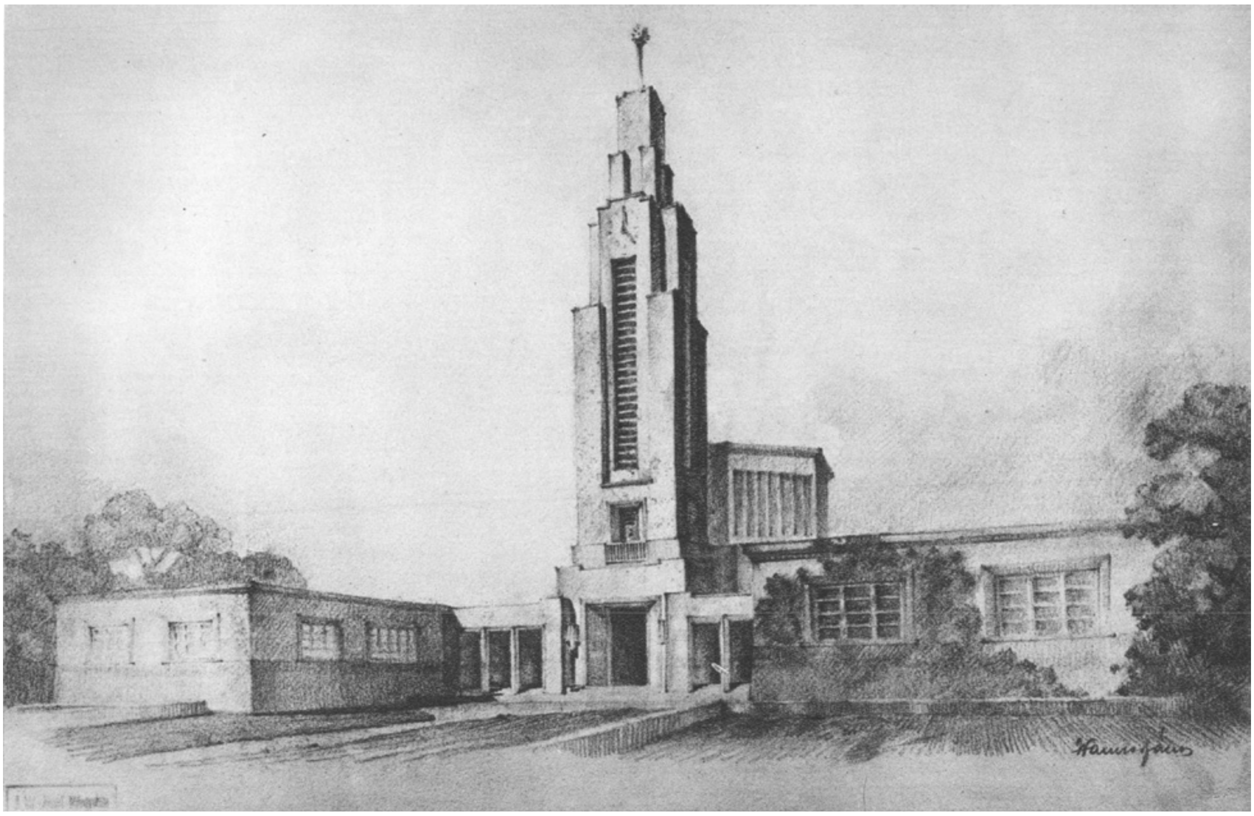


Fig. 3b..Student design displayed at the Budapest Technical University in 1930. © "A Budapesti M. Kir. József Műegyetem építész hallgatóinak kiállítása 1930"(1930), *Technika*, Vol. 11, No 7, appendix

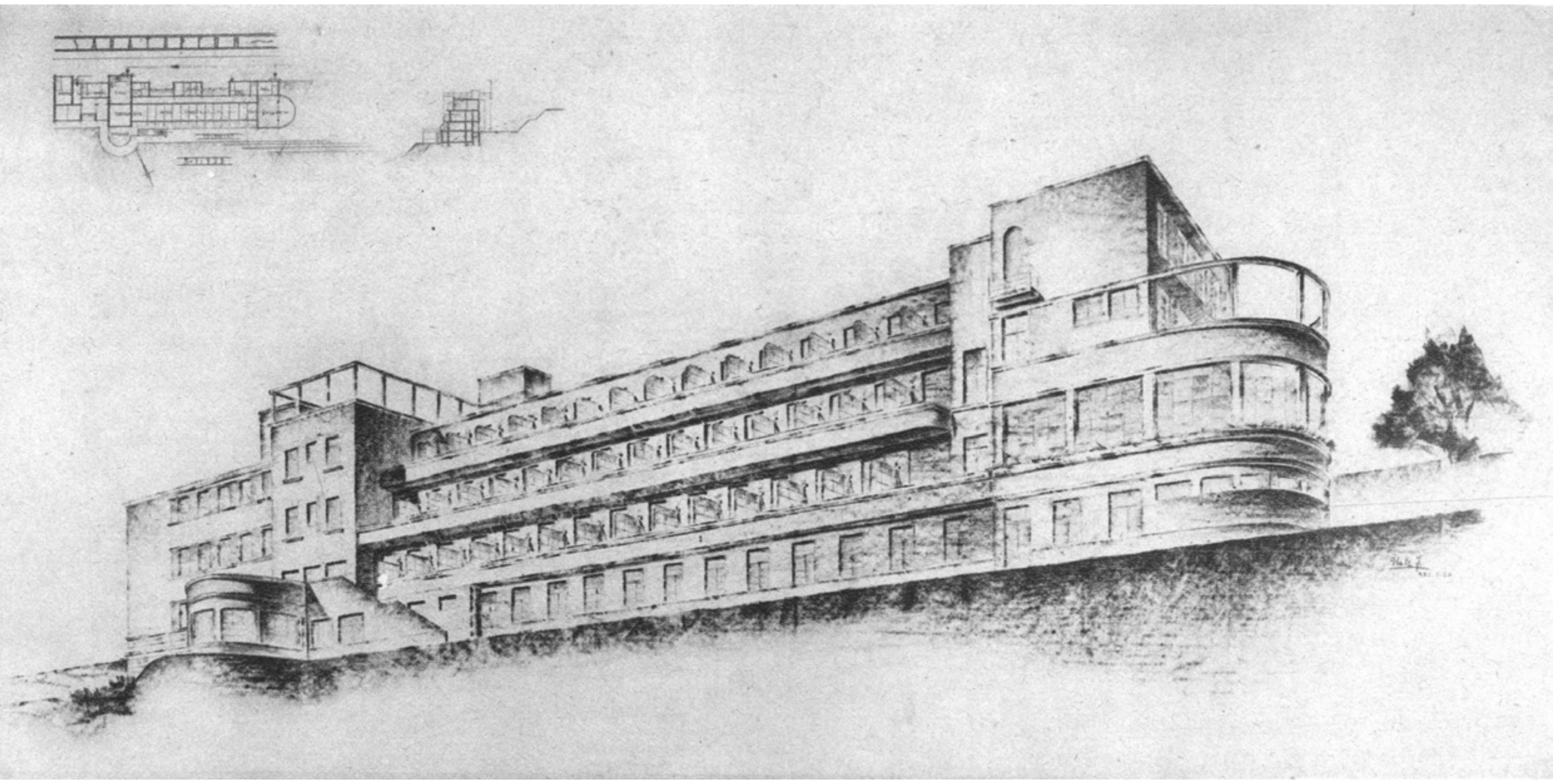


Fig. 3c..Student design displayed at the Budapest Technical University in 1930. © Credit: "A Budapesti M. Kir. József Műegyetem építész hallgatóinak kiállítása 1930"(1930), *Technika*, Vol. 11, No 7, appendix

perceivable in the exhibited works and the fact that some professors also participated in the exhibition gave further momentum to this process of renewal. We could say that an inner need for reform was already in the air.

THE ROLE OF PROFESSORS AT BTU

Some professors, first of all Professor Kotsis, admitted modern approaches to the university, albeit with compromises. So what were the most significant milestones of this reform process?

As the first step, the General Design Department was established in 1922, directed by Iván Kotsis. In reality, the status of the department became financially and institutionally consolidated only between 1926 and 1928. This delay shows the reservations that the Ministry of Religion and Education had regarding modern approaches represented by Kotsis's circle [K. Héberger 1979, 599–601.]. In the 1920s historical styles, especially Neo Baroque, were principally supported by the state and the church because the conservative political leadership was against every form of progression in the field of architecture as well as architectural education [A. Ferkai 1998, 245–46.].

From 1922 onwards, the General Design Department joined the three historic departments in teaching architectural design in lower-level classes. With this change a gradual process of disengagement from historical styles began to take place, but in reality even Kotsis' Department abandoned historic forms only from 1928 onwards [I. Kotsis 2010, 173.]. Similarly, from that same year, students could choose Kotsis as the supervisor in their more advanced classes and for their diploma project[5].

Modern approaches appeared parallelly at the three historic departments and at the Department of Drawing (in which students could design from 1929 onwards [Z. Szentkirályi 2006, 203.]), but the influence of the Modern Movement was undoubtedly the strongest in Kotsis' Department. This fact is well reflected in the material of the student exhibition of 1930 (Fig. 4). It is remarkable that not a single design submitted for that expo originated from the Middle Ages Department

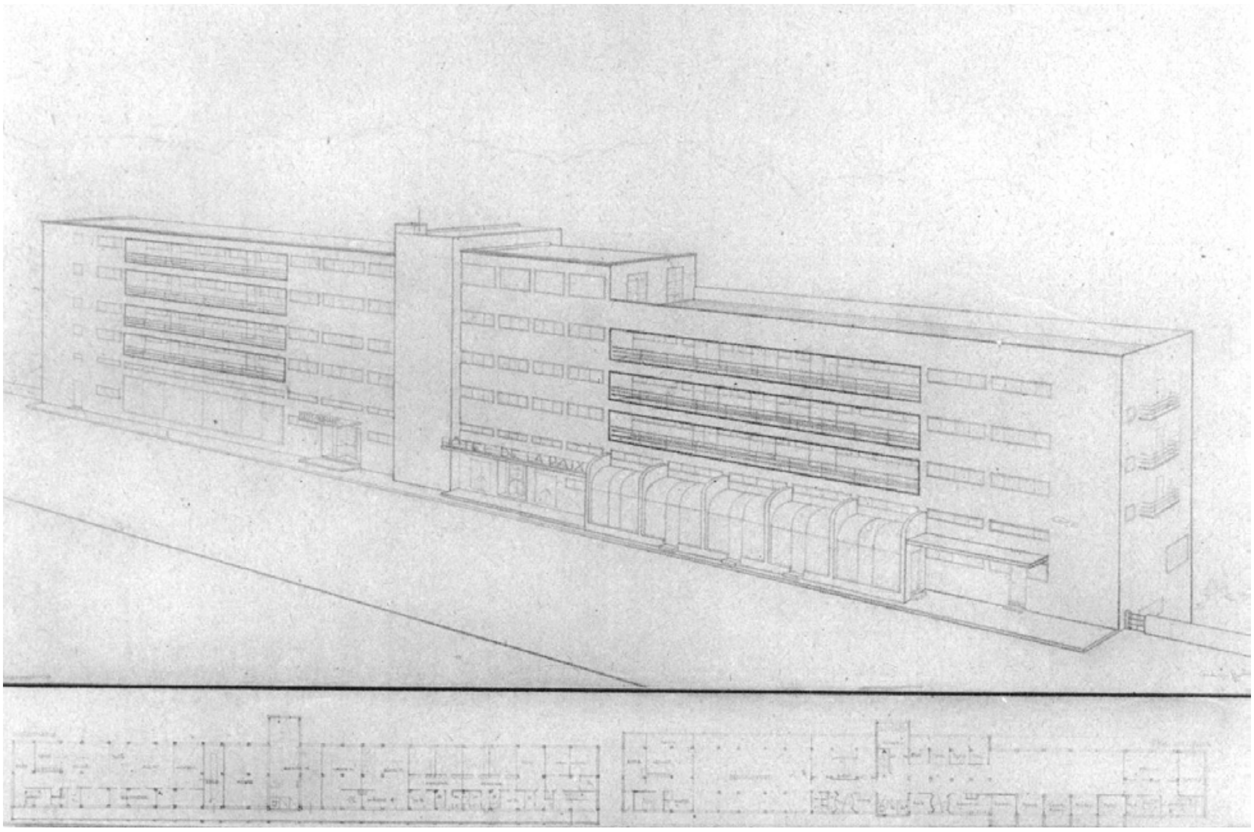


Fig. 4. Student design displayed at the Budapest Technical University in 1930. © Credit: "A Budapesti M. Kir. József Műegyetem építész hallgatóinak kiállítása 1930"(1930), *Technika*, Vol. 11, No 7, appendix

[5] Schedules of the Architecture Faculty in 1928/29. BUTE Archives http://public.omikk.bme.hu/bme_evkonyv/weblap.php?step=2&cat=orarendek&konyvtar=./orarendek/1928_29_1/&alcim_id=881

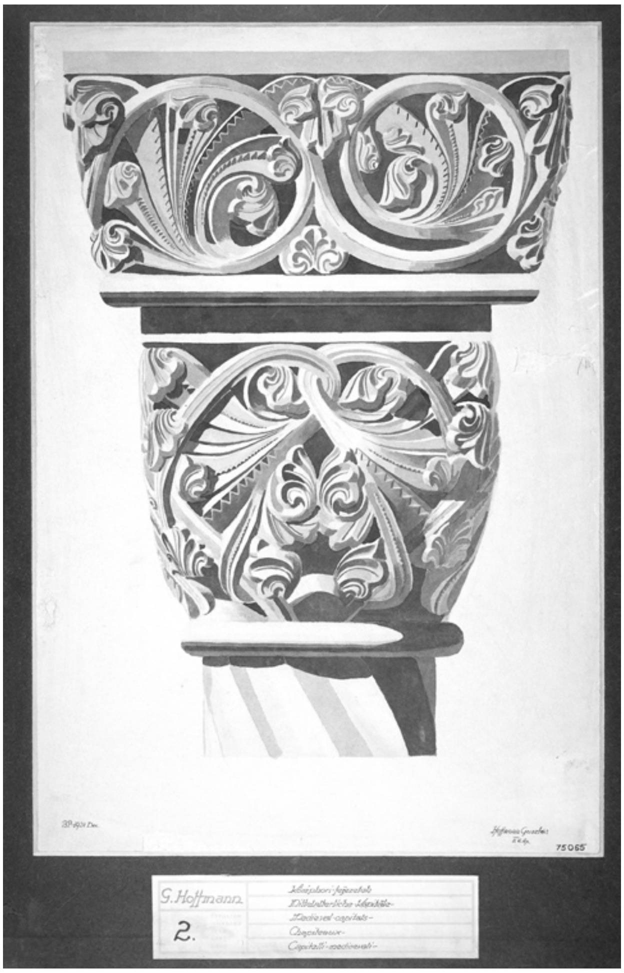


Fig. 5. Student drawing of a Medieval capital. © Credit: Plan Collection and Archives, Department of History of Architecture and Monument Preservation, BUTE, No 103 244

headed by István Möller (1860–1934). This is probably because Möller taught *Architectural design* according to the style of the Middle Ages even in 1928/29[6]. However, in another section of the exhibition in which student paintings, drawings of building constructions and depictions of historical architecture were showcased, several student drawings presented medieval building elements (Fig. 5).

The fact that drawings of historical architecture and architectural forms were also part of the exhibition in 1930 clearly shows that the professors at the Faculty, while gradually opening up to the new tendencies, continued to hold the teaching of architectural history in high esteem. The educational reform worked out in detail during the preparations for the 12th International Congress of Architects went as far as cutting back the number of historical classes and condensing those subjects into the first six semesters [Z. Szentkirályi 2006, 205–206.], but there was no willingness to eliminate them from the schedule. The most significant part of the reform was placing *Architectural design* in the centre of the curriculum from the 1931/32 academic year, introducing it into the third semester and increasing the number of lectures and practical classes[7]. Urban design and classes on industrial and agricultural architecture were also included in the curriculum thanks to the reform.

Nonetheless, this progression could still be considered conservative. Professor Kotsis himself described the educational method of his choice as follows: *"...I believe the right way is conservative progression. By 'progression' I mean satisfying the requirements of current times by the use of progressive structures in a purposeful and economical manner, while the term 'conservative' refers to the seriousness, architectural self-discipline and self-critique that we may inherit by studying the legacy of past eras. And since in my humble view, it is this approach that lays out the right direction for architectural design, the same should be adopted as a method for teaching design itself."* [I. Kotsis 1930, 195.]

Borrowing the terms applied by Iván Kotsis, the next part of the paper investigates further *progressive* and then *conservative* aspects of Hungarian architectural education around 1930.

PROGRESSIVE ASPECTS OF ARCHITECTURAL EDUCATION AT BTU

International architecture was taught by the professors with reliance on foreign professional publications and other materials. For instance Kotsis asked for large-scale reproductions of the photos of modern German architecture showcased at the exhibition of the 12th International Congress of Architects at the Kunsthalle in 1930 ["Architectura" 1930, 94–113.] and later used them as educational materials [I. Kotsis 2010, 199.] (Fig. 06). On behalf of BTU, senior lecturer Tibor Kiss (1899–1972) ordered copies of the whole plans (inclusive of construction plans and reinforced concrete plans) of *Villa Savoye* from Le Corbusier during his study trip in Paris [T. Kiss 2007, 134.].

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[6] Curriculum of the Architecture Faculty in 1928/29. BUTE Archives http://public.omikk.bme.hu/bme_evkonyv/weblap.php?step=2&cat=tanrendek&konyvtar=./tanrendek/1928_29/&alcim_id=1337

[7] 1931/32: III-IV. semester: 2 (lecture) – 6 (practice); V-VI. semester: 3 (lecture) – 10 (practice); VII-VIII. semester: 20 (practice), Schedules of the Architecture Faculty in 1931/32. BUTE Archives

[8] Minutes of the meetings of the University Board, 19. 06. 1931. BUTE Archives

Fig. 6. Photos of modern German architecture displayed at the 12th International Congress of Architects in 1930. © Credit: "Architectura", XII. nemzetközi építészkongresszus és építészi tervkiállítás (1930), Budapest, 98–99.

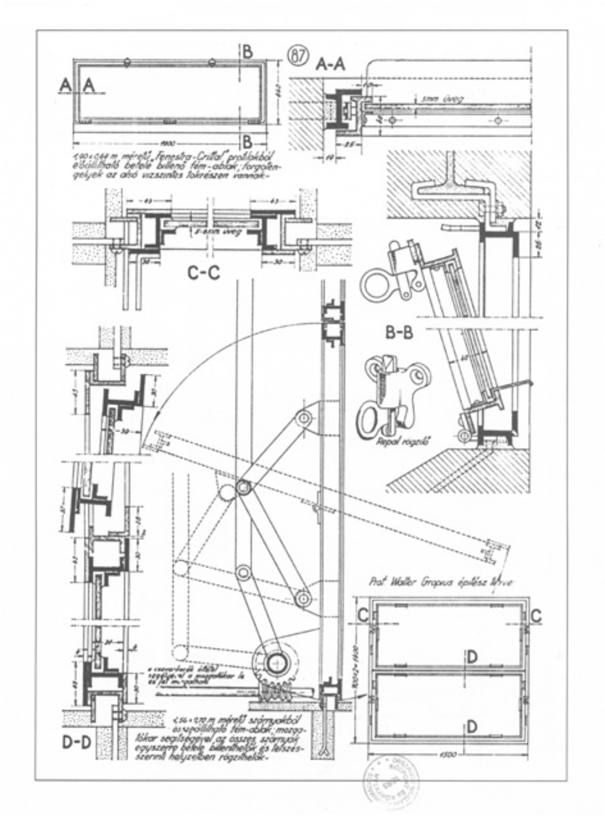

Fig. 7. Materials for the subject of *Building Constructions* taught by Professor Sándy. © Credit: Sándy, Gy. (1999), Épületszerkezettani táblák 1932, Gyorsjelentés Kiadó, (reprint), 87.

In 1930 and 1931 Professor Kotsis made suggestions to the National Board of Scholarship Programs about creating a regular scholarship program for students and teachers of architecture in order to assist them in getting acquainted with modern architecture by travelling abroad[8]. The Board was established in 1927 by the state [I. Romsics 1999, 184–187.] and offered opportunities for researchers, artists and architects to study at one of the *Collegium Hungaricums* or to make study tours abroad. Financial support provided for educational and cultural purposes was an important instrument of Hungarian politics during the interwar period, and some professors as board members could even make recommendations on who should receive grants and scholarships[9].

Furthermore, the curriculum of the Architecture Faculty also laid special emphasis on teaching engineering aspects of architecture. Apart from traditional constructions, contemporary structures were also taught at BTU. One example is Professor Gyula Sándy (1868–1953), who taught *Building constructions* and presented within the frame of this subject, among others, a type of metal window designed by Walter Gropius [Sándy, Gy. 1999, 87] (Fig. 7). Other professors, like Győző Mihailich (1877–1966) – a pioneer of reinforced concrete structures in Hungary and a lec-

[9]For example Professor Hültl was a board member in the 1930s.

Fig. 8a. Grain elevator of Csepel (1926–28, designed by Professor Mihailich and Professor Hültl) © Credit: "A M. Kir. budapesti vámmentes kikötő gabonatárháza" (1935), *Vízügyi Közlemények*, Vol. 17, No 4, 565.

Fig. 8b. Bus garage in Cházár András street, Budapest (1928–30, designed by Professor Mihailich and Professor Hültl) © Credit: Szerényi, Ö.(1930), Budapest székesfőváros autóbusz-garázsa, *Magyar Építőművészet*, Vol. 30, No 10–11. 9.

turer on *Iron and reinforced concrete constructions* at the university [G. Tassi 1984, 63–64.] – set an example by incorporating innovative solutions into their own work. Relevant structures from the investigated period include the grain elevator of Csepel (1926–28, Győző Mihailich together with Dezső Hültl) and the bus garage in Cházár András street, Budapest (1928–30, Győző Mihailich together with Dezső Hültl) (Fig. 8a; Fig. 8b).

CONSERVATIVE ASPECTS OF ARCHITECTURAL EDUCATION AT BTU

BTU professors stood up for the importance of teaching architecture and architectural forms of the past because they considered it essential for fundamental knowledge. It was believed that by such studies architects and students could find insights into eternal truths, improve their sense of proportion and last but not least, as Dezső Hültl highlighted in his welcome speech held in German at the opening of the student exhibition in 1930, these historical studies could help to preserve historic monuments in a professional way[10].

In addition to this, some professors rejected any direct copying of forms and solutions of modern architecture. Instead they called the students' attention to the need of better compliance with local circumstances, structures and materials [I. Kotsis 2010, 173–74.]. This direction was strengthened by the influence of Scandinavian and Italian architecture that became basic reference during *Architectural design* classes in the interwar period.

Dezső Hültl gave his inauguration speech as the Rector of the Technical University in 1930, a few days after the sessions of the 12th International Congress of Architects had finished. In his speech Hültl referred to the congress and especially to one of the international speakers, namely German Bestelmeyer from Munich, who claimed that modern architecture was not yet appropriate for every building type. Hültl was of the same opinion, asserting that in case of religious buildings, museums or town halls the unornamented style of modern architecture was not yet able to meet the existing representational demands. However, Hültl did not reject all aspects of new architectural directions and was convinced that modern architecture would be able to find its own forms in the future, and for this reason it would be suitable for every building type, because there was a general need for decorations [D. Hültl 1930, 155–56.]. All in all, Hültl's speech can also be considered a manifestation of *conservative progression.* It is important to notice that Hültl was the only one among the elder professors who always supported educational reforms suggested by his younger colleague Kotsis.

CONCLUSION

Architectural education at BTU was indirectly influenced by the Modern Movement and the Bauhaus, but things could have been very different.

[10] Legacy of Dezső Hültl, Hungarian Architectural Museum, No. 71.06.9.101.10

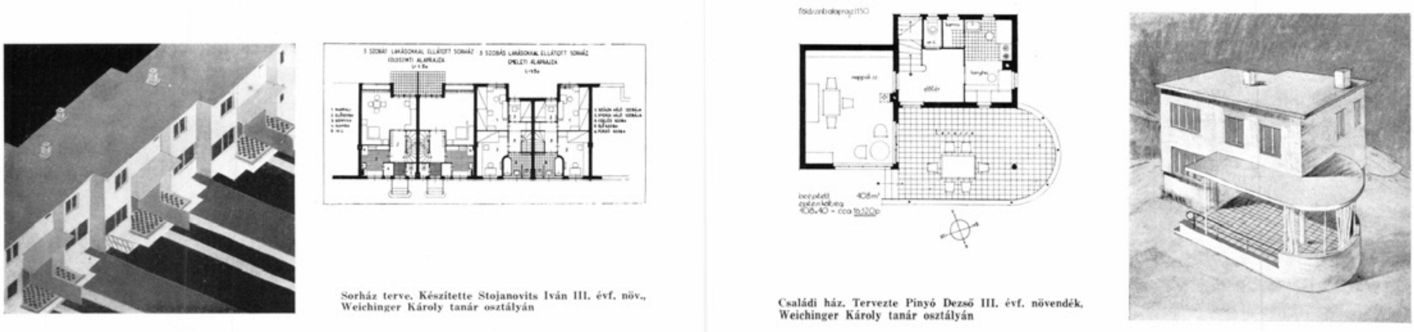

Fig. 9. Student designs at the School of Applied Arts. © Credit: Györgyi, D. (1931), Az O. M. K. Iparművészeti Iskola építészeti szakoktatása, Tér és Forma, Vol. 4, No 1, 36–37.

Almost exactly one hundred years ago, the authors of the educational reforms of 1919 wanted to establish two new General Design Departments and four further ones for Urban Design, Industrial and Agricultural Building Design, Interior Design and Art History. These departments would have been headed by architects – Móric Pogány (1878–1942), Lajos Kozma (1884–1948), Béla Málnai (1878–1941) etc. – who could have represented progressive directions of architecture at the university. The reform plan had one more significant part, which was to establish an additional, fifth art class for graduate students. Although the reform plan was confirmed in spring, at the same time as the Communist takeover of Hungary, the whole set of reform initiatives were abolished after the Republic of Councils [I. Romsics 1999, 123–131.] collapsed on the 1st August [K. Héberger 1979, 458–62.]. If those reforms had been introduced at BTU, they could have triggered more radical changes in the curriculum; it is however impossible to prove whether they would have brought more positive results.

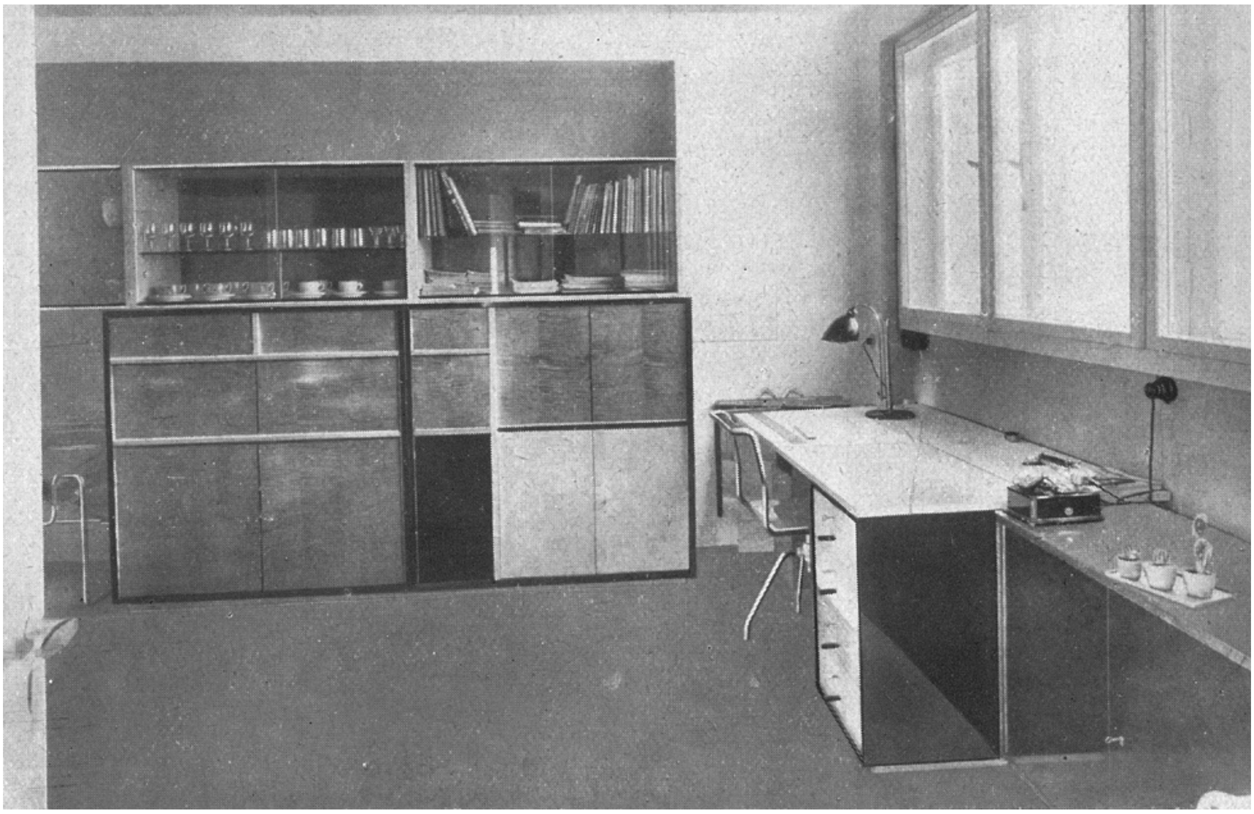

Fig. 10a. Workroom designed by Farkas Molnár. © Credit: "Architectura", XII. nemzetközi építészkongresszus és építészi tervkiállítás (1930), Budapest, 87.

Fig. 10b. Residential house designed by János Wanner. © Credit: Vándor, M. (1937), Kis családi házakról. Tér és Forma, Vol. 10, No 11, 330.

The influence of the Modern Movement and the Bauhaus was more discernible in the educational methods of the School of Applied Arts in Hungary around 1930. Here students of Furniture Design and Architectural Department received smaller design assignments early on in their education, before finally being required to design a house in its complexity, starting off with the initially designed interior architecture, and also giving consideration to the environment of the building (Fig. 9). Dénes Györgyi (1886–1961), the head of the Department, wanted to create strong connections between all the departments of the school and to place architectural thought in the centre as the basis for education in applied arts [D. Györgyi 1931, 33–44.]

When comparing the student exhibition of 1930 at the Technical University and the jubilee exhibition of the School of Applied Arts held in the same year, it can be seen that the presence of modern approaches was in fact stronger at the latter institution. However, changes and reforms made at BTU thanks to the Modern Movement during the second half of the 1920s, even if small in scale and gradual in terms of progress, were vitally important in the history of teaching architecture as well as in introducing modern approaches at the university of long historic heritage. The role of some professors was indubitable in this process of change, which indicates the existence of an inner need for progression. It was, however, progression with compromises: the concept of *conservative progression* which evolved during these years helped the teachers to deliver solid knowledge and did not hinder newly graduated architects in their attempts to find their own way or even become modernists, as did, among others, János Wanner (1906–1987) or Károly Dávid (1903–1973), who both worked at Le Corbusier's office after their studies [V. Hajdú, P. Ritoók 2010, 35.; A. Ferkai 2003, 81.] (Fig. 10a; Fig. 10b). *Conservative progression* became the basis for architectural education of the 1930s and remained prevalent even after WWII.

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BAUHAUS AND THE BEGINNING OF MASS HOUSING: HOW RESIDENTIAL OPEN BUILDING REACTS TO CHANGES IN SOCIETY

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Abstract
In current realizations and research papers, we increasingly encounter designs of flexible dwelling houses. Topics such as *Residential Open Building*, *Infill Architecture*, or *Support / Infill* are also interesting due to changing demands of a population and a long period from planning permission to the end of a building process. The hitherto neglected aspect is the origin of thinking about an apartment building as a flexible structure. The question is whether we can already find this topic in the work of the leading Bauhaus representatives.
Using the direct research method, the study of historical sources and available literature, we realized that this topic can be found in the work of the Bauhaus architects. Especially because this progressive school saw an architect's position in a broader context. Its visionary representatives predicted the rapid development of society and they responded to this by developing a new typology of apartment buildings that allowed a change.
The theme of residential open building can be found in the early 20th century especially in the European context. The work of the Bauhaus representatives was ahead of their time and began to consider the apartment building as a variable structure.

Keywords: Residential Open Building; Bauhaus; Walter Gropius; Mies van der Rohe; Adolf Rading

INTRODUCTION

In recent years, architectural studies and realizations share the theme of infill architecture/ IA, flexible housing or residential open building/ ROB. [S. Kendall 2013; Y. Vašourková 2011; J. Till, Schneider T. 2005] Flexible housing is able to adapt to the rapidly changing needs of society. Thanks to the ROB/flexible design of the house, the interior layout allows considerable variability. After some time, dispositions may change according to residents´ needs. The originally big one-room apartment for a young couple, together with a change of life situation, can become a standard disposition with several rooms for children. This idea already has a major impact on the beginning of the project. Andrea Kempe writes in his monograph that: "Houses must be flexible and they are attractive for different groups which equally increase their market value. ... The approval process of the building also records the theme of a neutral disposition." [A. Kempe, O. Thill 2004] The time from initial study to implementation is very long. Due to the complicated administration, this process takes up to 10 years in the Czechia. Thus a strictly defined house develop into a completely different economic situation at the time of the final approval. The answer to this phenomenon is a house that is not strictly defined, i.e. a house that allows for a change.

One of the most comprehensive studies about Residential Open Building is the publication of the same name by Dr. Stephen Kendall. [S. Kendall, J. Teicher 2000] The flexible apartment building theme is presented here as a progressive approach based on the experience that is appropriate for contemporary office buildings. The whole concept of prefabrication and special systems and methods are already standard in the construction of office buildings. In the second part of the book, based on case studies, there are analysed fundamental realized projects of the ROB concept from the 1960s to 1990s are analysed. The ROB / IA topic has recently received considerable attention in professional conferences and the building process. [R. Zuidema, 2015; J. Dale 2019; W. Nerdinger 2007]

The question is whether we can find the beginnings of thinking about an apartment building, which is flexible, already in the work of the Bauhaus representatives. That is, whether we can find these principles in the designs of architects at the beginning of the 20th century. Through the direct method of research, i.e. through the study of historical sources and available literature, this topic was researched at the beginning of the 20th century as a part of Bauhaus movement. The historical context and the beginning of ROB of this approach have been largely neglected to date. At the same time, historical archaeology within this theme can be a useful tool for designing apartment buildings at present.

The aim of this paper is to review the elements of ROB in the Bauhaus movement.

1. NEW WAY OF WORKING

The early 20th century Fordism allowed the transition from small-series atypical products to standardized types. Assembly line production and specialization carried out the same routine without their own inventiveness. As a result, a large number of products could be put on the market in a short time and at low cost. Industrialization has also had an impact on architecture. In civil engineering, prefabrication was emerging, which has reduced and accelerated the whole construction. For the first time the investor could buy a standardized product from the factory cheaper and without any/long waiting. Efficiency was also sought in building operations. Taylorization, i.e. rationalization of construction, was promoted by Frank B. Gillbreth, who taught masons to eliminate unnecessary work movements that caused slowness and tiredness. Efficiency was also sought in scaffolding and working tools. [F. Gillbreth, 2010]

2. NEW FAMILY

The rapid development of technology, new ways of working and accelerating transport have had a direct impact on the role of the family and the form of the family at the beginning of the 20th century. The leading figure of the Czechoslovak avant-garde Karel Teige, who lectured at Bauhaus, talks about a modern *nomad* in his book *The Smallest Apartment*. This is the person who lives everywhere but not in the apartment. We can find there also new relationships between people, i.e. couples who live without marriage, couples without

Fig. 1. From the book Bricklaying system, chapter: Training Apprentices, Picking up stock with both hands at the same time; source: Frank B. Gillbreth (1911), Bricklaying system.

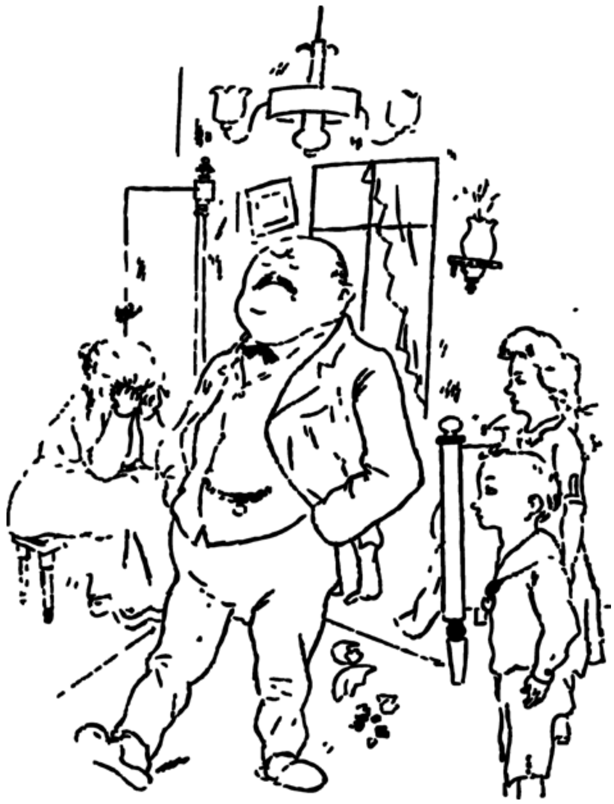

Fig. 2. George Grosz: caricature “warm of the family fireplace”; source: Karel Teige (1932), The Smallest Apartment.

children or increasing demand for temporary housing for modern nomads. There is a direct criticism of the traditional family, which is considered as the basis of the state. According to Teige, this traditional model of family is built on the enslavement of the woman.

George Grosz's caricature of the name "warmth of the family fireplace" faithfully illustrates Teige's view of the family's fate. In the middle, we see a proudly looking, well-dressed man who is the head of the family. Stepping symbolizes all the expected arrival in the apartment. In the background, sits unhappy wife and on the right side, there are two children standing to attention.

According to Teige, the family has changed in history and this model will not continue. There should be some change to a higher, new form. The housewife is also freed. A new woman, just like a man, goes to work. Compared to an earlier way of life, the apartment becomes especially a place of sleep. [K. Teige, 1932] The change in the way of work, the new relationship of people than the traditional family, is also reflected in architecture. There is a type of flexible housing, i.e. a flat that is open for a change. The collective house, where the apartment should only serve for sleeping. It was supposed to completely free the woman from housework, through the equipment of the house. Also in this period there are flats for temporary housing, for childless couples or experimental construction at world exhibitions. [H. Guzik, 2019]

3. ARCHITECT AS A SCIENTIST

Bauhaus representatives also have a different view on the profession of the architect. The main focus was on the scientific side as an important prerequisite for creation. Thus, the architect should be no longer perceived as an artist or profession that combines technical and artistic aspects. The architect should have a reliance on a scientific knowledge.

The Prague Club of Architects Publishes *Our Opinion on New Architecture*. Here, in addition to reference to the already modified analogy of industrial production, the emphasis is on the social issue of architecture, the suppression of self-serving aesthetics, the emphasis on hygiene requirements, we will find the following: "New demands must be understood scientifically: mathematically, empirically, statistically, and sociologically." (journal Stavba 1924/9) That is, the architect was not supposed to be an artist waiting for a moth, but a scientist. Hannes Mayer, former Bauhaus school director, after exile to the USSR in his unpublished theoretical text Thirteen Marxist Architecture Themes, goes further in his reflections: „Architecture is no longer an art. Building has become a science, architecture is a science of building. Building is not a matter of emotion but knowledge. - The architect is the organizer of building sciences." [F. Haas, 1983] However, this view is extreme and focuses mainly on the material, i.e. measurable, scientific needs of man. Walter Gropius continues and further develops the work of the sociologist Franz Carl Müller Layer in his book *Die Familie* (1921). In 1929, he published a text entitled *The Sociological Foundations of the Minimum Apartment for the Urban Population*. Gropius, as well as Teige, observes the changing structures of society, which will gradually reach the rise of individuals. He transforms sociological knowledge into thinking about architecture.

4. CHANGING OF THE APARTMENT BUILDING AT THE TURN OF THE 19TH AND 20TH CENTURIES

Related to the housing needs after WW 1., prefabrication and typing of the whole building began. This led to the industrialization of the whole building industry and the development of new approaches to housing. Teige said about this process: "The construction industry can create a dwelling house as an advanced industrial product - goods. The skeleton system allows floor plan variability, component typing, fast construction, dry assembly and easy transport." [K. Teige, 1932] It was the exhibition of modern living which was an excellent condition for finding new methods of construction and experimentation.

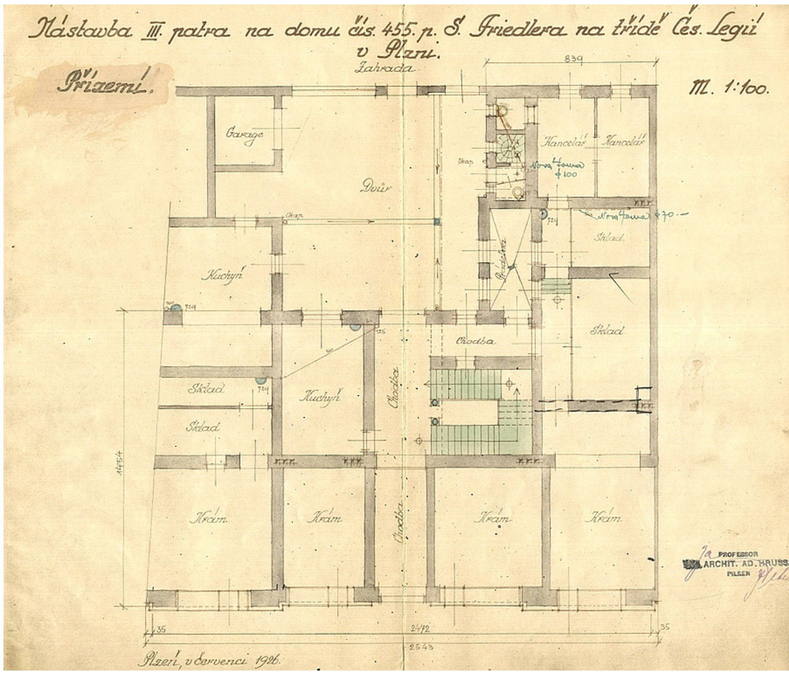

Fig. 3. Residential building no. 455 in Pilsen from the 1926; source: Pilsen Architecture Manual.

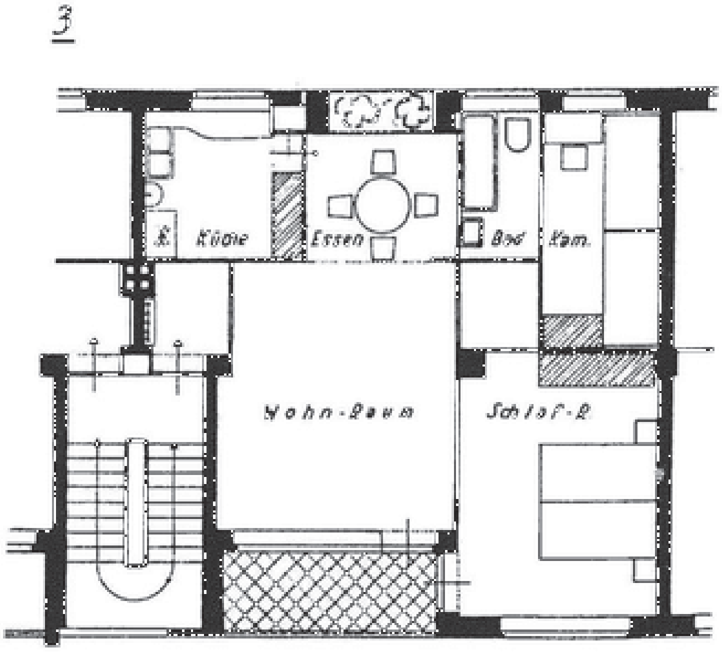

Fig. 4. Apartment in the district of Berlin-Siemensstadt by Hans Scharoun of 1929; source: Akademie-der-Kuenste-Berlin.

By comparing the standard apartment building from the late 19th century with the new apartment type, there is an obvious difference in the use of materials, the way of construction and their reflection in the form of housing production.

Historic apartment buildings often have considerable excavation work. There are large cellars. The masonry structure is characterized by a minimum of non-load bearing partitions. As a result, the floor plan makes disposition changes very difficult. Thanks to traditional truss systems, the roof can hardly be used without any radical intervention. The facade is richly decorated with stucco and with bossage. The flats have deep layout, large areas often without direct access to the terrace or balcony. The main building material is brick, wood and stone.

The aim of prefabrication was to reduce construction costs. Walter Gropius developed this idea in his industrialization program in construction in 1910.

Demanding excavation work and large cellars were not implemented in new types of apartment buildings. The skeleton construction allows a completely free floor plan. The internal partitions are non-loadbearing and therefore completely variable. The roof is flat. It allows to use it as a garden with a sun bath. The facade is free of costly stucco. Thus, the aesthetic effect is worked through a smooth facade. Great emphasis was placed on sunny apartments. New typological species were developed: apartments for childless couples, temporary accommodation, collective housing. Apartments had also balconies, terraces or loggias very often. From the apartment there was a direct access to the exterior. The main building material was concrete, steel or reinforced concrete.

5. STUTTGART – WEISSENHOF

In 1919, Mies van der Rohe became a member of the Novembergruppe. This organization promoted modern art and organizes exhibitions. As a result, Mies could expose his unrealized projects and became well known. As a vice-chairman of the Deutscher Werkbund (Association of German Works), he organized the construction of the Weissenhof housing estate in Stuttgart in 1927.

Housing exhibitions represented the progress of housing culture and the possibility of free experimentation in residential buildings. Housing exhibitions in the form of whole residential houses were a novelty of the post-war era. Thus, in the construction industry, which were in the 19th century the world exhibitions in London and Paris for the machinery industry. The fact that the housing exhibitions did not represent just floor plans or mock-ups, but real, fully furnished buildings adapted to housing, was also a turning point.

The first major exhibition and major manifestation of modern architecture, which meant housing reform, was the Wekbund exhibition “Die Wohnung” with the Wiessenhofsiedlung colony. At the time when modern architecture was rather theoretical, this exhibition had a major impact and international character.

Mies van der Rohe, who was also the author of the urban plan, invited international architects of “international” style to cooperate. The industrialization of construction was already planned. Mies van der Rohe himself created a three-storey house 1-4 with 24 apartments. The concept creates a variable housing layout. Throughout the house, the advantage of the skeletal structure is applied to the maximum. The floor plan is completely free. Only the communication core and hardware is fixed for installations. The rest is completely free. Partitions are non-load-bearing, lightweight and easy to move. Partitions are made of wood, plywood, transparent or opaque colored glass. [K. Teige, 1932] To emphasize this manifestation of the new open building, Mies invited other designers/ architects for designing interior with inner walls. Each apartment can be quite different in layout. What remains is the installation and communication core. For example Lilly Reich and Franz Schuster participated in the layout of the apartments. [Ch. Simon, 2002]

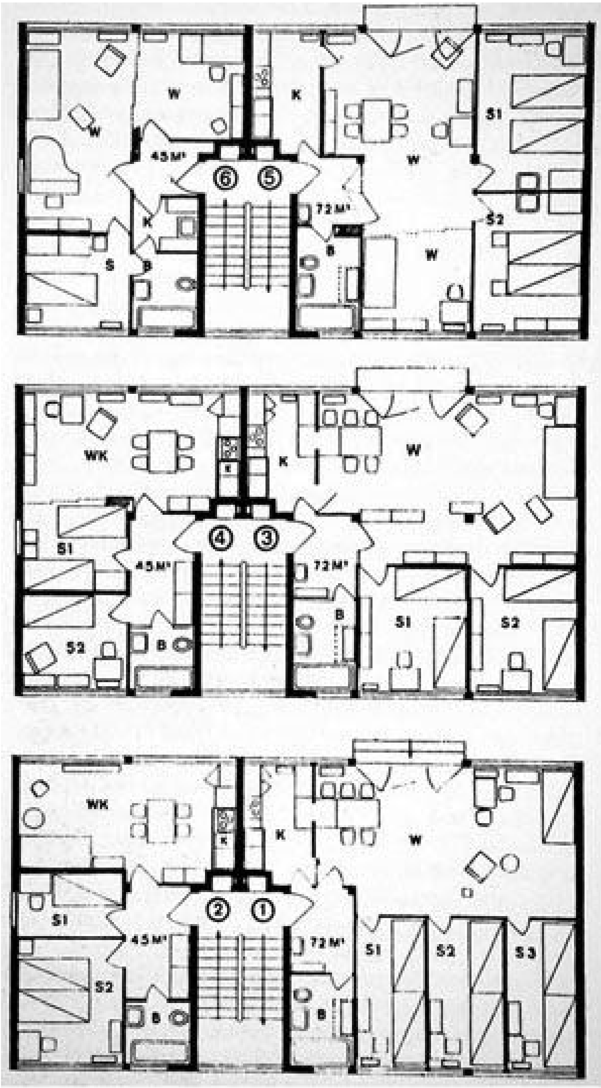

Fig. 5. Open apartment in house 1-4, designed by Mies van der Rohe, Wiessenhofsiedlung colony; source: MoMA New York.

6. BRESLAU – WUWA

Werkbund continued the experiments with the Wohnung und Werkraum exhibition in Wroclaw. The exhibition also included the building of houses in the Grüneiche district. Compared to Weissenhof, there is no longer such an international representation and new ideas of housing designs. The focus is on the small apartment *Kleinstwohnung*. Thanks to the heating of the whole settlement via heating plants, the houses do not have chimneys with soot smoke.

Rental houses connected with a staircase, designed by Adolf Rading, is another example of an open residential building. It is a five-storey apartment building. On a typical floor there are 8 apartments. Thanks to the sophisticated interconnection of houses there are savings on the communal core. The flats with a floor area of sixty meters are a skeleton in a 4x3.5m grid. The internal partitions are non-load-bearing and sliding. The layout of the apartment follows the apartment building from Mies. This variability is also demonstrated in Rading's proposal. Everyone has a unique apartment here. Rading thus illustrates the possibility of using it both for families with children and for childless couples or singles. All apartments have a loggia and are sunny. [B. Störtkuhl, J. Ilkosz, 2019]

7. BAUHAUS AND CZECHOSLOVAKIA

Architect Jan Gillar, born in 1904, studied architecture with Prof. Gočár at the Prague Academy. With his friend Karel Teige, he participated in Devětsil events, a left-wing art association. They also attended the Bauhaus School together. Gillar is the author of the French Schools in Prague 6. It is clearly possible to see Bauhaus's inspiration here. There was also an emphasis on maximum sun exposure without shadows being cast in the room. As a result, the arrangement of the desks could be variable. Another example of Gillar's work is the apartment buildings in Družstevní Ochoz street. It is also a skeletal structure of five-storey houses. Houses form a prototype of a functionalist response to the classic block. The houses are not closed, on the contrary they are open to the surroundings and each flat can be flexible in its layout. [Šlapeta V., 1998]

Several Czechs also studied at the Bauhaus. Unfortunately, none of them succeeded in the field of architecture. At the time of returning from the Bauhaus school, the economic crisis culminated, after which World War II came, and the Communist regime was not favourable to these free ideas of new architecture.

8. EMIGRATION

Even though Mies van der Rohe tried to compromise, in 1936, he was insulted sharply by one of the New Germany ideologues in one of the exhibition installations. Subsequently, he accepted an invitation to the United States and became the Dean of the Illinois Institute of Technology (IIT) and built the campus. Walter Gropius, later a professor at Harvard University, and Marcel Breuer, also immigrated to the United States.

Also the world-famous exhibition with the Wiessenhofsiedlung was not well received by the Nazis. So they liked to take the name Wiesenhof as a "Moroccan village", which Hermann Muthesius commented with refusal. [F. Haas, 1983] In emigration, Mies had the opportunity to devote himself to developing the idea of open housing as part of the 849-880 Lake Shore Drive Apartments project of 1949. These are two high-rise

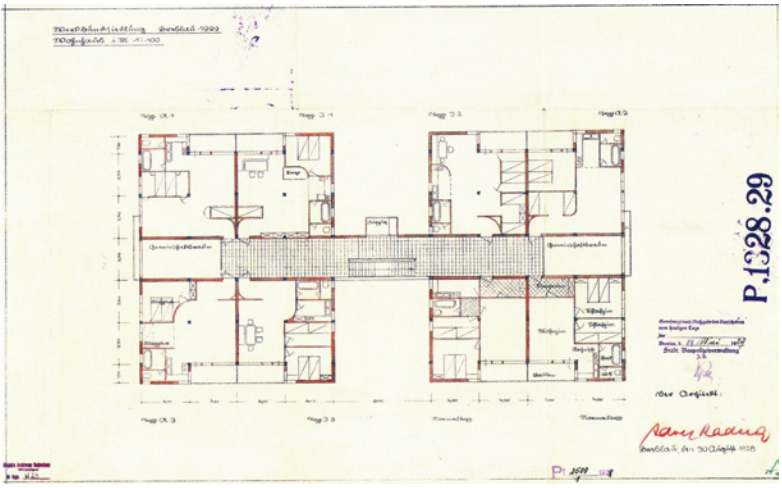

Fig. 6. House #7, designed by Adolf Rading, Wohnung und Werkraum exhibition; source: Adolf Rading in Breslau. Neues Bauen in der Weimarer Republik (2019).

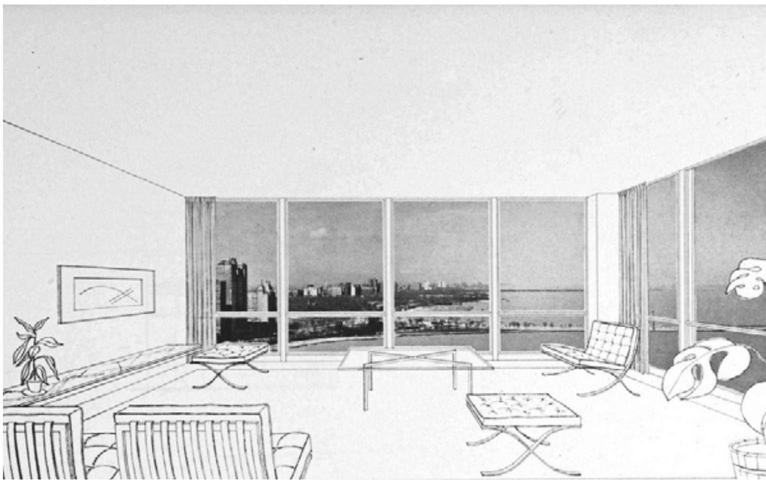

Fig. 8. Lake Shore Drive Apartment- interior, designed by Mies van der Rohe; source: Sales brochure, 860-880 lake shore drive, MoMA, New York.

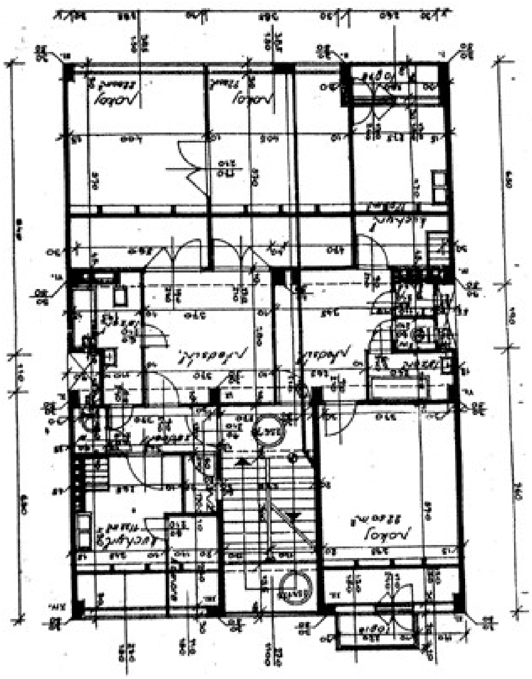

Fig. 7. Plan of apartment buildings in Družstevní Ochoz street, designed by Jan Gillar; source: Praha: Architektura XX. století (1998).

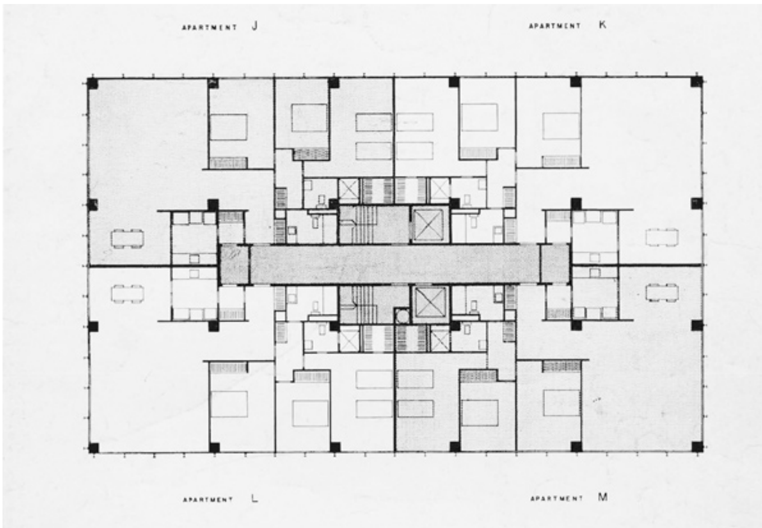

Fig. 9. Lake Shore Drive Apartments project – flexible plan, designed by Mies van der Rohe; source: Sales brochure, 860-880 lake shore drive, MoMA, New York.

apartment buildings in Chicago. First, the access floor is maximally open to the surroundings. Likewise, the apartments present the views of Lake Michigan as a painting.

Thanks to the layout of the communication core and the hygienic facilities around the staircase, the apartment can be easily changed in layout to combine rooms and a large living space. So Mies designed a Three-Bedroom Apartment (Typical apartment with enclosed kitchen), Two Bedroom Apartment (Living room and master bedroom), One bedroom plus Living room, Kitchen open to living and dining room) or Open Apartment (apartment is open, space is organized by furniture placement and partial height cabinets), each with the same square meters in one flat.

DISCUSSION, CONCLUSION

The beginnings of thinking about changing mass housing go back to the Bauhaus period. The radical transformation of society is characteristic of the first half of the 20th century. The beginnings of prefabrication, Fordism, new building materials like glass, concrete and steel, and the “liberation” of the housewife naturally implied completely new architectural concepts. The progressive environment of the Bauhaus school has generated creative answers to these rapid changes. The new way of working and the new structure of society, which was not just based on around the traditional family, was a challenge for mass housing concepts. In the works of prominent Bauhaus representatives such as Walter Gropius, Hanz Scharoun, Hanz Mayer, Mies van der Rohe or Adolf Rading, we find completely new approaches to mass housing at that time. Moreover, these are concepts that work with the theme of a collective house, i.e. a home where private and public activities blend, or just houses that their owners can customize. This is done with the help of sliding partitions or a completely free floor plan, where the interior partitions are intentionally non-load bearing. Even though the topic of open housing is now considered a new concept, the first experimental houses of the concept can be found a hundred years ago. An interesting piece of knowledge or continuation of this work could be proven in time; whether the flexibility that is a part of the DNA of these apartment buildings will be applied in the practice of its inhabitants.

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THE HERITAGE OF BAUHAUS AND THE CONCEPT OF HEALTH-AFFIRMING EVERYDAY PLACES

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Abstract
This paper discusses how the concept of health affirming places, which influence physical, mental and spiritual healing, is rooted in the original Bauhaus philosophy. The main aim of Bauhaus was to unite all forms of creative arts to shape a human-friendly environment. The Bauhaus architecture is the architecture of everyday esthetics, humble, mindful and sensitive. Its user would enjoy well-defined details and high quality of materials. Social engagement and integration with other disciplines of art were the foundation for the Bauhaus philosophy. The original Bauhaus goal was to create art which then shapes people. Today it is important to bring this approach back because modern architecture lost this focus over time and is often met with social disapproval. This criticism spurred research and inspired numerous studies on what makes a human-friendly environment. Many studies proved the importance of ecology and everyday contact with nature. It was also demonstrated that beauty, understood as aesthetically pleasing built environments, are invaluable. It is important to revive the original Bauhaus philosophy to create health-affirming places. An example of contemporary residential architecture is presented at the end of this paper.

Keywords: health affirming landscapes; everyday esthetics; humble architecture

INTRODUCTION

The concept of health affirming landscapes is being slowly incorporated into architectural and urban design. Urban health-affirming landscapes are understood as *"everyday places which unite the qualities of therapeutic landscapes to influence people's physical, mental and spiritual healing"* (M. Trojanowska and A. Sas-Bojarska 2018). That definition derives from the definition of therapeutic landscapes coined by Wilbert Gesler defying them as *"physical and built environments, social conditions and human perceptions combine to produce an atmosphere which is conducive to healing"* (2003).

This paper discusses how the modern concept of health-affirming places is rooted in the original Bauhaus philosophy. This study's objective was to explain the link between Eduard Francois – Flower tower in Paris and the Bauhaus heritage. The methodology consisted of literature studies as well as comparative analyses of selected building forms.

1. THE PHILOSOPHY OF BAUHAUS AND NATURE

Bauhaus was a new way of thinking which proclaimed no antagonism between architecture and its natural settings. The environmental concern was important to the Bauhaus movement from the beginnings. According to the Bauhaus philosophy architecture and nature could achieve perfect harmony. Bauhaus buildings were planned to be shaped with exterior spaces. Modernism glass façades provided an unobstructed view of the outside world. One underlying idea of the Bauhaus was the unity of interior spaces and exterior surroundings. The Bauhaus motto of "air, light, sun" was integrated into the architecture. The concern to provide a nice, heartwarming view of nature through a window that is crucial for health-affirming landscapes, and which the sustainable architecture is striving for today, originates from the Bauhaus philosophy.

Although landscape architecture was not the subjects taught at Bauhaus, there were Bauhaus architects who also conceived and planned the exterior spaces around their buildings. One of them was Mies van der Rohe. The novelty of the Bauhaus landscape was accentuating the existing terrain with mounds and recesses, hedges and walls, as well as opening perspective views to create long vistas. The minimalist architecture of Mies van der Rohe required the vivid accompaniment of lush greenery to create the final effect. (fig. 1)

1.1. Bauhaus and Biophilia

Today we go back to that philosophy and add the hypothesis of biophilia. Biophilia suggests that humans have an innate tendency to affiliate with other forms of life [Wilson 1995:p.416]. The Biophilic city is designed to facilitate everyday contact with nature. Back in the 1940's Laszlo Moholy Nagy pursued the *"happy and organic cities of which inhabitants have the experience of being amidst gardens and vegetation daily, not on their weekend trips only."* [P. Anker 2005, p.245]. This proves that the original Bauhaus and biophilic design movements form a common ground for designers. The biophilic design is one of the fundamentals for health-affirming landscapes.

Walter Gropius wrote that he wanted the commemorative tree supposed to bear his name *"to be a tree in which birds of many colors and shapes can sit and feel sustained"* [W. Gropius 1956, p.11]. He wanted to include every vital component of life in architecture. The house which he designed for his family when arriving in the US is a good example of striving to blend architecture harmoniously into the surrounding landscape. Every aspect of the house and its surrounding landscape was planned for maximum efficiency and simplicity. The house was conceived as part of the New England organic landscape. Gropius utilized the connection between the indoor and outdoor spaces to accentuate a relationship between the structure and the site. He used a rise and stone retaining walls to sit the house. Gropius was able to retain a broad view of the south, east, and west. He created a lawn around the entire house and transplanted mature trees from the neighboring forest. Walter Gropius wanted a fusion between the vernacular architectural tradition of New England (wood, brick, and stone) and contemporary industrial materials (glass block, welded steel, etc.) [W. Gropius 1956]. His attempts to harmoniously blend his design into traditional farmhouse aesthetics truly depicts the original philosophy of Bauhaus. His architecture seems hidden in the background to let the mature trees play the first role (fig. 2).

The Bauhaus philosophy led to the construction of everyday buildings that blend into the urban environment to form a background of human life. The Bauhaus architecture was a background architecture. The ornaments were truthful and grew out of construction or formal necessity. The Bauhaus architecture is humble, even if it experimented with new materials and technical possibilities. *Form Follow function* approach led to peaceful, elegant forms of unostentatious architecture deprived of any unnecessary decorations. This architecture is sensitive to the needs of the user, not a monument to the designer. The Bauhaus movement put people first and the design was crafted to make the human environment more viable.

2. LOST FOCUS AND REMEDIES

Nowadays it is important to bring this approach back because modern architecture has gradually lost this environmentally-based focus and it is often met with social disapproval.

What was lost was the biophilic connection between the building and the surrounding nature. The Bauhaus buildings were designed as a geometrical background for complex forms of nature, e.g. plants, boulders and other forms of the natural landscape. When deprived of that connection with the complexity of details found in nature, Bauhaus buildings are losing the biophilic qualities of health-affirming places.

Moreover, Bauhaus offered well-defined details and a high quality of materials. However, some later modernist buildings were of inferior quality when it came to materials and construction methods.

One of the major criticisms comes because modernist buildings follow the same geometrical principles regardless of regional context. Therefore, the internationalization of the modernist movement led to the globalization of forms and materials. The flat roofs were not suited for some of the climates, neither were glass nor steel curtain walls. That criticism led to a new movement called the critical regionalism. It combines the original Bauhaus philosophy with attention to regional constraints and possibilities. Traditional, available in situ materials are used, architectural forms are designed to blend with the environment. The local vernacular tradition serves as inspiration.

Fig. 1. Mies van der Rohe, Barcelona Pavillion (1929), The simplicity of architectural forms cedes the spotlight to nature. source:https://www.flickr.com/photos/naotakem/31291292254, retrived on 18.12.2019

Fig. 2. Walter Gropius House, Lincoln, Massachusetts (1938), Garden View, source: https://www.flickr.com/photos/newmundane/6668094003/, retrived on 18.12.2019

2.1. The revival of Integrated Design

The philosophy of Bauhaus was based on the cooperation of different crafts and artistic fields to create a human-friendly environment. This movement expressed anxieties about the soullessness of contemporary manufacturing. The machine-made objects no longer conveyed the artistic expression. The Bauhaus movement tried to revive the spirit of craftsmanship and combine it with serial production. They believed that it is possible to create art which then shapes people.

Today sustainable architecture requires Integrated Design – a comprehensive, holistic approach that unites all design branches together with prospective users to find the best possible and environmentally friendly solution. We can trace the beginning of this approach back to the Bauhaus school where all were working together to bring the integration of art disciplines. This method of education put stress on experiment and problem-solving which characterized the Bauhaus's approach and characterize Integrated Design today as well. The social engagement which was so important during the Bauhaus era comes back into the spotlight today. The creation of health-affirming landscapes stipulates the Integrated Design approach. There are many interesting examples around the world. One of them was chosen as a case study – the Flower Tower in Paris, designed by Eduard Francois.

2.2. Case study. Eduard Francois – Flower Tower

This building is located in Paris, XVII district, 23 rue Albert Roussel. It is a block of social flats. Therefore the budget must have been tight. The solution is as simple as ingenious. The flower containers put around the balconies to create a vertical urban garden. The building form is simple and left with the concrete finish, without any form of ornament. The articulation of the façade was created using the rhythm of giant precast concrete containers planted with bamboo. Bamboo is well known for its rapid growth and resistance, therefore it was chosen to quickly cover the façade with greenery. The irrigation dripping lines are supplied with rainwater. As bamboo grows the building gradually disappears behind the green façade. Moreover, the vegetation acts as a barrier to noise and a diffuser of light, preventing the façade from overheating. Additionally, it provides a gentle, rustling sound when touched by the wind blows and a bit of privacy to inhabitants. The tower is located next to an urban pocket park and acts as the vertical continuation of its greenery. The containers were put on three well-lit sides. The north façade is left in the concrete finish to look as if it was still waiting for its cladding or stucco finishing layer.

This façade is an example of biophilic design, where the plants which grow on balconies make a liv-

Fig. 3. Isokon (Lawn Road) Flats (1933) designed by Wells Coats, source: (right) https://www.flickr.com/photos/stevecadman/527667713, (left) https://www.flickr.com/photos/rogersg/15907268506, retrived on 18.12.2019

Fig. 4. Flower Tower, Paris - façade details, architect: Eduard Francois; photo: by the author

ing wall. The link between the exterior world and the interiors of dwellings is facilitating everyday contact with nature. A view through a window on bamboo growing in containers can be soothing especially if opposed to a view of stucco wall without any details. The view of the green façade may be attractive also to those living in neighboring residential blocks.

The building form is rooted in the Bauhaus legacy. The architectural analysis of the façade leads to a comparison to sculptural forms of the Isokon building in London (fig. 3). The rhythm of the balconies of Isokon was soothed in Flower Tower with the use of flower containers, but the main architectural concept bears resemblances (fig. 4-6).

Fig. 5. Flower Tower, Paris, architect: Eduard Francois. Façade details; photo: by the author

CONCLUSIONS

This criticism of modern architecture spurred research and inspired numerous studies on what makes a human-friendly environment. Many studies proved the importance of ecology and everyday contact with nature. The concept of Biophilia is gaining popularity, along with the growing legacy of Bauhaus buildings around the globe. However, the simplicity of forms attributed to the Bauhaus legacy should not overshadow the original concept of the unity of all arts and nature to create a perfect composition. The example of Flower Tower in Paris demonstrated how architecture can be hidden to direct the attention to the beauty of living nature (fig. 4-6), in the same way as original Bauhaus buildings worked. The humble architecture was the

Fig. 6. Flower Tower, Paris, architect: Eduard Francois. View from the street; photo: by the author

background to lush greenery to create a truly impressive union of art and nature of biophilic design to create the health-affirming places (fig 1-2).

The Bauhaus spirit was all crafts and design disciplines working together to create one - unobtrusive, but aesthetically pleasing form, which blended with its environment. Therefore it is important to revive the original Bauhaus philosophy to create the health-affirming places. We need not only contact with nature, but also beauty understood as aesthetically pleasing and intricate build environment. It is worthy to go to the roots of the Bauhaus movement and combine it with today's knowledge, continue studying and implementing its principles of humble, background architecture which facilitate everyday contact with nature.

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EKOLOGICZNY KAMPUS UNIWERSYTETEM PRZYSZŁOŚCI

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ECOLOGICAL CAMPUS – UNIVERSITY OF THE FUTURE

Abstract
Since the first school, similar to modern universities, were established, we have seen a steady increase in the importance of higher education. To meet the ever-increasing demands, universities make many changes in search of optimal solutions. It is important to think about the future not only in the context of how, but also in what buildings the university of the future will function. Because universities have a real impact on the condition and quality of human capital and can stimulate urban development, they should be supported at every stage and in every aspect of their activity.
Constantly deteriorating condition of the natural environment and the growing need for human contact with nature, directly affects the increasing use of ecological solutions. Some cities decide on more or less innovative methods and projects, e.g. the Swedish Hammarby Sjöstad estate, or the eco cities - Masdar City in Abu Dhabi and Logroño Montecorvo in Spain. The concept of green architecture should cover not only the residential function but also public facilities, including academic campuses. For the proper functioning of the university, in addition to the didactic base, the urban and architectural context are important. Campuses of prosperous universities have "community-creating" possibilities - they influence the identification with the place and creation of micro-community of students and researchers. The sense of belonging to society has a positive effect on the results of work and the image of the university and the region. The concept of connecting the city and universities is visible, for example, in the American strategy COL (City of Learning), which assumes their close cooperation.
So what will the university of the future look like? The answer to this question should be sought in the reports being developed (the Arup group), designs for new buildings and adaptations of existing academic facilities. Both European and Polish universities more and more often decide to change the status quo and take actions to adapt to new didactic, technological and ecological requirements. The article uses literature and existing examples of projects of urban objects and complexes, which implement the principles of sustainable development.

Streszczenie
Odkąd powstały pierwsze szkoły przypominające współczesne uniwersytety, obserwujemy stały wzrost znaczenia szkolnictwa wyższego. Uczelnie, aby sprostać ciągle rosnącym wymaganiom, dokonują wielu zmian w poszukiwaniu optymalnych rozwiązań funkcjonowania. Ważne jest myślenie o przyszłości nie tylko w kontekście tego w jaki sposób, ale także w jakich obiektach będzie funkcjonował uniwersytet przyszłości. Ponieważ szkoły wyższe mają realny wpływ na stan i jakość kapitału ludzkiego oraz mogą stymulować rozwój miast, powinny być wspierane na każdym etapie i w każdym aspekcie działalności.
Stale pogarszający się stan środowiska naturalnego oraz rosnąca potrzeba kontaktu człowieka z naturą wpływają bezpośrednio na coraz powszechniejsze stosowanie rozwiązań ekologicznych. Część miast decyduje się na mniej lub bardziej nowatorskie metody i projekty, np. szwedzkie osiedle Hammarby Sjöstad czy eko miasta – Masdar City w Abu Dhabi i Logroño Montecorvo w Hiszpanii. Koncepcja zielonej architektury powinna obejmować nie tylko funkcję mieszkaniową, ale także obiekty użyteczności publicznej, w tym budynki akademickie. Dla prawidłowego funkcjonowania uczelni, oprócz bazy dydaktycznej, istotny jest kontekst urbanistyczny oraz architektoniczny. Kampusy dobrze prosperujących szkół wyższych posiadają właściwości „wspólnototwórcze" – wpływają na utożsamianie się z miejscem i tworzeniem mikrospołeczności studentów i pracowników naukowych. Poczucie przynależności do społeczeństwa wpływa pozytywnie na wyniki pracy oraz wizerunek uczelni i regionu. Koncepcja połączenia miasta i szkół wyższych widoczna jest np. w amerykańskiej strategii COL (City of Learning), która zakłada ich ścisłą współpracę.

Jak zatem będzie wyglądać uniwersytet przyszłości? Odpowiedzi na to pytanie należy szukać w opracowywanych raportach (grupa Arup), projektach nowych budynków oraz adaptacjach już istniejących obiektów akademickich. Zarówno europejskie, jak i polskie uczelnie coraz częściej postanawiają zmienić *status quo* i podejmują działania mające na celu dostosowanie się do nowych wymagań dydaktycznych, technologicznych i ekologicznych. W pracy wykorzystano literaturę przedmiotu oraz istniejące przykłady projektów obiektów i zespołów urbanistycznych, realizujące zasady zrównoważonego rozwoju.

Keywords: ecology; campus; higher education; university; university of the future

Słowa kluczowe: ekologia; kampus; szkolnictwo wyższe; uniwersytet; uniwersytet przyszłości

WPROWADZENIE

Odkąd w czasach starożytnych powstały pierwsze szkoły przypominające współczesne uniwersytety, obserwujemy stały wzrost znaczenia szkolnictwa wyższego. Uczelnie od zawsze kojarzą się z dostatkiem i postępem cywilizacji oraz cieszą się szacunkiem i zaufaniem społeczeństwa. Dzięki swojej funkcji naukowo-dydaktycznej mają znaczący wpływ na rozwój miast i regionów. Instytucje akademickie od wieków są jednym z fundamentów społeczeństwa i jego rozwoju w zakresie wielu dziedzin. Dlatego aby sprostać rosnącym wymaganiom i by dostosować się do szybko rozwijającego się świata, uniwersytety przechodzą ciągłe zmiany, szukając złotego środka pomiędzy tradycją a nowoczesnością.

Uczelnie ze względu na ich rolę i różnorodność prowadzonych dyscyplin naukowych zalicza się do instytucji społecznych. W związku z tym w wielu przypadkach społeczność akademicka ma możliwość decydowania i inicjowania zmian w sposobie kształcenia i wychowania. Zmiana stylu i tempa życia, podejścia do studiowania, a także gwałtowny rozwój technologii informacyjnych sprawiają, że przygotowanie studentów do pracy zawodowej staje się wyzwaniem. Jakość kształcenia wyższego powinna być stale podnoszona i dostosowywana zarówno do oczekiwań rynku pracy, jak i studentów [J. Boguski 2009, s. 29]. Szczególnie ważne stają się kontakty z przyszłymi pracodawcami i współpracownikami oraz skupienie się na rozwoju umiejętności, które pozwolą na szybsze wdrożenie się w pracę na konkretnym stanowisku. Światowe Forum Ekonomiczne szacuje, że 65% dzieci chodzących dziś do szkoły podstawowej będzie pracować w zawodach, które jeszcze nie istnieją [E. Magnini i inni 2018, s. 9]. Ten fakt pokazuje, jak ważne jest myślenie nie tylko o tym jak, ale przede wszystkim w jakiej infrastrukturze będzie funkcjonował uniwersytet przyszłości. Aby zapewnić dostateczną jakość nauczania, współcześni architekci muszą przewidywać i próbować sprostać wymaganiom, które obecni uczniowie, a przyszli studenci, postawią im dopiero za 10-15 lat.

Większość miast w Polsce broni się przed tworzeniem kampusów uniwersyteckich. Głównie z powodów finansowych, wolą implementować funkcje akademickie w istniejące i łatwo dostępne budynki. Nowoczesny uniwersytet potrzebuje jednak czegoś więcej niż tradycyjnych auli czy sal laboratoryjnych.

W artykule starano się przedstawić korzyści wynikające z organizowania uczelni w kampusy bądź osiedla akademickie. Zostały przytoczone i krótko omówione przykłady budynków i kampusów projektowanych na zasadach zrównoważonego rozwoju. Przedstawiono wizje rozwoju i oczekiwania architektów oraz studentów dotyczące uniwersytetu przyszłości.

1. URBANISTYKA UCZELNI WYŻSZYCH

Czy sposób lokalizowania budynków akademickich w mieście ma wpływ na jakość uczelni i środowisko akademickie?

W wielu polskich miastach szkoły wyższe są jednym z elementów przyczyniających się do polepszenia jakości życia i atrakcyjności miasta. Współdziałanie uczelni i społeczeństwa w oczywisty sposób rozwija i promuje cały region. W takich przypadkach szczególnie ważne jest tworzenie prężnie działających ośrodków akademickich, które przyciągną studentów oraz pracowników dydaktycznych z kraju oraz zagranicy. Zapewniając swym absolwentom wykształcenie, szkoły wyższe mają bezpośredni wpływ na wielkość i jakość kapitału ludzkiego oraz poziom życia [K. Denek 2013, str. 8]. Dla prawidłowego funkcjonowania uczelni, oprócz bazy dydaktycznej, istotny jest zarówno kontekst urbanistyczny jak i architektoniczny, w którym odbywają się nauka i praca.

Uczelnie niejednokrotnie zajmują znaczną powierzchnię miasta, chociaż w wielu przypadkach zarówno społeczeństwo, jak i środowisko akademickie nie zdają sobie z tego sprawy. Wszystko za sprawą niekontrolowanego rozproszenia obiektów w tkance miasta. Głównymi przyczynami takiego stanu są: aspekt finansowy oraz łatwość dostępu do już istniejących obiektów, które szybko można dostosować do potrzeb dydaktycznych. Rozproszone budynki przysparzają problemów zarówno społeczności akademickiej, jak i miastu. Wiele uczelni wyższych nie może w pełni wykorzystać swoich możliwości oraz potencjału, ponieważ odległości pomiędzy poszczególnymi obiektami są na tyle duże, że zawiązanie międzywydziałowej współpracy jest utrudnione. Studenci, a także pracownicy, wybierając przyszłą szkołę kierują się przede wszystkim jakością kształcenia oraz możliwościami rozwoju. Nie bez znaczenia pozostają także „klimat" i działalność społeczności akademickiej oraz dodatkowe zajęcia, w które można się zaangażować. Brak spójnej wizji ośrodka akademickiego ma negatywny wpływ na zainteresowanie daną uczelnią oraz jej pozycję w krajowych rankingach. Mimo tego w Polsce niechętnie organizuje się obiekty uczelniane w kampusy czy osiedla akademickie. Takie wydzielone z miasta tereny, w obrębie których zlokalizowane są budynki wydziałowe, administracyjne oraz funkcje uzupełniające, doskonale sprawdzają się w wielu europejskich miastach, np. Heriot-Wyatt University (miasteczko akademickie) w Edynburgu, kampus uniwersytetu w Birmingham czy kampus Uniwersytetu Christiana Albrechta w Kilonii. Takie założenia często lokalizowane są na przedmieściach miast lub jako funkcja wtórna na rewitalizowanych terenach poprzemysłowych czy powojskowych.

Kampusy dobrze prosperujących szkół wyższych posiadają właściwości „wspólnototwórcze" – wpływają na utożsamianie się z miejscem i tworzenie mikrospołeczności. Wszystkie funkcje składające się w jeden „organizm" uczelni tworzą skomplikowaną siatkę powiązań, która tylko przy ścisłej współpracy może funkcjonować prawidłowo i efektywnie. Poczucie wspólnoty jest podstawowym czynnikiem, który spaja środowisko akademickie. Dobrze zaprojektowana urbanistyka kampusu, nowoczesne budynki i przyjazne środowisko dają sposobność do stworzenia funkcjonującej naukowej „maszyny", jaką niewątpliwie są najlepsze uczelnie. Przestrzeń urbanistyczna to zdecydowanie nie jest jedyny wyznacznik sukcesu, jednak przyjazne otoczenie oraz dostępność wszystkich funkcji sprzyjają nauce i zawiązywaniu interdyscyplinarnych relacji.

2. EKO OSIEDLE, EKO MIASTO, MIASTO NAUKOWE

Miejskie ogrody od zawsze są niezbędnymi elementami krajobrazu miasta. Tereny zielone powinny powstawać równolegle z budynkami użyteczności publicznej, ponieważ ich funkcja społeczna i miastotwórcza jest znacząca. Zieleń ma za zadanie „zmiękczyć" surowość architektury, uzupełnić lub podkreślić kompozycję przestrzeni oraz zapewnić miejsce do wypoczynku i rekreacji. Mieszkańcom dużych aglomeracji brakuje roślinności, otwartych przestrzeni, widoku drzew czy nieba. W krajach gęsto zaludnionych, jak np. Korea czy Chiny, zauważalny jest brak zieleni i klaustrofobiczne uczucie przytłoczenia otaczającą zabudową. Duże zagęszczenie oraz coraz wyższe budynki przytłaczają i ekspansywnie wdzierają się na tereny zielone. Stąd konieczność wdrażania działań ekologicznych, szczególnie na terenach miejskich. Architekci coraz częściej wykorzystują zieleń jako nieodłączny element struktury budynków, zarówno na elewacjach, jak i we wnętrzach. Coraz powszechniejsze staje się również projektowanie tzw. „inteligentnych budynków", których systemy są ze sobą połączone, a ich praca zoptymalizowana pod kątem wielu czynników, takich jak klimat, funkcja czy liczba użytkowników. Eksperymentuje się z budynkami nie tylko samowystarczalnymi energetycznie, ale nawet energetycznie dodatnimi. Działania takie są efektem zmieniającej i rozwijającej się technologii, ale przede wszystkim ciągle wzrastającego deficytu energetycznego na świecie. Rozwiązania te należy wprowadzić nie tylko w pojedynczych obiektach, lecz także w większych strukturach, jak osiedle czy dzielnica.

Zarówno architektura, jak i natura potrafią kształtować przestrzeń oraz relacje pomiędzy ludźmi a otoczeniem. Szczególnie widoczne jest to w projektach z początków XX w., w których ważna była synergia architektury z otaczającym krajobrazem. Symbolem tego zjawiska stał się *Dom nad Wodospadem* (1936 r.) Franka Lloyda Wrighta, w którym zaciera się granica pomiędzy przyrodą a zewnętrzną i wewnętrzną przestrzenią domu [M. Worłowska 2011, s. 44].

2.1. Eko osiedle - Hammarby Sjöstad

Idea eko osiedla jest kolejnym krokiem w realizacji założeń zrównoważonego rozwoju. W nowoprojektowanych jednostkach mieszkaniowych aspekty społeczne, ekologiczne i ekonomiczne powinny być równorzędne i ściśle ze sobą połączone. Nowoczesne zespoły mają być zdrowym, zielonym i prawie samowystarczalnym domem dla tysięcy mieszkańców. Doskonałym przykładem perspektywicznego myślenia ekologicznego jest Hammarby Sjöstad - dzielnica Sztokholmu, której projekt opracowany przez Jana Inge-Hagströma zakładał wysoką efektywność energetyczną oraz kładł nacisk na ochronę środowiska. Ważnym elementem, już na etapie procesu projektowego, było zintegrowanie wszystkich podmiotów uczestniczących w przedsięwzięciu. Efektem tej współpracy jest tzw. „Model Hammarby'ego", czyli system gospodarowania (w zamkniętym obiegu) zasobami takimi jak energia, słodka woda, woda opadowa i odpady, charakteryzujący się możliwie wysokim poziomem odzysku energii i ciepła [strona internetowa 1]. Cała zużyta energia

Ryc. 1. Park na osiedlu Hammarby Sjöstad; fot: Hans Kylberg, źródło: https://pl.wikipedia.org/wiki/Plik:Hammarby_Sjostad.jpg, (CC BY 2.0), [dostęp: 21.03.2019]
Fig. 1. Hammarby Sjöstad park; photo by: Hans Kylberg, source: https://pl.wikipedia.org/wiki/Plik:Hammarby_Sjostad.jpg (CC BY 2.0), [access: 21.03.2019]

Ryc. 2. Hammarby Sjöstad z lotu ptaka; fot. Esquilo, źródło: https://commons.wikimedia.org/wiki/File:Hammarby_sj%C3%B6-stad,_flygfoto_2014-09-20.jpg?uselang=pl (CC BY-SA 3.0), [dostęp: 21.03.2019]
Fig. 2. Hammarby Sjöstad aerial view; photo by: Esquilo, source: https://commons.wikimedia.org/wiki/File:Hammarby_sj%C3%B6-stad,_flygfoto_2014-09-20.jpg?uselang=pl (CC BY-SA 3.0), [access: 21.03.2019]

elektryczna pochodzi ze źródeł odnawialnych, a na terenie osiedla testowane są nowe typy ogniw paliwowych oraz paneli słonecznych. Prawie 100% budynków ogrzewanych jest ciepłem pozyskanym na terenie osiedla. Podstawowa produkcja pochodzi z palnych odpadów z gospodarstw domowych, oczyszczonych ścieków oraz biopaliwa. Prawie tysiąc mieszkań posiada kuchenki na biogaz, który pozyskiwany jest w procesie oczyszczania ścieków domowych. Biogaz wykorzystuje się również jako paliwo w pojazdach, których parkowanie odbywa się pod ziemią, aby zminimalizować ruch samochodów pomiędzy budynkami [strona internetowa 2].

Osiedle, którego gęstość zabudowy porównywalna jest z tą w centrum Sztokholmu, dzięki dobrze zaprojektowanej architekturze oraz infrastrukturze technicznej, posiada szczególny klimat oraz zapewnia mieszkańcom poczucie prywatności i bliskości z naturą. Wszystkie miejsca skomunikowane są systemem ścieżek, które poprowadzone zostały przez wszystkie dziedzińce oraz wzdłuż zbiorników wodnych [strona internetowa 1].

Działania na tak wielu polach uczyniło z Hammarby Sjöstad wzór do naśladowania i inspirację dla wielu nowych osiedli, zarówno w Szwecji, jak i poza jej granicami.

2.2. Eko miasta – Masdar City i Logroño Montecorvo

Współczesne wizje miasta przyszłości oparte są na postępie techniki i technologii, w tym na ekspansji elektroniki, która zaczyna sterować niemalże każdym aspektem życia miasta. Wciąż obecne są jednak także wizje zielonych i przyjaznych środowisku przestrzeni przeznaczonych do mieszkania i pracy [M. Wdowiaż-Bilska 2012, s. 306]. Tak właśnie powstały wizje eko miast, których działania opierają się na stosowaniu odnawialnych źródeł energii, zmniejszaniu zużycia wody, recyklingu i przetwarzaniu surowców. Ich ważnym elementem jest transport oparty na komunikacji publicznej, rowerach i elektrycznych samochodach [E. Węcławowicz-Bilska 2012, s. 324].

Szeroko omawianym przykładem wizji idealnego eko miasta jest zeroemisyjne Masdar City. Wąskie uliczki i gęsta sieć budynków mają zmniejszyć powierzchnię zabudowy oraz ułatwić zacienianie ulic. Przejścia między budynkami zaplanowano tak, aby jak najbardziej zwiększyć naturalne przewietrzanie ulic i placów. Na jednym z miejskich placów powstała wieża, która wykorzystuje naturalne przepływy mas powietrza, by schłodzić uliczki i przestrzenie publiczne miasteczka. Tradycyjna konstrukcja wieży wiatrowej została wyposażona w zraszacze (zamontowane u jej szczytu), które nawilżają zasysane powietrze i poprzez proces odparowywania pozwalają obniżyć jego temperaturę. Efektowną nowinką technologiczną są zacieniające, mobilne „parasole" zlokalizowane na centralnym placu miejskim. W dzień zadaszenie otwiera się, a zamontowane na szczycie panele fotowoltaiczne pobierają i magazynują energię słoneczną. W nocy konstrukcja zostaje zamknięta, a zgromadzona energia wykorzystana m.in. do ogrzania czy oświetlenia budynków. Postanowiono również całkowicie wyeliminować samochody i zastąpić je magnetyczną kolejką napędzaną energią ze źródeł odnawialnych. W tak gorącym klimacie szczególne znaczenie ma racjonalna gospodarka wodna. Cała zużyta woda jest uzdatniana i ponownie wykorzystywana, a zgromadzona woda deszczowa przeznaczana do nawadniania ogrodów oraz do celów gospodarczych, a po uzdatnieniu nawet do picia. Odpady nieorganiczne poddawane są recyklingowi, by później wytworzyć z nich energię, a pozyskany materiał wykorzystać do budowy elementów wyposażenia miasta. Imponującym osiągnięciem jest zbudowanie jednego z największych na świecie pól z kolektorami słonecznymi (87 780 ogniw fotowoltaicznych), z którego pozyskana energia wykorzystywana jest na potrzeby budowy, a jej nadmiar przesyłany do elektrowni w Abu Dhabi [strony internetowe 3,4]. Miasto cały czas znajduje się w fazie projektu i realizacji, a zakończenie inwestycji przewiduje się na 2030 rok. Projektanci i naukowcy ciągle poszukują nowych rozwiązań, śledzą trendy i nowinki technologiczne oraz na bieżąco badają efektywność zastosowanych systemów. Obecnie na terenie miasteczka mieszka ok. 3,5 tys. osób i są nimi głównie naukowcy i studenci poświęcający się pracy na rzecz Masdar City. Teren dostępny jest także dla turystów oraz istnieje możliwość zakupu lub wynajmu mieszkania. Niestety obecnie brakuje osób prywatnych, które chciałyby na stałe osiedlić się w najnowocześniejszym eko mieście. Trwające prace budowlane, brak takich funkcji miejskich jak szkoła, przedszkole, restauracja czy kino skutecznie zniechęcają potencjalnych nabywców. Mimo wszystko koncepcja MasdarCity to pionierska realizacja, która przeciera szlaki wszystkim smart cities. Warto pamiętać, że miasteczko ciągle zmienia się i rozwija, a na ostateczny efekt i ocenę należy zaczekać do zakończenia inwestycji.

Podobne założenie planowano zrealizować w Hiszpanii. Eko miasto Logroño Montecorvo zlokalizowano w dolinie pomiędzy dwoma wzgórzami, a jego powierzchnia zabudowy miała nie przekraczać 10% całego obszaru. Resztę terenu postanowiono przeznaczyć na ogród i ekopark oraz produkcję energii (ogniwa fotowoltaiczne na stokach wzgórz, wiatraki). Projektowane budynki miały pomieścić ok. 3 tys. mieszkań, a sama architektura korespondować z wysokością i charakterem otaczających teren wzgórz. Projekt zakładał także odzyskiwanie zużytej wody, dzięki wykorzystaniu naturalnych systemów jej oczyszczania [strona internetowa 5].

Oba projekty obrazują nowatorskie wizje miast przyszłości. Nie da się ukryć, że myślą przewodnią obu założeń są ekologia i samowystarczalność. Pozostaje jednak pytanie, czy takie miasta, które wielokrotnie stają się zamkniętymi enklawami, mogą być wygodnym i przyjaznym miejscem do życia? Być może funkcja publiczna lepiej wpisałaby się w ideę samowystarczalnej „wyspy” i w pełni wykorzystała potencjał miejsca.

2.3. Miasta naukowe

Inspirowanie się miastami czy osiedlami w projektowaniu ośrodków akademickich jest pomysłem nie do końca wykorzystanym, lecz nie nowym. Już w latach 60. powstawały tzw. Technopolie, czyli miasta naukowe, satelity wielkich miast - pierwsze z nich to Tsukuba (k. Tokio) i Akademgorodok (k. Nowosybirska). Założenia te miały koncentrować potencjał akademicko-naukowy kraju. Były ukierunkowane na rozwój funkcji naukowych i technologicznych, koncentrując instytucje badawcze w przestrzeni o charakterze współczesnego kampusu, czyli terenu wydzielonego z miasta z dostępem do wszystkich funkcji potrzebnych do nauki, mieszkania i wypoczynku. Na takim obszarze lokalizowano ośrodki rządowe, uniwersytety i inne instytucje naukowe oraz całe zaplecze mieszkalne i socjalne. Wszystkie budynki były powiązane systemem ścieżek pieszych, a całe założenie otaczały kompleksy zieleni [M. Wdowiaż-Bilska 2012, s. 306]. Mimo tego, że miasteczka w efekcie skupiały się głównie na „produkowaniu” nauki, sam pomysł oparcia funkcjonowania miasta na nauce przyjął się i przez lata ewoluował. W efekcie otrzymano parki naukowe, które przy sprzyjających warunkach rozwoju i współpracy pomiędzy sektorem naukowym a władzami miasta, przekształciły się w pełnoprawne struktury

Ryc. 3. Widok na centrum Tsukuba; fot. On-chan, źródło: https://en.wikipedia.org/wiki/Tsukuba,_Ibaraki#/media/File:Tsukuba_Center_%26_Mt.Tsukuba01.jpg (CC BY-SA 3.0), [dostęp: 21.03.2019]
Fig. 3. View of the center of Tsukuba; photo by: On-chan, source: https://en.wikipedia.org/wiki/Tsukuba,_Ibaraki#/media/File:Tsukuba_Center_%26_Mt.Tsukuba01.jpg (CC BY-SA 3.0), [access: 21.03.2019]

miejskie, jak np. Guangzhou Science City w Chinach [D. Charles 2015, 82-88]. Polskie uczelnie coraz chętniej podejmują współpracę z władzami miast, jednak bardzo często jest ona okazjonalna i skupia się głównie na przeprowadzaniu konkursów studenckich. Oba podmioty powinny się uzupełniać, umacniać wzajemne zależności oraz korzystać ze swoich atutów, aby stymulować rozwój zarówno samej uczelni, jak i miasta.

3. KAMPUS PRZYSZŁOŚCI

Koncepcja zrównoważonego rozwoju widoczna jest w wielu dziedzinach życia. Także projektowanie kampusów, które są z założenia rozbudowanymi, złożonymi systemami powinno się na niej opierać. Wydziały uczelni należy lokalizować blisko siebie, aby móc skupić się na współpracy, wymianie wiedzy i umiejętności. Bliskość obiektów mieszczących przedstawicieli różnych dyscyplin naukowych pozwala na łatwiejsze przemieszczanie się, zawiązywanie współpracy, interdyscyplinarne działania oraz poszerzanie naukowych horyzontów. Kampus pozwala na lepszą wydajność nauczania oraz na łatwiejsze organizowanie interdyscyplinarnych zespołów naukowych, skupionych na poszerzaniu badań. Nowoczesne budynki wydziałowe nie muszą być tak rozbudowane jak kiedyś. Rozległe aule ustępują miejsca wielofunkcyjnym salom projektowym, które mogą służyć różnym wydziałom i kierunkom.

Ryc. 4. Widok z lotu ptaka na Akademgorodok; fot. Elva, źródło: https://en.wikipedia.org/wiki/Akademgorodok#/media/File:Akademgorodok_Airphoto.jpg, [dostęp: 21.03.2019]
Fig. 4. Aerial view of Akademgorodok; photo by: Elva, source-:https://en.wikipedia.org/wiki/Akademgorodok#/media/File:Akademgorodok_Airphoto.jpg (CC BY-SA 3.0), [access: 21.03.2019]

Przykładem myślenia holistycznego jest amerykańska strategia City of Learning (COL), która łączy edukację z planowaniem miast. Jej podstawowe zasady to m.in.: szukanie synergii uczelni i miasta; odejście od szkół zbyt rozległych, które oddzielają się od lokalnej wspólnoty, odzyskiwanie starych budynków, aby ograniczyć koszty rozwoju uczelni, współpraca edukacji z biznesem czy wprowadzanie przestrzeni nauczania do różnych budynków [M. Bryx 2013, s. 12]. Większość nowoprojektowanych kampusów nawiązuje do tradycyjnego modelu szkolnictwa wyższego, w którym bardzo często głównym sposobem nauczania są wykłady. Szczególnie widoczne jest to na kierunkach humanistycznych, w mniejszym stopniu na kierunkach technicznych. W czasach ogólnego dostępu do informacji zauważa się spadek zainteresowania studentów takim modelem nauczania. Preferowane są zajęcia interaktywne, praktyczne, projektowe i praca w grupach. Dobrze zaprojektowany kampus powinien spełniać wszystkie najważniejsze zadania szkoły wyższej, a więc być nie tylko miejscem nauki, ale także wymiany pomysłów, budowania relacji czy zawierania znajomości. Każda z tych interakcji potrzebuje własnej przestrzeni, a współczesny kampus powinien zapewnić odpowiednie środowisko do ich realizowania [strona internetowa 6]. Przestrzenie przeznaczone do pracy powinny być zaprojektowane w sposób umożliwiający ich personalizację - meble i ścianki działowe to elementy, które umożliwiają użytkownikom natychmiastowe dostosowanie przestrzeni do własnych potrzeb. Zamiast standardowych biurek i krzeseł proponowane są miękkie siedziska i mobilne stoły, które pozwalają w prosty sposób zorganizować miejsce pracy o różnym charakterze i dostosowane do różnej liczby osób [E. Magnini i inni 2018, s. 15].

Jak zatem ma wyglądać uczelnia przyszłości? Jaką wizję tej przestrzeni mają architekci, a jaką studenci? Okazuje się, że ich pomysły w wielu punktach są zbieżne. W 2018 r. niezależna firma projektantów, planistów, inżynierów, konsultantów i specjalistów technicznych ARUP, razem z ekspertami z sektora szkolnictwa, stworzyła raport dotyczący wizji rozwoju szkolnictwa wyższego oraz współczesnych potrzeb studentów. Punktem wyjścia do przeprowadzonych analiz stały się zmiany społeczne, technologiczne i gospodarcze, z którymi muszą mierzyć się uniwersytety [E. Magnini i inni 2018, s. 4].

Technologie cyfrowe, które znacznie poszerzyły dostęp do edukacji, wymuszają ciągłe zmiany w sposobie nauczania oraz zakresie wiedzy przyswajanej przez studentów. Sami studenci mają coraz bardziej sprecyzowane oczekiwania dotyczące sposobów nauczania i miejsc, w których ta nauka ma się odbywać. Uniwersytety będą musiały zaangażować się w spełnienie tych oczekiwań, które są tym wyższe, im wyższe stają się oczekiwania rynku pracy. Analizy wykazały, że studenci szukają personalizacji zajęć i elastyczności sposobu, w jaki się uczą. Umożliwienie podejmowania własnych decyzji w kwestii studiowania zdecydowanie zachęci studentów, by spędzali czas na kampusie w sposób bardziej produktywny [E. Magnini i inni 2018, s. 5-6]. Działanie nowoczesnego kampusu powinno opierać się na kooperacji ze szkołami zawodowymi i przyszłymi pracodawcami. Przykładem może być Nanjing Technical College w Chinach, który wraz z firmą Siemens Bosch stworzył centrum szkoleniowe przeznaczone dla studentów uczelni oraz pracowników Siemensa, w celu zapewnienia ich ścisłej współpracy. Takie rozwiązanie daje młodym ludziom możliwość nabywania specjalistycznych umiejętności, a pracodawcom stwarza okazję do wprowadzenia przyszłych pracowników w tajniki działania firmy. System łączący studia teoretyczne i odbywanie praktyk, nazywany systemem podwójnej edukacji, staje się coraz ważniejszy dla studentów i pracodawców. W Niemczech każdego roku duża liczba studentów znajduje zatrudnienie właśnie w efekcie odbycia takiego stażu [E. Magnini i inni 2018, s. 41]. Nie są to tradycyjne wymiany studenckie czy praktyki, ale dobrze przemyślane programy, dające możliwość zdobycia doświadczenia, które niejednokrotnie jest cenione bardziej niż stopień naukowy.

Według raportu ARUP nowoczesny kampus stawia w swoim funkcjonowaniu na rozwiązania ekologiczne, oszczędności i recykling. Wiele firm jest w stanie dostarczać usługi lub sprzęty na zasadzie wynajmu. Liczni dostawcy i wykonawcy oferują usługi naprawy i wymiany zużytych elementów w ramach trwającej umowy. Takie rozwiązanie pozwala przenieść odpowiedzialność za poprawne działanie i renowacje danego komponentu z zarządców budynku na wykonawców. Dzięki temu oszczędza się zasoby, minimalizuje zakłócenia pracy danego sprzętu czy usługi i zmniejsza związane z tym koszty [E. Magnini i inni 2018, s. 17-18]. Naprawa istniejących systemów w wielu przypadkach jest tańsza i bardziej ekologiczna niż wymiana i wiążące się z nią remonty pociągające ze sobą dodatkowe koszty. Idea naprawiania, recyklingu i upcyklingu to również elementy eko świadomości, która powinna być myślą przewodnią kampusu przyszłości.

Powtarzającym się elementem omawianych przykładów jest widoczny nacisk na wdrożenie rozwiązań ekologicznych zarówno w strukturze budynków, jak i w ich otoczeniu. Wykorzystanie wody deszczowej jako wody szarej, ponowne użycie ciepła produkowanego w laboratoriach czy recykling odzyskanych surowców to tylko przykłady działań, które powinny być oczywiste przy funkcjonowaniu tego typu obiektów. Coraz częściej stosowany w budynkach biurowych czy handlowych system BMS (Building Management System) pozwala w sposób zintegrowany i efektywny zarządzać całym obiektem. Możliwość aktualizowania danych i dostosowywania poszczególnych parametrów, np. ogrzewania, klimatyzacji, oświetlenia czy nagłośnienia w czasie rzeczywistym, daje komfort użytkowania przestrzeni i racjonalizacji jej wykorzystania. Kampus powinien zostać wyposażony w podobny system, który będzie dbać o komfort pracy i nauki. Dzięki sieci internetowej możliwe jest gromadzenie danych w czasie rzeczywistym z dowolnego systemu czy obiektu, a następnie dostosowanie ich do potrzeb użytkowników. Możliwe jest zgromadzenia parametrów takich jak jakość powietrza, hałas, ruch i zużycie energii, ale także aktywność na biurkach, obecność w salach i preferencje użytkowników danej przestrzeni. Dzięki temu algorytmy wprowadzone do systemu pozwalają efektywniej nią zarządzać i „uczyć się" wzorców jej użytkowania. Dla poszczególnych osób możliwe będzie np. automatycznie dostosowanie wysokość biurka lub zmiany kształtu czy rozmiaru sali (ścianki działowe) w zależności od liczebności grupy ćwiczeniowej. Pomysłodawcą takiej optymalizacji jest zespół We Work, który zajmuje się tworzeniem współdzielonych przestrzeni biurowych [E. Magnini i inni 2018, s. 20-22].

Analizy przeprowadzone przez zespół Arup miały charakter holistyczny. Jednym ze sposobów poznania prawdziwych potrzeb użytkowników kampusu była współpraca ze studentami. Stworzyli oni własne scenariusze, a nawet projekty kampusu przyszłości. Wyniki były bardzo interesujące. Wizja przyszłości dla studentów wiąże się z wielodyscyplinarnym podejściem do nauki oraz wykorzystaniem nowoczesnych systemów zarządzania i organizacji pracy i życia na uczelni, które uzupełnią tradycyjne metody nauczania. Jednym z ważniejszych elementów okazała się możliwość korzystania na terenie kampusu z dodatkowych usług, np. kawiarni, siłowni, salonu fryzjerskiego czy terenów zielonych. Interesujące są studenckie wizje budynków wydziałowych, które jawią się jako przestrzenie otwarte, z dużym dostępem światła słonecznego i z niemalże zatartą granicą między wnętrzem a zewnętrzem budynku [E. Magnini i inni 2018, s. 44-48].

Kampus przyszłości, według Arup, jest zatem przestrzenią wielofunkcyjną, elastyczną, otwartą, przyjazną współpracy i wielozadaniowości, a nowoczesne technologie stanowią jej nieodłączny element. Niestety ta wizja w wielu przypadkach nie przystaje do rzeczywistego wyglądu budynków wydziałowych, których układ funkcjonalny oraz komfort użytkowania często rozczarowują.

4. EKO KAMPUS - CASE STUDY

Każdy budynek oddziałuje na środowisko przyrodnicze w całym cyklu swojego istnienia. Najtrudniejsze zadanie, jakie stoi przed projektantami zielonej architektury, stanowi więc wyważenie proporcji pomiędzy funkcją danego obiektu a jego wpływem na ekosystem [M. Leźnicki 2014, s. 120].

Działania prowadzone na kampusie Aarhus N, należącym do VIA University College w Danii, są wspaniałymi przykładami połączenia idei zrównoważonego rozwoju z synergicznym współdziałaniem różnych dyscyplin naukowych. Na teren kampusu przeniesiono kilka zakładów naukowych, które wcześniej znajdowały się w różnych częściach miasta. Sam kształt budynku - cztery skrzydła rozchodzące się od centralnego atrium - pozwala na rozwój interdyscyplinarnego środowiska badawczego, wspólną pracę i naukę. Budynek został zaprojektowany i wykonany jako wysoce oszczędny energetycznie. Ważnymi założeniami projektu były zastosowanie zielonych dachów i elewacji oraz zapewnienie dostępu do jak największej ilości światła dziennego. Duży kopułowy świetlik w centralnym atrium wpuszcza naturalne światło w wielopiętrową, otwartą przestrzeń przywodzącą na myśl miejski plac. Technologia użyta w budynku pozwala na kontrolowanie prawie wszystkich parametrów wewnętrznego środowiska, np. oświetlenia, temperatury czy systemu naturalnej wentylacji, który jest automatycznie dostosowywany do liczby osób przebywających w pomieszczeniu [strona internetowa 7].

Uczelnie wyższe, jako instytucje kształtujące społeczeństwo, powinny stać się miejscem, gdzie rozwija się i testuje innowacyjne rozwiązania. Idąc z duchem czasu kampus Queen Elizabeth Olympic Park we wschodnim Londynie na całej swojej powierzchni (ok. 336 000 m2) wprowadził system wizualizacji inspirowany schematami elektronicznymi. W przestrzeni wspólnej kampusu zostały zainstalowane interaktywne tablice informacyjne z dotykowymi wyświetlaczami, które przypominają i informują o ważnych wydarzeniach i sprawach dotyczących życia na uniwersytecie. Dane są dostępne dla wszystkich i mogą być aktualizowane na bieżąco [E. Magnini i inni 2018, s. 31]. Podobne rozwiązania znane są już z przestrzeni publicznych, takich jak galerie handlowe czy dworce kolejowe, jednak w kontekście uczelni jest to ciągle rozwiązanie innowacyjne.

Również polskie uczelnie zaczynają przykładać wagę do zmniejszania wpływu swoich obiektów na środowisko. Doskonałymi przykładami są nowy kampus Uniwersytetu w Białymstoku oraz siedziba Instytutu Nauk Geologicznych Uniwersytetu Jagiellońskiego. Kampus w Białymstoku już na etapie idei zakładał jedność przyrody i nauki. Powstały na ponad 38 tys. m2 zespół trzypiętrowych budynków mieści ponad 800 pomieszczeń. Wszystkie gmachy są energooszczędne i dźwiękochłonne, klimatyzowane i wentylowane. Budynki wyposażono w system BMS, który steruje m.in. zasilaniem, ogrzewaniem, wentylacją i klimatyzacją oraz pozwala na indywidualną kontrolę temperatury w salach wykładowych. Obiekty posiadają także system ogrzewania podłogowego. Zadbano również o zagospodarowanie całego terenu wokół kampusu. Ważnymi elementami krajobrazu są strumyki wijące się między budynkami oraz oczka wodne zasilane deszczówką, której nadmiar spływa do zbiornika retencyjnego.

Budynek Instytutu Nauk Geologicznych UJ to czterokondygnacyjny obiekt o powierzchni całkowitej 5,8 tys. m2. Na parterze znajdują się: główna aula, którą można podzielić na dwie części za pomocą przesuwnej ściany, pracownie laboratoryjne oraz patio. Na pierwszym piętrze znajduje się siedem sal dydaktycznych, biblioteka z czytelnią, sala komputerowa oraz dwa pomieszczenia rekreacyjne. Pozostałe kondygnacje mieszczą szesnaście specjalistycznych laboratoriów, pokoje pracowników naukowych i administracyjnych, salę konferencyjną oraz pokój profesorski. Na dachu, na fasadzie południowo-zachodniej oraz na terenie wokół budynku zainstalowano panele fotowoltaiczne, które pozwalają obniżyć koszty związane z eksploatacją obiektu. Panele wokół budynku umieszczono na obrotowych platformach (trackerach) umożliwiających śledzenie położenia słońca i prostopadłe ustawienie ich do kierunku padania promieni. Budynek ogrzewany jest naturalnym ciepłem Ziemi, przy pomocy pomp ciepła. Nie zabrakło też małej oczyszczalni ścieków, dzięki której neutralizowane są ciekłe odpady z laboratoriów chemicznych i biologicznych. Wszystkimi urządzeniami w budynku i jego otoczeniu zawiaduje system BMS. Zrównoważony rozwój to nie tylko odpowiednie systemy i architektura budynku, ale również programy naukowo-dydaktyczne, np. program „Zielony Kampus", w ramach którego omawiane są rezultaty i doświadczenia zdobyte podczas projektu i budowy. W specjalnie zaprojektowanym laboratorium, podczas ćwiczeń dydaktycznych wykorzystuje się dostęp do Odnawialnych Źródeł Energii. Umożliwia to zapoznanie się z problematyką OZE, prowadzenie badań i eksperymentowanie w poszukiwaniu ulepszeń dla znanych już rozwiązań [strona internetowa 8]. Oba projekty to przykłady działań architektonicznych, które mają faktyczny wpływ na jakość i rozwój nauki i techniki oraz inicjują innowacyjne badania. Oba założenia zaprojektowano i wybudowano z zachowaniem zasad zrównoważonego rozwoju, ze szczególną dbałością o środowisko naturalne.

Nie każdy uniwersytet może pozwolić sobie na zmianę lokalizacji czy wybudowanie nowych obiektów wydziałowych. Na szczęście ekologiczne działania można wprowadzać w obrębie starych zabudowań, tak aby istniejące od lat budynki uniwersyteckie przekształcić w ich lepszą, ekologiczną wersję. Takie działania prowadzi Harvard Green Campus Initative, który od lat pracuje nad przekształceniem historycznego uniwersytetu w najbardziej zielony kampus w USA. Zaczynając od idei, iż najbardziej ekologiczny budynek to taki, który już stoi, zaczęto selekcjonować obiekty pod względem ich adaptacyjności i wprowadzać strategie ekologiczne w kolejnych starych budynkach. Uniwersytet swoje działania opiera na wytycznych systemu oceny budynków LEED. Efektem tego jest lista ponad 70 obiektów akademickich, które posiadają lub są w trakcie certyfikacji. Podczas remontu czy adaptacji istniejącego obiektu zużywa się wielokrotnie mniej energii niż podczas budowy nowego. Tak zwana „embodied energy", czyli energia zużyta do produkcji danego materiału, w budynkach istniejących jest mniejsza, ponieważ wiele elementów budowlanych nadaje się do ponownego wykorzystania w tym lub innym obiekcie. Podczas planowania i wykonywania prac remontowych dokłada się starań, aby jak najwięcej materiałów poddać recyklingowi, np. stare okna, które są wymieniane na nowe, bardziej energooszczędne, przekazywane są dla osób potrzebujących, mieszkających w miejscach o cieplejszym klimacie. W Polsce takich okien z odzysku można użyć np. w schroniskach dla psów lub w innych obiektach, które nie wymagają tak dobrej izolacyjności cieplnej. Ważną zmianą jest podejście do sprawy segregacji odpadów. W 2009 r. ponad 55% śmieci wyprodukowanych na uniwersytecie Harvarda zostało oddanych do recyklingu. Szkoła działa i myśli lokalnie, na co dzień kupując i korzystając z lokalnych surowców oraz zatrudniając i współpracując z lokalnymi przedsiębiorcami i dostawcami [strona internetowa 9].

Dobrze, że zarówno w Polsce, jak i na świecie podejmowane są działania mające na celu zmniejszenie szkodliwego wpływu budynków na ekosystem. Działalność dydaktyczna uczelni wyższych w bezpośredni sposób wpływa na społeczeństwo, jego stan wiedzy i świadomość także w kwestii ekologii i zrównoważonego rozwoju. Dlatego bez względu na wielkość i typ uczelni, powinny być w nich prowadzone zdecydowane działania na rzecz ochrony jakości środowiska naturalnego.

PODSUMOWANIE

Wydaje się, że kampus ekologiczny jest przyszłością szkolnictwa wyższego. Zarówno architekci, jak i studenci widzą uniwersytet jako synergiczny układ wiedzy, przestrzeni i ludzi, którzy ją tworzą. Miasta z rozwiniętą funkcją edukacyjną, które poważnie myślą o prężnym, rozwoju powinny pochylić się nad zagadnieniem zrównoważonego rozwoju i zainwestować w budowę nowych lub ekomodernizację już istniejących budynków akademickich.

Ludzie coraz bardziej przyczyniają się do niszczenia środowiska przyrodniczego, a budownictwo szczególnie mocno odciska na nim swoje piętno. Właśnie dlatego każde miasto powinno na poziomie lokalnym działać zapobiegawczo, chronić swoje środowisko oraz wprowadzać do nowych i istniejących budynków ulepszenia i programy naprawcze, by jak najbardziej minimalizować negatywny wpływ architektury na otoczenie. Kluczowe jest zastosowanie nowoczesnych systemów, które usprawniają i optymalizują działanie obiektów. Pozytywny wpływ takich rozwiązań jest szczególnie widoczny w tak rozległych założeniach urbanistycznych, jakimi są kampusy czy osiedla akademickie. Środki zaoszczędzone na eksploatacji obiektów wydziałowych można spożytkować na rozwój działalności naukowej i społecznej uczelni.

Omówione projekty i koncepcje są pozytywnymi przykładami działań, które mogą ułatwić realizację założeń kampusu w praktyce. Pokazują, skąd można czerpać inspiracje, jak można rozumieć i rozwijać zasady zrównoważonego rozwoju w przestrzeni szkół wyższych, które niejednokrotnie stanowią podstawę rozwoju wielu miast i regionów. Trend budowania ekologicznego, który z roku na rok zyskuje na popularności, pozwala patrzeć w przyszłość z optymizmem i nadzieją, że na stałe zadomowi się również na polskich uczelniach.

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STRONY INTERNETOWE

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