

# Evolution of Factors Hindering Innovation Adoption by Residential Developers in Poland

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## ABSTRACT:

Innovations in the real estate market stimulate pro-ecology, energy efficiency, ergonomics and renewable energy sources. They make economies develop by creating increasingly better conditions for people, thus contributing to the increase in the competitive position of regions and stimulating sustainable development. The aim of the article is to identify factors influencing the counteraction of the implementation of innovations by developers implementing multi-family, multi-storey housing projects on the real estate market in Poland. Data for achieving the goal was obtained primarily from a survey conducted in 2020 and then in 2022 using the CATI - computer-assisted telephone interviewing method - in Poland. The paper presents barriers to the introduction of innovations as well as factors stimulating them. In addition, an attempt to indicate the most important areas related to the activities of housing developers that inhibit the development of innovations on the real estate market in Poland was made. The above was confronted with new EU regulations which will be a factor forcing the introduction of innovations in residential construction, in the field of energy efficiency. The study also contains general recommendations regarding the necessary changes that should take place in order that housing developers in Poland start to implement more innovations into their projects.

*Keywords: RES, innovation, housing developer, residential construction, sustainable development*

## 1. Introduction

Since 2004, after Poland joined the European Union (EU), the tempo of change in the Polish economy, and also in the global economy, has become a driver of development of the economy. Primatively, this development in Poland was driven by common market within the European Union, namely the free flow of goods, services, people and capital, thus creating a single internal market for the Union. (Internal Market, 2023).

Nowadays, it is becoming increasingly clear that there is a huge interest in the issue of innovation, which is a consequence of the progress of civilization, characteristic of the 21st century. The pursuit of innovative development induces an increase in labor efficiency and productivity, promotes a culture focused on innovation, modern technologies, products and solutions, while taking into account the aspects of sustainable development, which translates into the development of more environmentally friendly solutions, while meeting the needs of the society. Within the EU, innovation is seen as a main point for EU competitiveness in the international markets. Article 173 of the “Treaty on the Functioning of the European Union” (Art. 173, 1016) states that “The Union and the

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Member States shall ensure that the conditions necessary for the competitiveness of the Union's industry exist". The innovation policy consistent of many EU strategies, with the Lisbon Strategy (2000) of 2000-2020, the Europe 2020 Strategy – a strategy for sustainable growth (a - European Commission, 2010) from 2010 to 2020, and now within the initiatives like the “Green Deal” and “Fit for 55”, the strategies of the Renovation Wave or the new action plan for a circular economy strategy, the European Union is clearly emphasizing ecological, and sustainable development, to achieve climate neutrality, which can be obtained by the implementation of innovation (European Commission, 2023).

The European Union's strategy and regulations clearly emphasize sustainability, green transformation and the achievement of climate neutrality, in which helps development of innovations. This means that the development of the green transition will have a major impact on the construction sector, as it has a high rate of energy consumption and emits a large amount of greenhouse gases. Buildings account for 40% of EU energy consumption and 36% of direct and indirect energy-related greenhouse gas emissions. In the EU's efforts, sustainable construction has the main industry with a key role in saving energy, using renewable energy, reducing greenhouse gases emission, and improving the health and wellness of building users.

The war in Ukraine, is also a strong cause and driver of searching innovations towards the residential market. Russia's invasion of Ukraine, that began on 24 February 2022, has caused major negative consequences for the entire global economy, the EU economy, and especially in countries in the immediate vicinity of the conflict, such as Poland. The price of commodities, especially energy ones, like oil, natural gas and coal, increased very rapidly. This stroke the European Union countries directly, as Russia was a key supplier of energy resources to the EU., which, combined with successive restrictions, like the embargo on the import of raw materials from Russia, caused a sharp rise in their price, along with the energy security risks. The above was additional element in the rising role of innovation, including climate innovation, as well as energy security. On the other hand, this situation limits introduction of others then connected with energy efficiency, innovations. The war in Ukraine was also one of the factors which engine increase in prices, i.e. inflation, which reached in Poland in 2022/2023 a maximum of 18.4%. (GUS,2025) High inflation caused wage pressure - also in the construction sector, and an increase in interest rates. High interest rates significantly limited the lending activity of banks, including mortgage loans. This caused construction costs to grow significantly and decrease of demand driven by, among others, mortgage loans. Such a situation limits the number of new housing project, and usually drives market down because of low demand, what makes developers not to introduce innovations in their new projects.

As a result of changes in the geopolitical situation, and consequently also in the economic situation and especially inflation, changes in external factors are taking place, influencing the implementation of innovations in residential construction. The construction industry, which is one of the most important elements of the economy, represents one of the sectors highly affected by the negative effects of rising prices. Therefore, in order to enable the healthy development of the residential real estate market, including innovative, sustainable projects, broadly understood stabilization is necessary. Stabilization in this context concerns both the geopolitical situation, the country's internal policy (legal and political risk) and the macroeconomic situation.

It seems surprising that after 20 years of free market in Poland, after its accession to the European Union, the Polish economy – especially in the real estate sector, the level of innovation is significantly different not only from the EU economy, but also from the world economy. The relatively low level of innovativeness of the economy and enterprises can be illustrated by considering information on research and development (R&D) expenditures (Report of the Digital Poland Association, 2024; European Commission, 2023).

Poland has seen significant year-on-year growth in research and development (R&D) activity. The latest up-to-date data published by the Central Statistical Office of Poland (GUS, 2022) shows that Poland's gross domestic expenditures on R&D are steadily increasing, and today reach more than 44.7 billion zlotys. For comparison – just seven years ago, this spending was only 18.1 billion zlotys, i.e. less than half of that. Since Poland joined the European Union in 2004, R&D investment has increased as a percentage of national GDP – from 0.55 percent to 1.46 percent in 2022. (Polish Development Fund Report, 2024).

In addition, the number of employees in the most innovative industry – information and communication technology (ICT) in 2023 in Poland was 4.3, while in the EU – 4.8. The aggregate innovation index for Poland was 72.5 this year, for the EU – 110, for the EU innovation leader Denmark – 150. 42.7 is the rating of attractiveness of research systems for Poland.

R&D expenditures in EU countries in 2022 (% of GDP) in EU, 2.24% GDP; POLAND - 1.46 % GDP.

The financing structure of R&D expenditures, which are mainly funded from the state budget, is also unfavorable (Chądzyński, 2011), while in the countries with highly developed economies, it is the companies themselves that mostly fund this type of activity. Analysis conducted primarily by public entities, such as the Central Statistical Office of Poland (GUS), or the National Bank of Poland (NBP), concerning the Polish housing sector, mainly indicates that the low of Poland's housing stock is low. The housing situation in Poland is one of the worst in Europe. Thus, it is possible to notice a clear absence of a diagnosis of the housing situation in comparison with the European housing market.

Taking into account the data on the housing stock, the number of households, as well as the reported estimate of unoccupied housing (11%) in the last census, and the current situation in the real estate sector, it is clear that there is a massive housing deficit of 2.4 million units (GUS, 2022).

Thus, the current situation in the residential real estate sector in Poland has become a motivation to undertake an analysis of the process of gradual changes in the factors inhibiting innovation.

## 2. Literature Review

The main market definition is provided by the Oslo Manual (OECD/European Union, 2018):

“A new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).”

Within the EU, such an innovative product plays a key role for EU competitiveness in international markets.

The European Union and its 27 member states are actively participating in the preparation of a series of specific documents to bring about a change in socio-economic practices and promote sustainable development. The impact of the European Union on the construction and real estate markets is going to be significant. The most important documents currently being developed are:

**Fit for 55 package**, (European Parliament; b-European Commission, 2021; POBE, 2021; c-European Commission, 2021).

The European Union has set itself the goal of achieving climate neutrality by 2050 and reducing emissions by at least 55% by 2030 compared to 1990. Unfortunately, current regulations do not allow these goals to be achieved. According to the EC's analysis, the current policy framework is inadequate, so emissions are projected to be reduced by only 40% by 2050 (European Parliament).

In order to achieve the climate goals of the European Green Deal and the 2030 Climate Plan), the European Commission included the Fit for 55 (b- European Commission, 2021) legislative package in the Commission Work Program.

As part of the Fit for 55 package, the European Commission has planned revisions to many regulations, which will accelerate significant reductions of emissions, and the use of clean technologies (POBE, 2021). Due to the low level of pollution abatement in the real estate market, the following are planned for it (c-European Commission, 2021):

- creating a separate Emissions Trading System (ETS) for emissions from fuels used in construction,
- increasing the use of RES in buildings to 49% of energy by 2030,
- removing tax exemptions for high-carbon fuels used in construction,
- increasing the rate of renovation to at least 3% per year for the total area of all public utility buildings,
- reducing primary energy consumption (-39%) and final energy consumption (-36%) by 2030.

**Renovation Wave Package** (d-European Commission),

In September 2020, the European Commission adopted the Renovation Wave as a strategy within the European Green Deal, to ensure energy efficiency improvements in buildings and doubling of the renovation rate over the next 10 years. The document specifically aims to mobilize reduction efforts in the construction industry, which is responsible for about 40% of energy consumption and 36% of greenhouse gas emissions in the EU (e-European Commission). The current pace of renovation: 1% per year is not sufficient to achieve climate neutrality in 2050.

**Green Deal Package** (Green Deal, 2022),.

In connection with the ambitious plans for the European Green Deal, the EC has put forward the following non-binding targets for buildings:

- reducing greenhouse gas emissions from buildings by 60%,

- reducing energy consumption for heating and cooling by 18%, and final energy consumption by 14%;
- renovating ca. 35 million buildings by 2030 and continuing further deep retrofits to support the achievement of climate neutrality in 2050;
- doubling the annual rate of energy renovation of residential and non-residential buildings by 2030;
- accelerating the integration of renewable energy sources, developing local energy communities and promoting greater use of waste heat,
- applying circular economy principles to building renovation, especially in the scope of materials.

**Package including a new action plan for a Circular Economy** (g-European Commission),

The new Roadmap for a circular economy predicts that global consumption of materials (metals, fossil fuels and minerals) will double over the next 40 years, while waste generation will increase by 70% by 2050). The action plan prepared sets a reduction path for the consumption footprint and proposes solutions that will double the rate of material use in a circular economy in the coming decade. The benefits will be felt especially by manufacturing companies, which spend ca. 40% of their costs on materials.

Having analyzed the housing stock in Poland in 2020, selected characteristic housing issues are presented against the background of the European housing sector. The housing stock in Poland is presented in comparison with Europe (own research based on: (Samorek, Cichocki, 2022):

**- Housing ratio per 1,000 people**

**Poland: 392.4    Europe: 495.0    Min. Slovakia: 381.5    Max. Portugal: 581.9**

Poland has the second lowest rate of satisfaction of housing needs within the EU, but nevertheless the situation is improving steadily. In Poland, one of the main housing problems is the housing deficit (Samorek, Cichocki, 2022)). The housing gap, i.e. the difference between the number of households and the occupied housing, is estimated to be about 2,300,000 units in 2020.

**- Spending on housing construction**

**Poland: 1.9% GDP    Europe: 5.4% GDP    Min. Greece: 1.1% GDP  
Max. Cyprus: 7.6% GDP**

The share of housing construction in GDP creation in Poland is among the lowest in the European Union. It is almost three times lower than the European average and nearly four times lower than the level of Western European countries.

**- Rise in housing prices (between 2015 and 2020)**

**Poland: 35%    Europe: 27%    Min. Italy: 0.4%    Max. Hungary: 78.6%**

There was a marked increase in housing prices in EU countries in 2015-2020. In Poland, prices in the housing market increased by more than 35% since 2015. In Europe, the average was just under 27%. The lowest housing price growth was recorded in Italy (0.4%) and Finland (6.7%). The highest price increases affected Hungary (78.6%) and Iceland (57.8%).

**- Housing overcrowding rate**

**Poland: 36.9%    Europe: 17.5%    Min. Cyprus: 2.5%    Max. Romania: 45.1%**

According to Eurostat data, in 2020 Poland ranked 4th among EU countries in terms of the overcrowding rate. Only Romania (45.1%), Lithuania (42.5) and Bulgaria (39.5%) were ahead of Poland. The rate for Poland is more than half that of the average of the 27 EU countries (for Poland in 2020 it was 36.9%, the EU average – 17.5%).

#### **- Apartment area per person**

**Poland: 24.3 m<sup>2</sup> Europe: 33 m<sup>2</sup> Min.Slovakia: 16.4 m<sup>2</sup> Max.Norway: 46.9 m<sup>2</sup>**

In Poland in 2020, the size of an apartment per person in a household was 24.3 m<sup>2</sup>, while in Europe it was more than a quarter more – 33 m<sup>2</sup> Northern Europeans, including Norwegians (46.9 sqm) and Finns (45.4%), have the largest statistical area of housing, while Slovaks (16.4 sqm) and Cypriots (20.8 sqm) - the smallest.

An analysis of Poland's housing stock in 2020 against the European housing sector shows a significant housing deficit, severe overcrowding (Poland – 36.9%, European average – 17.5%) and low financial and credit availability of housing – that is, it shows a large rent gap. According to the Habitat for Humanity Foundation, as many as 60% of Polish households cannot afford to buy a home or meet their housing needs under market conditions (Habitat for Humanity Poland, 2020).

Considering the large rent gap in Poland in 2022, as reported by the Habitat for Humanity Foundation, it should be noted that a comparison of the first half of 2022 and 2021 shows an overall decrease in the number of building permits issued, especially for single- and multi-family residential buildings (GUNB, 2022). Building permits, including for construction of single-family houses, notifications of construction with designs to the architectural and construction administration departments, and construction facilities handed over for use in total, showed a marked decrease compared to the first half of 2021. In H1 2022, the number of multi-family buildings handed over for use was 2,669, while in the same period of 2021, 3,288 such structures were handed over, more than 18% less.

Thus, taking into account the housing stock in Poland in 2022, the low financial and credit availability of housing – the rent gap<sup>1</sup> and EU regulations on the actual threats related to negativ climate changes, the Author try to analyze the problem of implementing innovations to the residential market.

### **3. Material and Methods**

The study of innovation level, directed to developers of the primary residential market, the investigates changes in market environment and barriers for implementation of innovations, was based on a survey conducted among developers in Poland. The survey was conducted using CATI method, which is exactly computer-assisted telephone interviewing method. The survey focused on housing developers who introduce multi-story, multi-family projects on the real estate market. The first survey was conducted in August 2020, when a general population of housing developers was identified as 314 entities. Author gained answers from 130 developers as a research sample. After 2 years the research was repeated by conducting another survey, also with CATI method, in

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<sup>1</sup> The rent gap is understood as the percentage of people whose income does not allow them to buy or rent an apartment on the market, while the salary they receive does not qualify them to take advantage of rent-reduced housing(Habitat for Humanity Poland, 2020).

October/November 2022. This time the general population was identified as 280 developers and the responses was obtained from 98 entities - the research sample. Both researches wasn't limited to the companies size of employment, because on the analyzed market also small companies conducts big multi-story, multi-family projects using subcontractors. The research allowed to identify, analyze developers' perceptions of innovation and gradual changes in the factors that inhibit it.

#### 4. Results and Discussion

The analysis of survey data over the period of 2020-2022 (Sitek 2020; Sitek 2022a; Sitek 2023b) demonstrated the impact of the scope of developers' activity on implementation of innovations. An analysis of the results of the 2020 and 2022 surveys, allows the comparison of the percentage level of developers introducing innovations in the residential market in Poland (fig. 1)

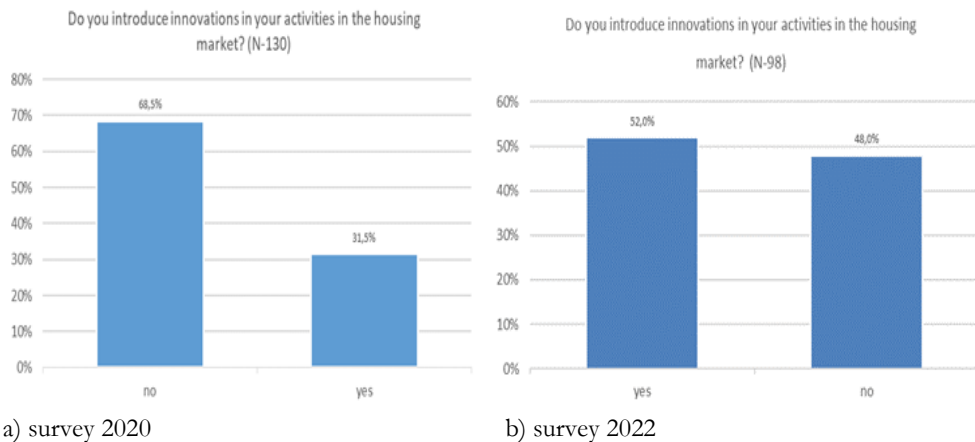


Figure 1. Do you introduce innovations in your activities in the housing market?

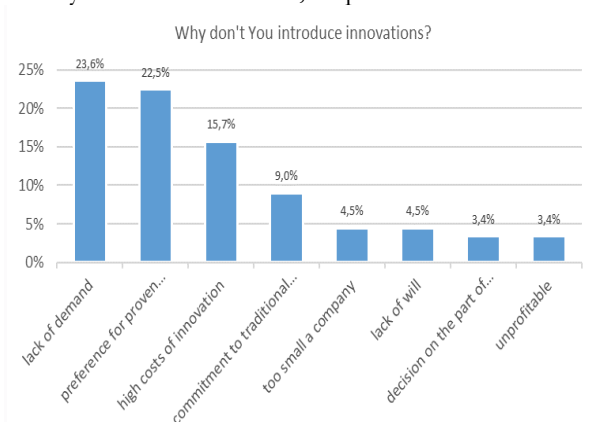
Source: own work.

The questionnaire survey presented showed that the low share of entities declaring implementation of innovations in 2020 was determined, first of all, by 3 key determinants, i.e. lack of demand – 23.6%, followed by preference for proven solutions – 22.5% and high cost of innovation – 15.7%.

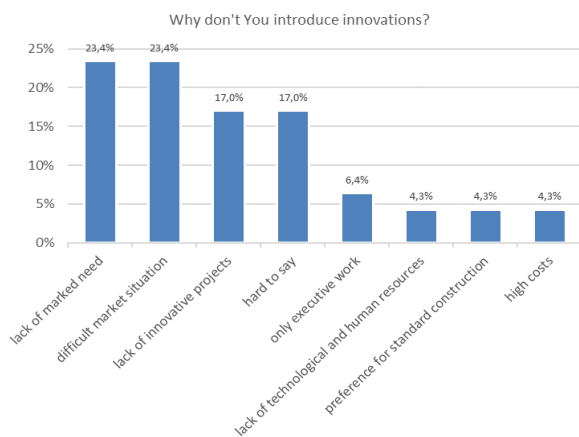
In 2022, in turn, developers ranked lack of need for innovation in their business as the top 3 factors of not implementing innovations in their business - 23.4%, difficult market

situation 23.4% and lack of innovative projects, respectively. First of all, this presents that consciousness of the need for housing developers to innovate is high, resulting in an increase in the companies stating that they implement innovations. Second, that inspite of the continuing lack of demand/need and preferencing standard solutions in 2022, high expenditures on innovations have not been one of the key factors of lack of innovation introduce.

In addition, comparing the 2020 and 2022 surveys (fig. 2), it can be observe that in the survey conducted in 2022, respondents indicated a difficult market situation.



a) survey 2020



b) survey 2022

Figure 2. Why don't You introduce innovations?

Source: own work

This situation is determined by the consequences of the war in Ukraine, high inflation, high interest rates and thus limited access to mortgages. This means an increase in construction costs and a decrease in demand for apartments. Low demand was driven, on the one hand, by high prices on the housing market resulting from high prices of construction materials and on the other hand by limited access to the mortgages.



With regard to innovations introduced, developers pointed that the most frequently implement innovations are in the group of technical and technological (product) innovations (36.52%), marketing innovations (32.17%), financial innovations (20%) and process and organizational innovations (27%). The most frequently introduced innovations are the ones from group of the technical and technological (product). Furthermore, developers recognize the advantages of implementing innovations. Moreover, they realize the need of introduction innovations and the risk of bankruptcy if innovations are not implemented. In addition, responders recognize the advantages of innovative projects, and notice the risk of not introducing them, especially in the long term, as they reveal in their strategies. Why, then, did about half of them admit innovations weren't being implemented? It seems plausible to conclude that the broader market has not exerted adequate pressure on them to prompt them to compete more by using innovations.

The most important determinant pointed by developers in both surveys, i.e. lack of need/demand, turned by 180 grade in July 2023 due to the adoption of the Energy Efficiency Directive (fig 3). It enforces such a need, i.e. it imposes the need for sustainable buildings, where houses should be energy efficient and even generate an energy surplus obtained from renewable sources.

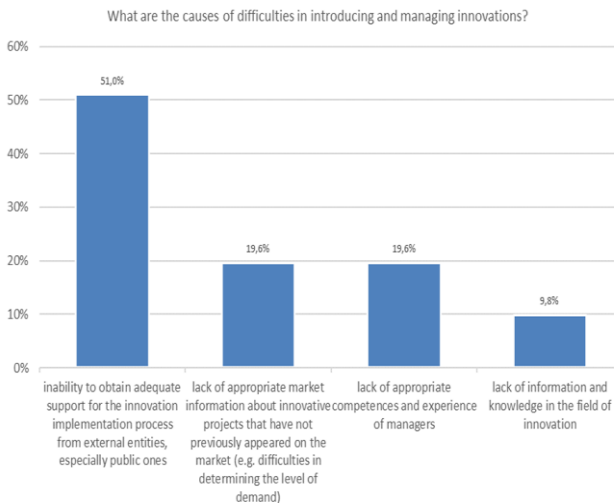


Figure 3. What are the causes of difficulties in introducing and managing innovations?

Source: own work

At the same time, the results of empirical studies indicate that there are many barriers to innovation for Polish companies.

Surveys also carried out by various centers show that the most serious barrier is the lack of financial resources, problems with obtaining credit, and high interest rates, a high degree of uncertainty, legal acts, standards, regulations, lack of a broad understanding of the

market needs in terms of information and new technologies and the possibility of cooperation with other institutions, and a low level of funding for R&D.

The main ones include mentality – i.e. the way people think about innovation – and, of course, time – which plays a significant role in the scope of ideas, research, testing and implementation.

Also, studies conducted in European countries confirm that the main barriers to innovation are lack of financial resources, high risks and costs of innovation, and lack of intellectual property rights (Tiwari, Buse, 2007).

Somewhat different aspects are highlighted by the results of the Harris Interactive (PARP 2023) study in July 2010 in the United States, the 5 most significant barriers to innovation in companies are too much pressure to achieve short-term goals (quick result), other business goals are prioritized, lack of time, incentives to inspire and reward innovation, lack of systems and tools to support innovation.

As the presented research shows, the main factor determining the low level of innovation in the residential real estate market in Poland is the lack of demand for innovative, sustainable construction. This situation is caused by buyers choosing cheaper, more affordable apartments rather than more expensive, ecological and at the same time innovative ones. This is caused by the constantly rising prices of apartments which very often make it impossible to buy more expensive innovative apartments (fig. 4). The average Pole has a problem with obtaining a mortgage loan to buy an apartment in standard construction, thus there is no possibility of choosing an apartment in sustainable construction. The demand gap on the real estate market in Poland presented in the literature review allows us to assume that real estate prices should not fall significantly in the coming years. Therefore, government intervention is needed to close the demand gap, but it should be well-thought-out and promote sustainable construction. The last government program "safe credit 2%" allowed the purchase of a first apartment based on financing with a mortgage at a fixed rate of 2% for a period of 10 years, after which the interest rate changes to a variable one. The effect was a dynamic increase in market prices and, as a result, an even greater limitation of the possibility of purchasing apartments after the expiry of the program, which financial pool - PLN 13.6 billion - ended after six months.

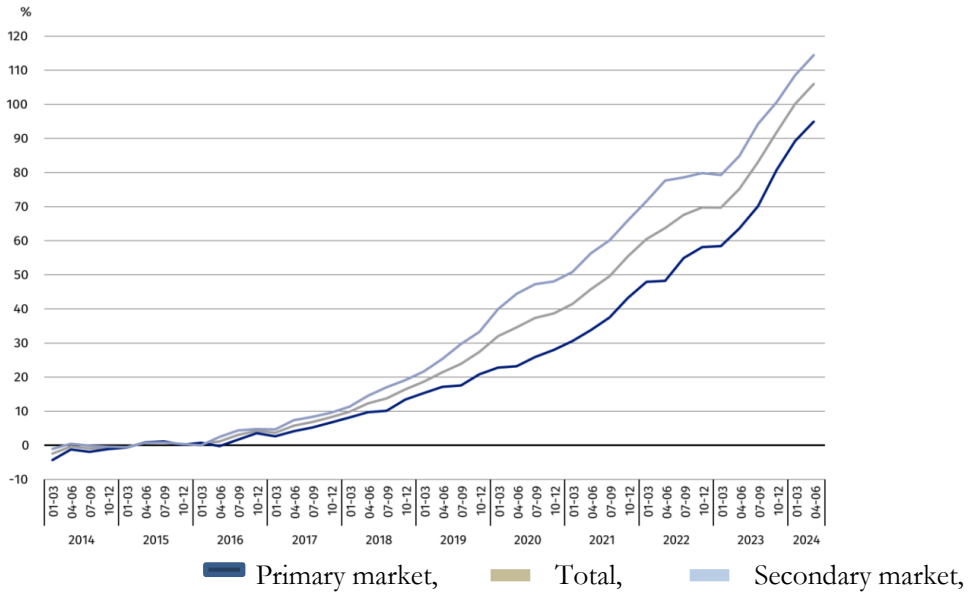


Figure 4. Quarterly changes in apartments' prices compared to 2015

Source: GUS (2024).

The housing shortfall should be reduced by government interventions, however programs should be directed to supply not demand. Based on international experience, the following initiatives can be proposed to support the development of the housing market, but within the framework of sustainable construction using innovations:

- Government subsidies and grants - financial support for projects to build, not buy, sustainable housing properties. Subsidies for loans for the construction of sustainable houses for investors would increase supply and allow for offering sustainable flats at a lower price - in Germany government subsidizes building of passive houses (Federal Ministry n.d.; Bundesministerium fur Wohnen n.d.)
- Tax incentives - tax credit for investors building sustainable houses. In Poland, after the political and economic transformation in 1989, there was a construction tax credit under which the investor could deduct all expenses for the construction of residential buildings incurred in 1992-1996. Currently, the tax credit should apply to sustainable construction and should not cover all expenses but only the part concerning innovative solutions. (Kochański & Partners, 2023).;
- Building regulations and standards - as presented in the literature review, the EU, by introducing appropriate regulations, especially the Green Deal, will force the construction of sustainable, energy-efficient housing. In addition, regulations on sustainable finance will oblige banks to finance sustainable construction. (Wyszkowski, 2024).
- Public-private partnership - a broad initiative used in many countries, which involves combining private and public resources in order to implement innovative housing projects like in United Kingdom or Canada. In Poland, developers report that it is not is an opportunity to create interesting solutions within the framework of a public-private

partnership, in which a local government unit contributes land or built-up real estate for modernization in order to implement sustainable housing projects (The World Bank, 2025)

- Research and development programs - many countries invest in research and development of new construction technologies, e.g. in the Netherlands research is being conducted on floating houses. In Poland there is lack of initiatives for cooperation between universities, research institutions with entrepreneurs resulting in the development of effective and affordable construction techniques. Companies undertaking cooperation with research centers should indicate problems/initiatives to investigate which, financed from public funds, could then be used in practice The above initiatives are only general suggestions, and the selection and specification of the best one must be supported by appropriate research (Instytut n.d.; Amsterdam n.d.)

## 5. Conclusions

The article identifies the main barriers to innovation in the Polish companies. Among the most frequently cited obstacles were the lack of appropriate government policies, weakness of the science sector or attitude of employees towards the innovations being implemented. However, lack of financial resources was often cited among the barriers, and that barrier is not a concern exclusively for Polish entrepreneurs. This factor is important for the level of innovation also in highly developed countries. In addition to identifying the most important barriers to innovation implementation, the ways of overcoming them have also been presented. A positive impact on reducing barriers to innovation comes from increasing (at least slightly) outlays on R&D activities, and changes in Polish legislation. Avoiding or minimizing failures in innovation implementation are possible with multiple variants, flexibility and actual novelties.

On the basis of literature reports and the analysis of identified barriers to the implementation of innovation into the residential real estate sector in Poland, proposals for solutions to reduce or eliminate the barriers to innovation implementation processes in enterprises, and especially in the residential real estate market, were selected. It seems that their application will contribute to promotion and development of innovations. According to the author, the most important demands include:

- changes in financial support for entrepreneurs,
- removal of the legal provisions that hinder cooperation among entrepreneurs and between entrepreneurs and R&D units,
- placement at universities of standardization laboratories, qualification laboratories, as well as other units supporting scientific research;
- increase in funds allocated by companies for the purchase of licenses or R&D works;
- introduction of innovations by companies in separate subsidiaries or separate units,
- coordination of work (selection and prioritization) in the R&D area – increase in the share of development work;
- clarity and transparency of innovation information for all employees.
- introducing an appropriate government initiative aimed at reducing the demand gap and at the same time increasing the share of innovative residential real estate on the market

The author intends to continue research on the introduction of innovations in the housing market in the context of diagnosing and systemic solving the issue of increasing the level of innovation in the housing market in Poland based on a study of preferences among developers.

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