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The Evaluation of the Use of Container Houses in Meeting Housing Needs Based on a Survey of Real Estate Agents

Abstract

Objectives: The problem of housing needs requires continuous monitoring as well as analysis and evaluation of its solutions. One such solution could be container housing, positive examples of which can be found abroad, e.g. in Sweden or Canada. For this to happen, an attempt should be made to assess whether this type of construction has a chance to appear in Poland and whether it can be an attractive segment from the point of view of the market and meeting the needs of buyers. Therefore, the objectives of the study were to assess: (1) whether container housing can become a segment seriously considered in the context of meeting housing needs in Poland; (2) the interest of potential buyers of housing in container housing; (3) the attractiveness of container housing.

Research Design & Methods: To achieve the objectives, a survey was conducted in Q4 2023 among 67 real estate agents as entities that serve clients on a daily basis and know their needs and preferences.

Implications / Recommendations: The obtained results indicate that it is currently difficult to say unequivocally whether container housing can become a segment seriously considered for meeting housing needs in Poland. On the one hand, the results show that there are serious doubts about this (small number of offers, low customer interest, little knowledge of the subject, customer fears), while on the other hand, container flats can be visually attractive to customers, are full-featured, and, most importantly, are definitely cheaper than those built with traditional technology. These could be the factors for the potential success of this market segment, perhaps even on such a scale that more mass production of this type of housing would become the so-called ‘game changer’ of the market.

Contribution / Value Added: It is necessary to increase people’s awareness, promote this type of construction (including showing positive examples from abroad), and reduce fears and doubts about living in container buildings.

Keywords: housing property, modular homes, real estate market, container housing, housing needs

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Introduction

The problem of housing needs in Poland is described quite extensively in the literature. Firstly, it is pointed out that it must be treated in a special way due to the importance of housing in human life. The confirmation of this thesis can be found, *inter alia*, in Article 75 of the Constitution of the Republic of Poland, which states that the authorities are to support citizens in satisfying their housing needs. Studies also emphasise the formal entrenchment of housing in international documents and the rank in the satisfaction of needs related to the functioning of households, the exceptional character of a good which should be covered by the scope of the state (Andrzejewski, 1979; Cesarski, 2017, Koszel & Strączkowski, 2021; Lis, 2005, 2021; Twardoch, 2015, 2021). Secondly, there are very dynamic changes in the housing environment that are causing, or will sooner rather than later cause, tensions in meeting housing needs. It is sufficient to mention three issues: (1) the housing problem of young people and the low availability of housing (low purchasing capacity of young people); (2) the ageing of the population (questions about the adaptation of the housing stock to the needs of senior citizens); (3) the influx of large numbers of refugees, both as a result of the Russian-Ukrainian conflict and for economic reasons (from Africa or Asia). Thirdly, the problem of meeting housing needs is related to the requirements for new housing.

As far as the housing problem of young people is concerned, it is mainly due to high prices of flats, especially in large Polish cities, and the relatively low earnings of the youngest clients on the market. This is confirmed, among others, by studies by B. Marona and K. Tomasik, A. Czerniak, as well as Ł. Strączkowski, which indicate that there is a problem of economic accessibility with regard to housing and related restrictions of the mobility of young people in Poland. The decrease in the ability to purchase a flat is still progressing, which is the result of (apart from the increasing prices): the increase in interest rates on housing loans, the tightening of policy regarding the assessment of creditworthiness, and the increase in the cost of living. At the same time, it should be added that the level of the housing affordability index is the lowest since 2012 (Marona & Tomasik, 2023; Czerniak, 2023; Strączkowski, 2022).

In the case of demographic changes in Poland, on the other hand, the ageing of the population is considered to be key. According to projections by the Central Statistical Office (GUS), by 2050, almost every third Pole will be aged 65 or over. It is estimated that the old-age ratio will then reach 32.7%, of which 10.4% will be people aged 80 and over (GUS, 2014). In addition, the group of people aged 80 and over is characterised by the highest rate of change. This phenomenon is referred to by demographers as the double ageing of the population (Deniszczuk, 2001, p. 10). The increasing proportion of elderly people in the population is not only a problem for health care, pensions, and the Social Insurance Institution (ZUS), but also a key challenge for the housing economy. As indicated by T. Bojęć, P. Chimczak, J. Kowalska, and D. Różewicz, there is a shortage of adapted housing in Poland. In housing estates, the number of architectural barriers excludes many seniors or people with reduced mobility from daily functioning and creates the phenomenon of the so-called ‘fourth-floor prisoners’. The scale of these phenomena, coupled with the projected demand, make it necessary to look for solutions today. If solutions are not discussed and sought, the future will only bring higher social costs (Bojęć et al., 2020, pp. 50–55).

Finally, in the demographic-economic layer, the influx of refugees, whether for political or economic reasons, cannot be forgotten. Estimates of the number of foreigners in Poland vary. The Central Statistical Office indicates that the number of foreigners working in Poland is close to 990,000 (GUS, 2023). Similar data is presented by ZUS, according to which the number

of foreigners in pension insurance amounted to over 1 million persons (ZUS, 2022). In turn, a report by the Warsaw Enterprise Institute shows that the total number of immigrants in Poland (legal and illegal) can be estimated at around 3.5–4 million, with Ukrainians staying in Poland in September 2023 at 2.5–3 million people (Piekutowski, 2023). Obviously, these people have to live somewhere in Poland and are therefore users of Polish housing stock.

Meanwhile, there is still a housing shortage in Poland. Although, according to the Census of 2021, it is known that the number of dwellings amounted to 15.2 million units, and the number of households to 12.5 million (i.e. there are more dwellings than households). (1) There are socio-demographic changes, the consequence of which is also a decrease in households. (2) Part of the dwellings in the resources are units of a reduced standard (e.g. without bathrooms and toilets). (3) It is an indicator of the form: the number of dwellings per 1,000 inhabitants is used to show the shortage of dwellings. Thus, if one assumes, following the Ministry of Development report of 2020 (Ministerstwo Rozwoju, 2020, p. 12), that the target indicator of the housing saturation in Polish conditions is a value of approximately 450 dwellings per 1,000 inhabitants, then at the end of 2022, Poland is short of approximately 1.4 million dwellings. All this makes it necessary to take a fresh look at housing issues, including the construction of new units, through the prism of new challenges posed by the dynamically changing environment, looking for various possibilities to satisfy one of the basic human needs.

The possibility of using container housing for housing purposes

Modular housing is one of the modern construction methods. Each modular construction consists of a number of separate modules, and each module is a three-dimensional object that is able to provide usable space due to its size. Modules are designed for permanent or temporary housing, storage, public purposes (e.g. for hospitals). They can be intended exclusively for new buildings, but can also be used for additions and superstructures to buildings or can be incorporated into existing buildings, and the quality class of the provided modules depends on the demand side (the customer ordering them) and the supply side (the supplier) (Kyjaková & Bašková, 2016).

There are various benefits of modular construction. Researchers focus on different aspects. For example, K. E. Hwang, I. Kim, J. I. Kim, and S. H. Cha include the possibility of using standardised and repeatable modules that clients can tailor to individual preferences. They also point out that the modularisation of spatial units enables the project to be assembled quickly and easily (Hwang et al., 2023). In turn, L. Kyjaková and R. Bašková highlight the reduced requirements for facilities and equipment used on construction sites (finished components arrive), a safer working environment at the component manufacturing site (a kind of house factory), faster construction and optimised labour costs, fewer design errors and better quality in component production, easier quality control on site at the factory, less waste on site, and less pollution during construction (Kyjaková & Bašková, 2016). In contrast, H. Michalak adds that modules allow the creation of hundreds of setup options while maintaining the same unit load-bearing structure; modular architecture is relatively lightweight and can be easily adapted to most types of construction due to its repeatability and mobility (Michalak, 2021).

One segment of modular construction is container construction. As can be guessed, the basic building block is a shipping container. This can be a brand new container or one that has been decommissioned and used for architectural purposes. This reduces the environmental impact of a steel container by extending its useful life. This is quite important, because, if they are

not reused, they will be deposited in landfills and pose a huge environmental burden in terms of disposal (Anagal & Dhongde, 2017). Added to this is the fact that buildings are the largest energy consumers, accounting for almost 40% of all energy consumed. Therefore, the need to develop and design more efficient buildings is increasingly being highlighted. These are exactly the kind of buildings that can be constructed using container technology while maintaining self-sufficiency or energy efficiency (Bowley & Mukhopadhyaya, 2017; Wellcamp, 2024).

Container homes are an interesting solution to the world's housing problem. Over the last 30 years, they have become a popular housing solution worldwide. As can be pointed out in the literature, recent years have highlighted the enormous potential for the use of containers in housing. This potential is seen in the cuboid shape and in the creation of a whole building from smaller, identical or very similar, elements. Another argument in favour of the use of containers is the relatively quick construction process compared to traditional construction. The individual elements of the building block, which are, *de facto*, prefabricated elements, are ready to be modified and set up in the appropriate configuration (Gomółka & Furmańczyk, 2022). To this, the use of structurally new containers, or the re-use of shipping containers, offers a number of advantages, the most important of which are cost-effectiveness, environmental friendliness, durability, versatility, and portability. This makes them an attractive alternative housing solution for those seeking sustainable, innovative, and cost-effective housing options. Given the affordability of housing built with this technology, the trend of building with this technology can be expected to grow in popularity as a viable and sustainable housing solution in the years to come (Palcis, 2023; Executive-moving, 2024).

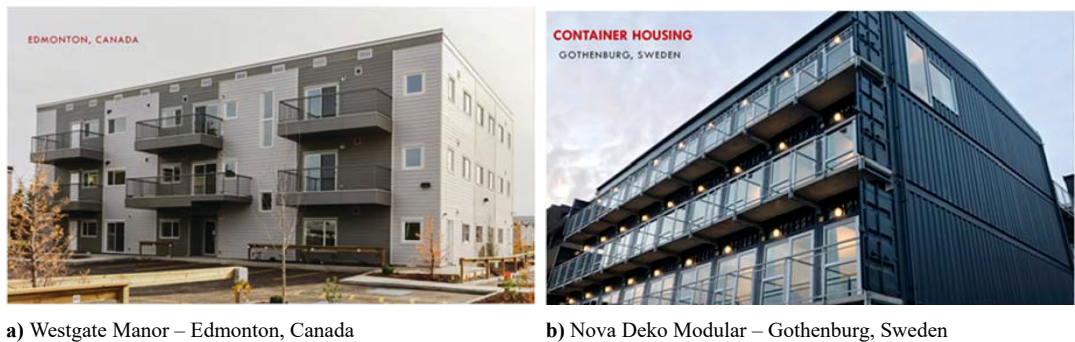


Figure 1. Examples of the use of shipping containers for housing purposes

Source: a) <https://i.ytimg.com/vi/JWKSvI2PcZY/maxresdefault.jpg> [accessed: 26.05.2024]; b) <https://i.ytimg.com/vi/abd27o76eLo/maxresdefault.jpg> [accessed: 26.05.2024].

To think seriously about container construction, it is also worth looking at positive examples of the use of such elements in foreign housing projects. The first site, illustrated in Figure 1a, can be the Westgate Manor development completed in 2018 in Edmonton, Canada. This is an example of a multi-family building that used 48 steel shipping containers for optimisation along the dimensions of: the speed of construction, minimum cost, minimum environmental impact. In the three-storey, year-round building, there are 20 one- and two-bedroom units (ShelterMode, 2021a). The second example (Figure 1b.) shows a building made up of 162 specially designed flats (each with an area of 26 m²), distributed over 5 floors. The entire complex, built

in 2017 in Gothenburg, Sweden, comprises three student housing buildings, which were completed in three phases. Each building has been arranged around a central courtyard, accessed by stairs, with walkways providing access to each capsule and bridges connecting all levels (ShelterMode, 2021b).

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Examples that are positively evaluated can be multiplied. However, questions arise: Since other countries, richer than Poland, use this kind of technology, would it also be possible to use the container building material in Poland? Would there be buyers on the housing market? How would they assess such projects? And, finally – could container housing become a serious segment in meeting housing needs? Looking at the possibilities of using container housing for housing, the positive experiences, and the scale of Polish housing needs, the problem is worth further reflection and research.

As the use of container housing on a mass scale in Poland is minimal, doubts also arose as to how this problem could be studied – who could be the subject of the study, what could be studied, and, finally, how to study this problem. Looking for the possibility of solving the situation, in the Department of Investment and Real Estate of the Poznań University of Economics and Business, the research topic was undertaken – ‘possibilities of satisfying housing needs through the use of container construction’. Table 1 shows the assumptions for the research procedure.

Table 1. Information on the research procedure

Specification	Description
The objectives of the study	1) The assessment of whether container housing can become a segment seriously considered for meeting housing needs in Poland; 2) The assessment of interest of potential buyers of flats in container housing; 3) The assessment of the attractiveness of container housing.
The material scope of the survey	The subject of the research – real estate agents; as persons providing services to clients, they are familiar with clients’ problems, hence they can be considered experts. Also – preferences of potential buyers concerning container flats.
The spatial scope of the study	The Wielkopolskie voivodeship
The temporal scope of the survey	Q4 2023; the time scope of the survey coincided with the time of information collection
Sampling and sample size	A non-random, purposive selection was used, also dictated by the availability of the respondents; the sample size was n=67 units.
Survey instrument	Online survey questionnaire – it included questions with nominal and ordinal levels of measurement; all questions were closed; apart from the part related to the subject of the survey, the questionnaire also included a metric in order to be able to differentiate the answers according to the characteristics of the intermediaries at a later stage.

Source: Own work.

Three points in Table 1 seem to need clarification. The first one is – why real estate agents? It was considered that, as a market actor serving clients on an ongoing basis, intermediaries are aware of the expectations and preferences of housing buyers. As such, they can assess potential customer interest in container housing. Second – is the sample size of n=67 intermediaries a large

number? In answering this question, it is important to be aware of the possibility of reaching respondents. In general, given the nature of their work, it is difficult to encourage them to take the time to complete questionnaires. Nonetheless, in cooperation with a local association of realtors, the project was successful. So, as far as the presented numbers are concerned: according to the data published by the National Bank of Poland, the number of realtors in Poznań reaches 408 units (Łaszek, 2023, p. 276), the number of members associated in the local organisation of realtors is 163 (WSPON, 2024), while in the register of the Polish Real Estate Market Federation, 215 entities from the Wielkopolska region can be found (PFRN, 2024). This means that, in percentage terms, we have managed to survey quite a large group of realtors (16% according to NBP, 41% according to WSPON, 31% according to PFRN), even more so taking into account the specialisation of realtors in Poland (the answers were given by entities servicing the housing market).

The third point is how the respondents were enabled to assess the container-built dwellings. Well, each of the intermediaries received drawings of such flats. Only after looking at the designs did the respondents give their opinions in relation to this segment of dwellings and customer preferences. The questions in the survey questionnaire were prepared in accordance with the methodological recommendations found in studies on marketing research methodology (Mazurek-Łopacińska, 2005; Kaczmarczyk, 2003).

Research results

Among the respondents, 33% of the realtors confirmed that they had never personally dealt with container housing. Another 21% said that they had had contact with this type of market product, but in relation to small houses, rather erected on allotment gardens. The remaining group, representing 46% of the total, confirmed that they had come across offers of container housing, but this was not related to their activities, but, rather, emerged on the basis of browsing various news or interesting facts from the market, or offers from competitors.

From the point of view of the potential for container housing to meet housing needs, the key questions were the interest in this type of housing among customers, the availability of such offers on the market, and, finally, whether there was a chance that container housing for housing could become a key segment in the next three years. Answering the first question, the respondents (69%) stated that there is basically no or very little such interest. Only 2% were of the opposite opinion, indicating quite high interest. Most likely, one of the reasons for this distribution of answers is the lack of a sufficiently large number of offers on the real estate market. This is confirmed by the distribution of answers in the next question – as many as 82% of the respondents indicated that there are no such offers of flats for sale or the number of offers of such flats is very small. Thus, in the opinion of the respondents, the chance that the Polish market could become one of the key segments for satisfying housing needs within the next three years is relatively small, as is estimated at 38%.

Although the result obtained is not high, it is also not very low. Rather, it means that there are some opportunities for this market segment to be promoted. The question is – what to do to make it more widely known? The respondents' answers are presented in Figure 2.

As can be seen, in order for the segment to develop, it is necessary to spread knowledge among people (75% of indications). Education in this area could prove to be the most important, as this would make many customers realise that the cost of buying a container flat is significantly lower compared to one built with technologies commonly used by developers. The time needed to

complete the investment could also play an important role – significantly shorter than in traditional building methods.

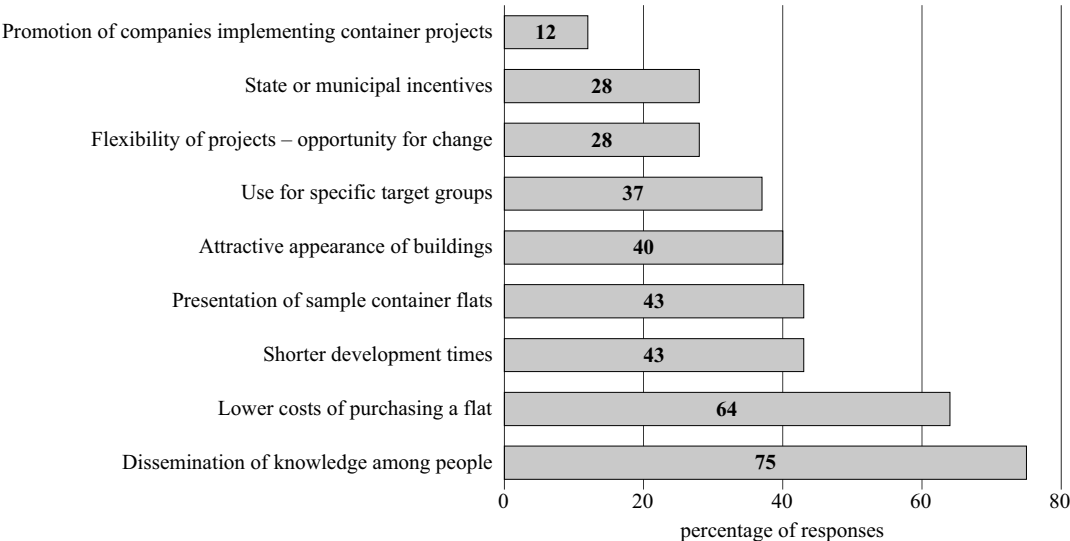


Figure 2. Factors that could positively influence the opportunities for the development of container housing for residential purposes

Source: Own research.

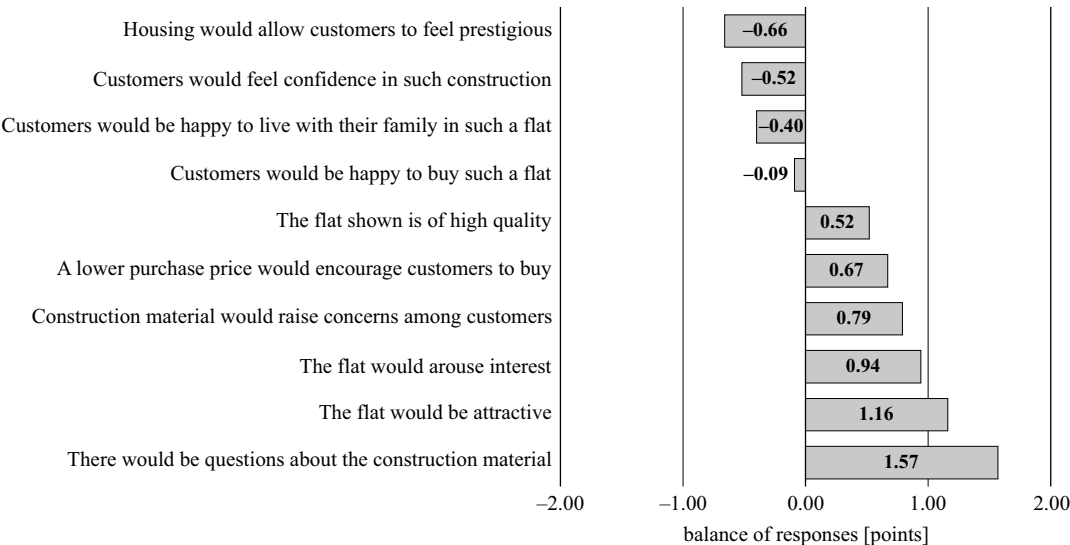


Figure 3. The evaluation of container dwellings through the lens of dwelling purchasers' preferences

Source: Own research.

The factors indicated in Figure 2 take on greater significance when juxtaposed with the intermediaries' assessment of the container dwelling. These evaluations, in the form of response

balances, are presented in Figure 3. It should be added that negative values of the balances indicate negative evaluations, while positive values indicate positive evaluations.

As can be seen, the shown container dwelling was assessed quite positively – it would appeal, it would generate interest, it is visually complete, and the lower purchase amount could act as an incentive to customers. However, there would certainly be questions from customers about the construction material, which could raise concerns for reasons such as durability or safety. Concerns translate into negative evaluations – clients would rather buy such a dwelling and be reluctant to live in it with their family. Further, the flat would not give a sense of prestige.

Conclusions

What do these results mean? Firstly, it is difficult at this stage to say unequivocally whether container housing can become a segment seriously considered in the context of meeting housing needs in Poland. On the one hand, the results indicate that there are serious doubts about this (small number of offers, low customer interest, little knowledge of the subject, customer fears). On the other hand, container flats can be visually attractive to customers, they are full-featured, and, most importantly, they are definitely cheaper than those built with traditional technologies. These could be the factors for the potential success of this market segment, perhaps even on such a scale that more mass production of this type of housing would become the so-called ‘game changer’ of the market. For this to happen, however, it is necessary to raise people’s awareness, promote this type of construction (including showing positive examples from abroad), and reduce fears and doubts about living in container buildings.

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Research Ethics Committee

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Conflicts of Interest

The authors declares no conflict of interest.

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Data Availability Statement

All data will be available and shared upon request.