

## Article

# Understanding Sustainability of Construction Products: Answers from Investors, Contractors, and Sellers of Building Materials

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**Abstract:** Preventing environmental degradation and climate changes are some of the primary challenges of our civilization. Changes to the construction sector, which consumes vast amounts of raw materials, emits significant amounts of greenhouse gas and significant amounts of waste, are very important to reduce emissions and stop negative environmental changes. Regardless of the type of goal, an essential element to achieve it is understanding the purpose and tools necessary to implement appropriate and efficient solutions. This paper presents the survey results on understanding issues related to assessing construction products, including their environmental impact. The survey was conducted among professional groups related to construction, i.e., 181 investors, 522 contractors, and 116 sellers of construction products from various regions of Poland. Questions concerning thermal insulation materials and the external thermal insulation composite system (ETICS), the most widely used solution in the EU for the improvement of thermal performance of buildings, were asked. The obtained results indicate that the knowledge of the basic requirements of construction works under the Construction Products Regulation (CPR) is not too high (the share of correct answers was respectively 33.5%, 23.2%, and 16.2% in contractors, sellers, and investors groups). Similarly, the awareness of the tested, related to the environmental burden in terms of GWP of insulation materials and components of ETICS, should be assessed (49.7% of investors, 57.1% sellers of construction products, and 76.4% contractors indicated the thermal insulation material as the ETICS component with the highest environmental impact in terms of GWP). The obtained research results indicate the need for further education for evaluating construction products and sustainability.

**Keywords:** construction product; external thermal insulation composite system (ETICS); environmental product declaration (EPD); assessment of construction product; basic requirement for construction works; thermal insulation materials; investors; contractors; sellers of construction products



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## 1. Introduction

The European Union (EU), recognizing the importance of climate problems and environmental degradation and understanding the need to urgently intensify actions to reduce the threat not only to Europe but also to the whole world, in December 2019, adopted an action plan called the European Green Deal (EGD) [1]. The goal of the EGD is to transform the EU economy into a modern, resource-efficient, and competitive economy. The plan's primary goals are to achieve a net-zero level of greenhouse gas (GHG) by 2050 and separate economic growth from resource consumption. These activities need to be implemented so that no person or region is left behind. The EGD also aims to help the EU economy recover from the situation arising from the COVID-19 pandemic. For the implementation of the EGD, the European Commission intends to spend one-third of the amount of 1.8 trillion euro earmarked for investments under the NextGenerationEU recovery plan and from the funds from the seven-year EU budget [2]. Specifying further actions in July 2021, the European Commission revealed the plan to meet 55% GHG emission reduction by 2030 compared to 1990 in a fair, cost-effective, and competitive way [3].

The construction sector uses vast amounts of raw materials, emits a significant amount of GHG, and produces enormous waste. In 2019, almost 40% of energy- and process-related emissions came from buildings and the construction sector [4]. In the same 2019, building emissions in the EU-27 amounted to 530 Mt CO<sub>2</sub> eq., for 2020 approximated inventory anticipated the emission of 511 Mt CO<sub>2</sub> eq., and EU plans predict a decrease to 408 Mt CO<sub>2</sub> eq. in 2030 [5]. The scale of the changes made in the past years is better visible, reminding that in 2005 672 Mt CO<sub>2</sub> eq. was emitted from buildings. Taking into account the number of existing buildings in the EU, their standard, the need to renovate and build new ones that meet modern standards, and the fact that by 2050 there are less than thirty years left, this implies a need to renovate more than 90,000 homes per week across the EU [6].

From the construction perspective, achieving the goals set by the EU for GHG emissions by 2050 will be primarily possible by:

- reducing energy use in new and existing buildings;
- optimizing the use of renewable energy sources;
- decarbonizing all energy supplies to buildings;
- minimizing embodied GHG emissions in construction materials and construction works (construction, renovation, and demolition) both in the construction of new and renovated existing buildings;
- reducing GHG emissions from building operations.

The most significant potential for energy savings is reducing space heating purposes. The goals of water heating and lighting and electrical appliances are also necessary. In some climatic areas, cooling consumption is essential [7]. In 2016, in the EU, energy consumption by end-use per dwelling was 1.39 tons of oil equivalent, of which 66.2% for space heating, 15.1% for lighting and electric appliances, 12.9% for water heating, 5.0% for cooking, and 0.8% for cooling [7]. In Poland, Germany, and Cyprus, the share of space heating in total energy use consumption by end-use per dwelling in 2016 was 68.5%, 68.0%, and 33.3%, respectively [7].

Between 1990 and 2016, the energy efficiency of households in the EU-28 improved by 35% [7]. During the same period, energy consumption for space heating per dwelling dropped by 24.5%, while per 1 m<sup>2</sup> by 31.9% in the EU-28 [7]. Energy efficiency improvements in space heating result from the better thermal performance of new and renovated buildings resulting, first of all, from the EU mandatory regulation in this area [8–11]. Very well insulated buildings are currently nearly zero GHG emission buildings. Considering very well insulated buildings in the EU, we understand complex systems, i.e., insulation of external walls, energy-efficient space heating/cooling, well-controlled natural or mechanical ventilation, high thermal performance windows, self-generated renewable electricity, and heat, and more often on-site electricity and heat storage.

In the European market, the most widely used solution to increase the thermal resistance of walls is the external thermal insulation composite system (ETICS). Despite COVID-19 restrictions, the European market together with Russia in 2020 was estimated at a record number of 332 million m<sup>2</sup> of insulated external walls of buildings with the share of the two the most important thermal insulation products used in ETICS, i.e., expanded polystyrene (EPS) and mineral wool (MW) equal to 80% versus 15% [12]. ETICS, used for the first time in 1957, is a well-known and proven solution to improve the energy efficiency of buildings in Europe. The inspections of hundreds of ETICS insulated buildings carried out in 1975–2004 clearly showed that damage or degradation of ETICS facades does not occur more often than in the case of conventional rendered masonry walls. Furthermore, other durability aspects, costs, and frequency of maintenance for ETICS are comparable to traditional solutions. Only in terms of susceptibility to the growth of microorganisms, a slightly higher probability of this phenomenon was observed in the case of ETICS compared to non-insulated walls [13]. The market success of the ETICS is also because the installation itself is relatively quick, and possible runtime errors and imperfections are also well identified [14–17]. Due to changes in the formal requirements and market expectations, ETICS manufacturers systematically improve the offered solutions, according to the

research published by academia [18–22]. ETICS is still an innovative solution. There is no European harmonized standard, despite many years of work of CEN/TC 88/WG 18. ETICS manufacturers need to obtain a European Technical Assessment (ETA) to assess and verify the constancy of performance (AVCP) of a construction product such as ETICS and CE mark it [23]. Until 29 October 2020, the basis for AVCP was ETAG 004 [24], and as of that date is the European Assessment Document EAD 040083-00-0404 [25]. It is also worth mentioning that ETAG 004, which was the basis of AVCP for ETICS for almost twenty years, and EAD 040083-00-0404, defined ETICS as a set of components specified by one type of thermal insulation product. This fundamental requirement that prevents obtaining an ETA for ETICS consisting of various thermal insulation materials is virtually unnoticed by academia [26]. Of course, there are different thermal insulation materials on one facade in real life, but this is due to other regulations, e.g., fire safety.

ETICS should not be considered only to improve the energy efficiency of buildings by reducing the need for operational energy. It is the essential dimension of the use of ETICS, but ETICS should also be seen as any other construction product. Its assessment should comprise its entire life cycle. To improve the energy efficiency of buildings, ETICS is constantly developing in connection with the legal regulations on the energy performance of facilities present in the extent of legislation at the EU and national levels. Unfortunately, much less is constantly devoted to the entire life cycle issues. Yet, issues associated with minimizing embodied GHG emissions in construction materials are essential dimensions of the fight against climate change, environmental degradation, and sustainable resource management [27]. One of the reasons for this state of affairs is the fact that the assessment of construction products in the field of sustainable use of natural resources in the construction regulations appeared on 1 July 2013, i.e., on the date when the Construction Products Regulation (CPR) came into force [23]. In addition, the sustainability assessment of construction products is not obligatory. The current work on harmonization of sustainability requirements does not indicate that significant changes in this area are to occur quickly [28]. Admittedly already in 2004, the European Commission issued a standardization mandate to CEN to develop horizontal standardized methods for assessing the integrated environmental performance of buildings [29]. Eight years later, i.e., in 2012, EN 15804 was published—the European standard for developing the environmental product declaration (EPD) of building materials [30]. According to the authors of the EPD concept, it should provide data on a construction product's influence on the environment at various stages of its life in a transparent, reliable, quantified, and comparable way [31,32]. Since 2011, parallel activities, initiated by the European Commission, aimed to develop the Product Environmental Footprint (PEF) and Organization Environmental Footprint (OEF) methods—another alternative approach to sustainability issues in construction [33]. The comparison between the PEF method and the EPDs based on Product Category Rules shows that having different requirements of both ways makes results impossible to compare. Therefore, alternative use of PEF and EPD is also impossible [34].

However, despite the efforts of many construction products market actors, the reality is far from ideal. The data quality of many EPDs often varies so much that it leads to confusion and misunderstandings [26,35,36]. In addition, extensive complex data quantifying the environmental impacts of construction products are challenging to understand and often discourage actors in the construction sector from the more profound analysis [37,38]. Additionally, comparing data from EPDs is difficult due to geographical (local) context [39] and data changing over time [40]. The simplification of EPD's data is needed to reach individual market actors with a clear message effectively [26,41]. It is no different in the case of thermal insulation materials, where additionally, not always fully defined, the functional unit often introduces misunderstanding [42,43] and ETICS, for which not so many EPDs and scientific publications have been published [26]. From the EU perspective, expanded polystyrene (EPS) is the most widely used thermal insulation material in ETICS, followed by mineral wool (MW) and extruded polystyrene (XPS). The use of other materials is still negligible [12]. In the context of minimizing embodied GHG emissions in

construction materials, it is impossible to achieve a zero or negative result. Only increasing the use of plants and wood instead of the traditionally used thermal insulation materials can significantly reduce the embodied GHG emissions. Such materials are subject to an environmental impact assessment [43–50]. However, their massive market share requires time and user acceptance, and this ambitious goal is far away, if at all possible.

As indicated above, the construction sector, including construction products, is of fundamental importance for implementing the plans related to reducing GHG emissions and reducing the negative environmental impact. Understanding the principles of assessing construction products and their effect on the environment is the first step to achieving ambitious goals. Because sustainable development has been the subject of our attention for a long time, the European Commission launched activities in the standardization area in 2004 [29]. From 2012 it is possible to evaluate the product, including construction products, following EN 15804 [30], and develop EPD. We also know much about the imperfections of EPDs themselves [26,35–40]. It is essential to diagnose where the construction sector and people professionally associated with it are today to understand the impact of construction products on the environment. This paper presents the results of a survey conducted among investors, contractors, and sellers of construction products on selected issues in the field of construction products assessment and the knowledge of the environmental impact of ETICS and ETICS components. Information about the perception of environmental problems by construction products market actors is essential because, despite the considerable activity of industry, scientists, and politicians concerning sustainability, one can often have the impression that there is progress, but only in terminology itself [51]. So far, studies on the knowledge of the CPR basic requirements for professional groups related to construction were not published. The research results presented in this paper are the first ones in this respect. Similarly, the research results on the perception of the environmental dimension of ETICS by contractors, sellers of construction products, and investors have not been published yet in scientific journals.

## 2. Materials and Methods

The study using a non-random sampling technique in three groups related to the construction process: investors, contractors, and sellers of construction products, was performed. Purposeful selection (arbitrary, discretionary, selective), which is the most typical case of non-random choice among non-probabilistic selection techniques, was used in the study [52]. The study was conducted at the turn of 2020 and 2021. The authors used the database of investors, contractors, and sellers of construction products of one of the Polish key manufacturers of building materials.

The investors' database consisted of 479 items, including developers building single- and multi-family residential buildings, housing cooperatives, public utility buildings' investors, and investors of industrial facilities. The selected investors base represents all the types of investors mentioned above. Their companies are of different sizes and come from other geographic regions of the country. Database of contractors included nine thousand three hundred sixty-nine items. The survey authors selected companies to represent geographically different country regions and various size locations, e.g., large cities, towns, and rural communes. The third criterion in the case of contractors was the purchase value of construction products—from EUR 1000 up to approximately EUR 200,000. The survey authors selected sellers of construction products from a database of 280 companies. The selection criteria were geographic location and the purchase value of construction materials—from EUR 5000 to EUR 14 million. As in the case of the last two groups, the authors selected sellers of construction products to represent all possible cases in the sample evenly.

The sampling technique and sample size determination are crucial in survey-based research problems. We used non-random sampling to avoid the situation where the technique or the sample size is inappropriate, leading to erroneous conclusions. In the non-random sampling method, we considered all possible units included in the study. However,

due to their diversity (a large company, a medium company, a small company, a company located in a large city, in the countryside, in the south of Poland, in the north of Poland), we did not analyze individual subgroups, believing that it could lead to erroneous requests. Additionally, dividing each of the analyzed groups (contractors, investors, and sellers of construction products) into subgroups in a situation where the size of the groups is different would create a position in which it would be difficult to make a reliable comparison. The division of three groups, as performed, although different in number, made it possible to compare the obtained results at the same specified level of certainty. Further analysis resulting from the division of each of the surveyed professional groups into subgroups would not allow for a comparison at a satisfactory level of confidence.

The sample size of each of the studied groups was determined under the formula for calculating a sample for proportions Cochran [53] given in Equation (1):

$$n_0 = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p(1-p)}{e^2 N}\right)} \quad (1)$$

where:  $n_0$  is the sample size,  $z$  is the selected critical value of desired confidence level,  $p$  is the estimated proportion of an attribute present in the population,  $e$  is the desired level of precision.

According to the Cochran assumption, when the population is finite and refers to a small population, the sample size may be slightly reduced [53]. In the modification of the Cochran formula for a smaller population, the sample size is calculated according to the formula given in Equation (2):

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}} \quad (2)$$

where:  $n_0$  is the sample size derived from Equation (1),  $N$  is the population size.

Table 1 summarizes the size of its base for each of the surveyed professionals, the size of the test sample calculated for the desired confidence level of 95% and  $\pm 5\%$  desired level of precision (margin of error), and the size of the sample size calculated using the Cochran formula for the small population. The last column of Table 1 shows the number of participants to whom the survey was directed.

**Table 1.** Population size, the sample size, the sample size for the finite small population, the sample size as defined by the authors of the survey divided into the researched professional groups.

Professional Group	Population Size, $N$	Sample Size Equation (1), $n_0$	Sample Size Equation (2), $n$	Real Sample Size
Investors	479	213	147	181
Constructors	9369	369	355	522
Sellers	280	162	102	116
Total				819

The survey was in the form of a questionnaire interview. The interviewer asked questions from the questionnaire, marked the answers, or left the questionnaire to the interviewee, who completed the answers themselves. In both cases, the questions were asked/arranged in the same order, and the questions contained in the questionnaire were closed, i.e., there was always a finite number of answers.

Before starting the survey, all survey participants received a cover letter containing basic information about the survey, such as: who is doing it, what is the purpose of the study, what other professional groups were included in the study, how the results obtained from the survey will be used, and information on anonymity respondent. Additionally, interviewers (technical and sales representatives of the manufacturer) answered questions from the respondents if they appeared.

The study's authors selected 819 respondents, i.e., 181 investors, 522 contractors, and 116 sellers of construction products.

### 3. Results

Table 2 shows the non-respondent rate in the individual surveyed groups of professionals. As previously stated, a confidence level of 95% and  $\pm 5\%$  precision level characterized the calculated sample size for each of the surveyed professional groups. In individual professional groups (investors, contractors, sellers of construction products), 8, 39, and 4 respondents did not answer the questionnaire. It is worth noting that the number of respondents in each group determined by the study's authors was more numerous than the required number of respondents for a given database size, calculated using Cochran's formula for the small population (Equation (2)). Reducing the number of investors, contractors, and sellers of construction products and those who did not respond, we attained the number that responded. These numbers are also higher than the number of respondents required by Cochran's formula for the small population (Equation (2)). According to Cochran's formula for the small population, more respondents than required means that the results were obtained with more minor errors than the assumed confidence level of 95% and  $\pm 5\%$  precision level.

**Table 2.** The sample size for the finite small population, the real sample size, and non-respondent rate divided into the researched professional groups.

Professional Group	Sample Size Equation (2), $n$	Real Sample Size	Non-Respondent Rate, %
Investors	147	181	4.42
Constructors	355	522	7.48
Sellers	102	116	3.45

The results of the study will be further analyzed against the final sample size (only respondents who answered), i.e., investors—173, contractors—483, and sellers of construction products—112, and are summarized in Table 3.

**Table 3.** The questionnaire obtained survey results (questions and answers) in individual professional groups, i.e., investors, contractors, and sellers of construction products.

No.	Question	Investors (173)	Contractors (483)	Sellers (112)
1.	From the following requirements, highlight those that are basic requirements for construction works under Regulation (EU) No 305/2011 of the European Parliament and of the Council (CPR):			
	• mechanical resistance and stability	117	393	76
	• safety in case of fire	131	401	83
	• hygiene, health, and the environment	116	357	71
	• safety and accessibility in use	125	385	73
	• protection against noise	111	331	69
	• energy economy and heat retention	129	404	82
	• sustainable use of natural resources	108	329	68
2.	Do you know the environmental burden of global warming potential of 1 m <sup>2</sup> of the ETICS?			
	• Yes	87	131	37
	• No	86	352	75

Table 3. Cont.

No.	Question	Investors (173)	Contractors (483)	Sellers (112)
3.	Manufacturing which thermal insulation material has the most significant negative impact on the global warming potential:			
	• EPS	30	163	27
	• XPS	100	218	66
	• MW	43	102	19
4.	Production of which ETICS component has the most significant negative impact on the global warming potential:			
	• adhesive for bonding	6	13	9
	• insulation material	86	396	64
	• glass fiber mesh	61	74	29
	• adhesive for a base coat	13	15	1
	• finishing coat	7	12	9

#### 4. Discussion

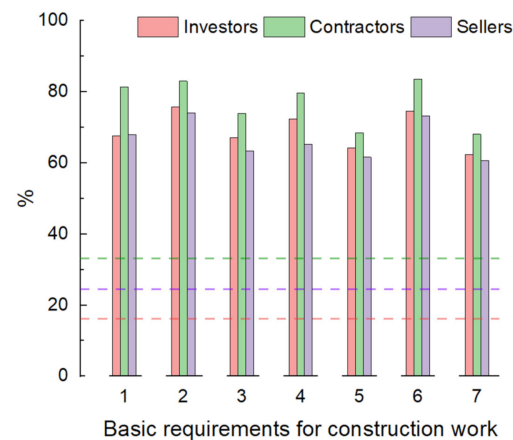
According to the requirements of the CPR, which regulates the entire EU market in this regard by establishing harmonized rules for the marketing of construction products, with routine maintenance, construction works must meet the seven basic requirements for construction works for an economically justified period of use [23]. Consequently, a manufacturer must assess construction products against the essential characteristic of the CPR basic requirements. Depending on the intended use of a construction product, it can be assessed from one to six basic requirements—not all basic requirements apply to every product. Since the criteria for the seventh basic requirement, i.e., the sustainable use of natural resources, has not been established so far, the manufacturer will not evaluate the product in this respect when assessing and verifying the constancy of performance (AVCP). It can do it voluntarily by developing an EPD that is a standardized presentation of the environmental impact of a product.

The first question in the survey aimed to indicate the basic requirements for construction works under CPR by the respondents. The correct answer was to reveal all the seven listed basic requirements. The obtained results are shown in Table 3, and for better illustration, presented in Figure 1.

The highest number of correct answers was recorded in the contractor's group—33.5%, and the lowest in investors—only 16.2%. Almost every fourth answered correctly among sellers of construction products—23.2%. Generally, the correct answers (indicating all the listed basic requirements) should be considered low. More accurate answers in the groups of contractors and sellers of construction products can be explained by frequent inspections of the correctness of placing construction products carried out by market surveillance authorities [54,55]. In Poland, due to the applicable legal regulations, these inspections mainly occur on construction sites and at points of sale of building materials [56]. It is most likely the reason for more correct indications in contractors and sellers than among investors.

When analyzing the number of indications of individual basic requirements, it should be noted that most respondents in each of the surveyed groups indicated safety in case of fire (basic requirements number two) and energy economy and heat retention (basic requirement number six). The highest number of indications of safety in case of fire was recorded in the group of contractors—83.0%. Furthermore, in the case of basic requirements—energy economy and heat retention—the contractors had the highest number of responses—83.6%. The lowest responses in each of the surveyed group of professionals were noted for the seventh basic requirement—sustainable use of natural resources—60.7%, 62.4%, and 68.1%,

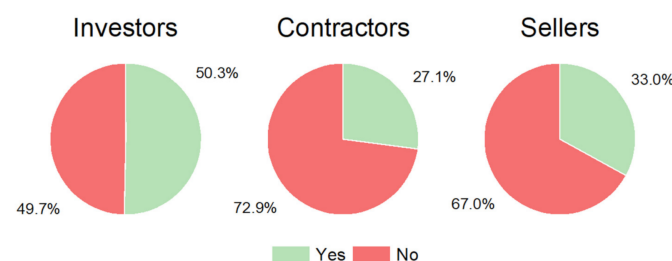
respectively, in the sellers of construction products, investors, and contractor groups. The following least popular basic requirement after sustainable use of natural resources was protection against noise (basic requirement number five).



**Figure 1.** The share of indications on the individual basic requirements (1—mechanical resistance and stability; 2—safety in case of fire; 3—hygiene, health, and the environment; 4—safety and accessibility in use; 5—protection against noise; 6—energy economy and heat retention; 7—sustainable use of natural resources) in individual surveyed professional groups. Dashed lines correspond to correct answers in the surveyed groups.

The largest number of indications for each of the basic requirements was recorded in the contractor's group. It shows that this group has the best knowledge of the CPR basic requirements. However, one should remember that although the individual basic requirements in the contractor's group were obtained from 68.5% (basic requirement number five) to 83.6% (basic requirement number six), the correct answer was given by much fewer respondents in this group, as only 33.5%. In the investor's group, the basic requirement number two was highlighted by 75.7% of respondents, and the minor basic requirement number seven by 62.4% of respondents. However, only 16.2% of the respondents in the investor's group gave the correct answer by indicating all seven basic requirements.

Another question was related to the knowledge of the environmental burden defined as global warming potential (GWP) for 1 m<sup>2</sup> of ETICS. There were two possible answers, yes or no. It is also worth noting that the question does not define the type of thermal insulation material in the ETICS. The results obtained in this question are shown in Figure 2, while the source data are presented in Table 3.

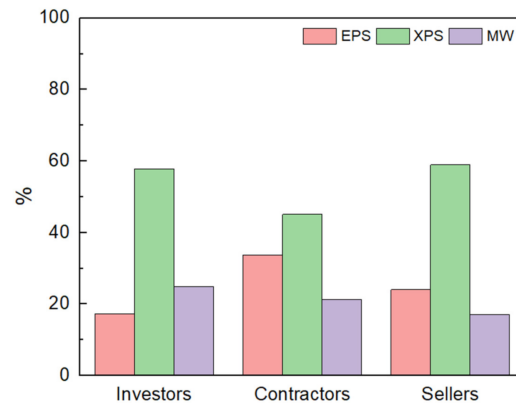


**Figure 2.** Share individual answers to the surveyed groups on the environmental burden of global warming potential of 1 m<sup>2</sup> of the ETICS.

Most respondents reported that they knew the GWP of ETICS for investors—50.3%—and the least for contractors—27.1%. It is worth noting that in the case of this question, the answer to it is declarative—it is only a declaration of “I know” or “I do not know”. This declarative nature of the solution is even more evident when analyzing the following question regarding the indication among thermal insulation material (EPS, XPS, and MW) of



that which has the most significant negative impact on GWP. Figure 3 presents graphically the results obtained for the question about the production of which of the three mentioned thermal insulation materials (EPS, XPS, MW) is characterized by the most significant negative impact on the GWP. Table 3 shows the results obtained for this question.



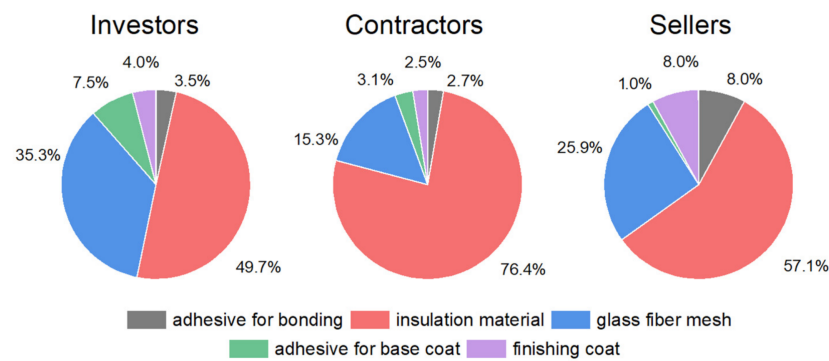
**Figure 3.** Share of answers to the question, which thermal insulation material production from among the three—EPS, XPS, and MW—has the most significant negative impact on the GWP value in the surveyed professional groups—investors, contractors, and sellers of construction products.

In each surveyed professional group, most respondents indicated that the most significant negative impact on GWP among EPS, XPS, and MW has XPS during production. In the contractors and sellers of construction products professional groups, MW was indicated by the smallest number of respondents.

When analyzing the obtained results, it should be noted that the so-called functional unit when we consider this type of building materials [42,47]. In EPDs and scientific publications, thermal insulation materials' environmental impacts are presented in various units. The presentation of environmental indicators per mass of material in the case of MW means that this product can be perceived as more friendly in terms of GWP related to material production than EPS or XPS [42]. Additionally, the difficulty in answering this question stems from the fact that different EPDs indicate different values of individual indicators, often significantly different from one another [47]. In the literature, you can find information indicating that the production of MW is associated with a more significant burden on the environment in terms of GWP than the production of XPS and EPS [45]. Still, some indicate that XPS production is a more significant burden on the environment than the production of MW [42,47]. Thermal insulation materials are also considered natural and synthetic ones [45]. Synthetic products involve synthetic organic chemicals, commonly perceived as worse for the environment. However, despite these discrepancies mentioned above, the answer indicating MW as the thermal insulation material, the production of which is characterized by the most significant negative impact on the environment, should be considered correct [45].

The obtained results indicate that the knowledge about the environmental burden associated with thermal insulation materials production is limited. However, considering various information, often contradictory, that is available from both EPDs and scientific publications, the obtained results confirm the prevailing state of affairs in this regard. In response to the question on the understanding of the 1 m<sup>2</sup> of ETICS production phase GWP the respondents declared that most did not have such knowledge. Our previous research on EPDs among investors, architects, contractors, and sellers of construction products showed as many as 74.0%, 64.6%, and 75.9% of respondents in the investors, contractors, and sellers of construction products, respectively, believe that EPDs are a mandatory document that a manufacturer of construction products must obtain, but it is not [57].

Figure 4 shows the results obtained by answering question production of which component of ETICS has the most significant negative impact on the GWP.



**Figure 4.** Share of answers to which component of ETICS production has the most significant negative impact on the GWP value in the surveyed professional groups—investors, contractors, and sellers of construction products.

For this question, 49.7% of investors, 57.1% sellers of construction products, and 76.4% contractors indicated the thermal insulation material as the ETICS component with the highest environmental impact in terms of GWP, which is the correct answer. Noteworthy, the thermal insulation material has the largest share in GWP in the ETICS production phase, regardless of the type of thermal insulation material [57,58]. The questionnaire itself did not specify what kind of thermal insulation material is an element of ETICS. For question number four of the analyzed questionnaire, the correct answer is that the thermal insulation material is the ETICS component having the highest share in the GWP index of the entire system [57,58]. A surprisingly large number of respondents indicated glass fiber mesh as a component of ETICS having the most significant negative impact on the environment (GWP) in the production phase—from 15.3% of contractors to 35.3% of investors. Actually, glass fiber mesh slightly affects the production of ETICS [57,58]. Not many respondents indicated adhesive for bonding, adhesive for a base coat, and a finishing coat as having the most negative impact on the GWP. Depending on ETICS type, these three components share several or a dozen percent in GWP [59,60].

## 5. Conclusions

Although the CPR has been in force since 1 July 2013, and its requirements daily accompany the construction market participants, their knowledge can be considered low. Correctly, only 16.2% of surveyed investors answered the question about selecting the seven basic requirements for construction works under CPR. Sellers of construction products showed a better knowledge—23.2% of correct answers—and the most familiar was the contractor's group—33.5% of correct answers. Better results in the groups: contractors and sellers of construction products are probably due to frequent inspections of market surveillance authorities both on construction sites and at points of sale of building materials. When analyzing the individual surveyed basic requirements for construction works under CPR, according to all respondents, the most indications were two requirements, i.e., safety in case of fire (basic requirement number two) and energy economy and heat retention (basic requirement number six). The seventh basic requirement, i.e., sustainable use of natural resources, received the lowest number of indications.

Only 27.1% surveyed contractors, 33.0% sellers of construction products, and 50.3% of investors declared the knowledge of the value of the environmental burden of 1 m<sup>2</sup> of ETICS in terms of GWP. It seems that this result is also not surprising in the light of other research on the knowledge of EPD and environmental issues [61,62].

It is also worth noting that construction-related professional groups such as investors, contractors, and sellers of construction products are incidentally subject to research about understanding construction product assessment, including sustainability [62]. It is slightly better in the case of another professional group related to construction, namely architects [61–63].

In the case of answering the question, the production of which of the three thermal insulation materials (EPS, XPS, MW) is related to the most significant negative impact on the GWP, XPS was indicated by the most people from each of the studied groups. A surprisingly large number of people also pointed to the EPS. However, it results from using various functional units expressing environmental impact, including GWP of thermal insulation materials. In addition, in many cases, the intended use of different units results mainly due to the rivalry between manufacturers of thermal insulation materials [42].

More excellent knowledge of the environmental impact issues was shown in all the examined groups, answering which component of ETICS production has the most significant negative impact on the GWP value. As many as 74.6% of contractors correctly indicated that insulation material production is the most environmentally damaging among all components of ETICS. The results of sellers of construction products (57.1%) and investors (49.7%) are also satisfying.

Of course, awareness of sustainable development issues is the subject of many studies, including mostly surveys on monitoring Sustainable Development Goals (SDGs) globally [64–67] and in Poland [68,69]. However, the presented research results of three professional groups (investors, contractors, and sellers of building materials) related to the construction sector shown in this paper are among the first of their kind [61–63]. It would be interesting to compare the results described in this paper with similar studies in other countries, especially EU countries, but such studies were not published so far. It would also be attractive due to the much greater activity of construction supervision authorities in Poland compared to other EU members [54,55].

The results obtained in the study indicate the need for further education in the field of assessment of construction products, including their environmental impact. It is consistent with other studies on the knowledge of construction product assessment and environmental issues in construction [70].

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