

BIM POLICY IN EASTERN EUROPE

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Abstract

The European Union in *the Industry 5,0* proposal encourages technological transformation. ICT *Information and Communications Technology*, which for the AEC industry are BIM and Digital Twin is appreciated, but also innovative and variable over time. Therefore publications like this, which verify the validity of information are important. Global BIM policy analysis can be valuable for stakeholders of the investment process, policymakers, researchers. The authors performed a scientific analysis on an extensive database of articles (over 20,000) as well as national regulations (in non-English languages). BIM mandatory in public investments depicted on the map, also charts showing other indicators. In Eastern Europe has been observed a small scale (22%) of planned BIM requirements. Czech Republic plans BIM mandate on public investments for project above the EU threshold. The Polish road map proposes MacroBIM for risky or complicated, public investments with budget exceeding EUR 10 million since 2025 and for all since 2025. Comparing with other indicators the Czech Republic and Poland have high GDP per capita and percentage of the industrial sector (including construction) in GDP value added. Poland is classified also as a developed market within the global equity indices. This may have an impact on digital transformation, which is a demanding project due to investment costs. Bulgaria did not include a BIM mandate in its digital transformations plan. Due to *the Industry 5,0* and the positive results from case studies of countries that have already applied BIM mandatory introducing BIM requirements in public procurements should be motivated and supported.

Keywords: BIM policy, BIM mandatory, BIM mandate, BIM implementation, ICT, AEC, industry 5,0

1. INTRODUCTION

ICT *Information and Communication Technology* in short is the creation and ex-change of electronic information, whose positive impact on industry is appreciated [1, 2]. The European Union also encourages technological transformation in proposal *Industry 5,0* [3]. In the AEC industry it manifest as BIM and Digital Twin. Building Information Modelling is „*the process of generating, storing, managing, exchanging, and sharing building information in an interoperable and reusable way*” [4],

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and with real-time simulation models and also artificial intelligence is Digital Twin. The next step towards which the technological transformation in the AEC seems to be heading is iBIM [5], that is integrated BIM, a common, interoperable, interdisciplinary model, holistic, used throughout the whole life cycle of built asset. ICT is innovative and changeable over time, so information from previous publications is often outdated. Global BIM policy analysis can be valuable for stakeholders of the investment process, policymakers, researchers. This prompted the authors to carry out this research, which, due to its wide scope, was divided into several articles. BIM policy in Oceania has already been published [6], this study focuses on Eastern Europe, according to *the United Nations Statistics Division* UNSD. The aim of the work is a scientometric analysis and presentation of BIM policy for Eastern European and a comparison with other indicators characterizing given countries.

2. MATERIALS AND METHODS

The research approach is conducted in several stages. Based on an extensive database, a scientometric analysis was performed to identify possible BIM requirements by public agencies. Next were checked regulations on the official websites of government and institutions. BIM policy chapter presents all restrictions and strategies. Afterwards it shows a comparison other indicator characterizing individual countries.

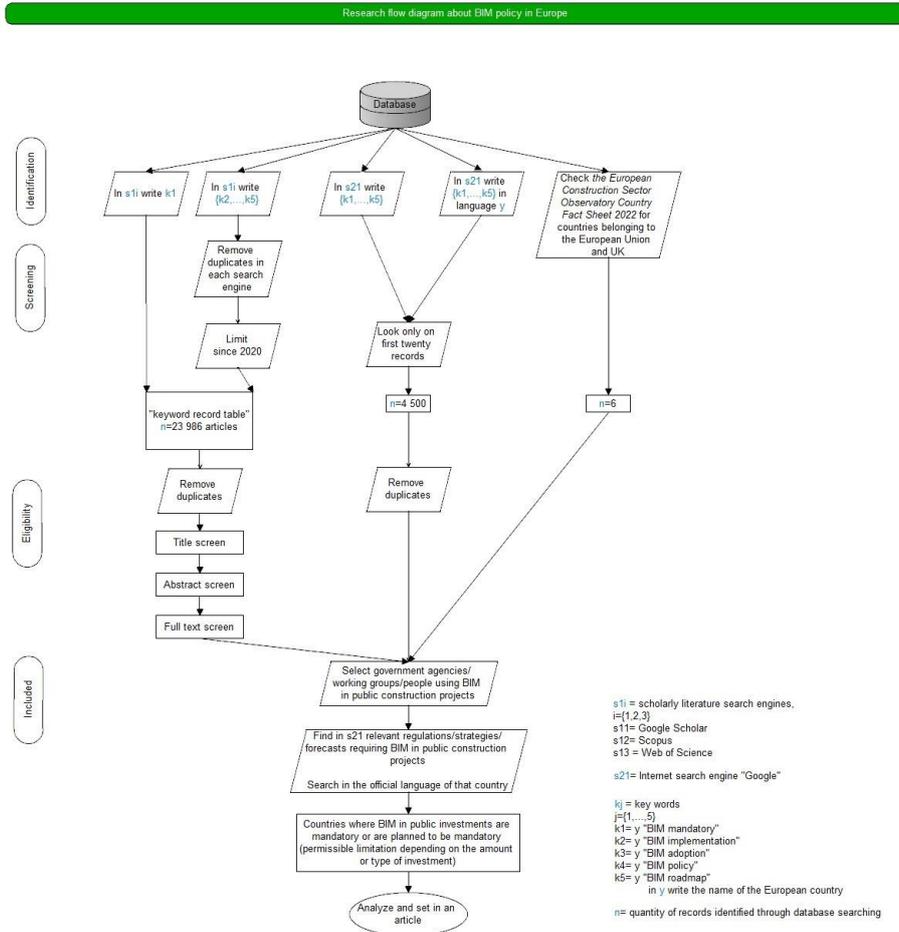


Fig. 1 Research methodology for finding Eastern European BIM policy. Own study

According to the *United Nations Statistics Division* UNSD Eastern Europe includes Belarus, Bulgaria, Czechia, Hungary, Poland, Republic of Moldova, Romania, Russian Federation, Slovakia and Ukraine. Russia will be analysed in the study on Asia. Research methodology for finding Eastern European BIM policy is shown in Fig. 1.

Keywords $k_j = \{k_1, \dots, k_5\}$ were entered in search engines of scientific articles: Google Scholar, Scopus, Web of Science. Some have been limited by an additional filter (date from 2020). After removing duplicates, a given pool of articles was verified. First by title, then by abstract, and finally, those that went to the next stage were selected by article content. Table 1. illustrates the number of records.

Table 1. Keyword records table in Eastern European BIM policy studies. Own study

Country	n for k_1 in:			n for ($k_2+k_3+k_4+k_5$ -duplicates) in: ***		
	Google Scholar	Scopus	Web of Science	Google Scholar	Scopus	Web of Science
Belarus	0	0	0	1 050	0	0
Bulgaria	6	0	0	1 380	1	2
Czech Republic**	27	0	4	3 710	5	21
Hungary	17	0	0	2 580	0	3
Poland	24	1	1	7 460	5	29
Republic of Moldova	0	0	1	173	0	0
Romania	8	0	1	2 870	1	5
Slovakia	7	0	0	2 200	0	7
Ukraine	1	0	1	2 380	0	5

*the analysis on Russian Federation are included in the study about the Asia section

** wrote 'Czech'

*** since 2020

quantity of records was obtained by 2023

Notes about records:

1. records may be duplicated between search engines and between n for k_1 and (k_2 or k_3 or k_4).
2. Google Scholar searches the articles that contain keywords in: title, abstract, keywords, article.
3. Scopus searches the articles that contain keywords in: title, abstract, keywords.
4. Web of Sciences searches the articles that contain keywords in: title, abstract, keywords, author, affiliation, publisher, publication titles.

$k_1 = y$ "BIM mandatory", $k_2 = y$ "BIM implementation", $k_3 = y$ "BIM adoption", $k_4 = y$ "BIM policy", $k_5 = y$ "BIM roadmap", $y =$ name of the European country

The second part of database was made up of records from the Google web browser. There, the first 20th records were reviewed for each keyword k_j and another 20th for each record in the country's native language. The last part of the data to verification were the *European Construction Sector Observatory Fact Sheet 2022* for countries that are members of the European Union. Duplicates were removed again, the obtained information was collected, and then they were thoroughly checked against regulations, strategies etc. of given countries or public agencies. The difficulty here was the language of the documents, because the vast majority were not in English. Google Translate was used to translate. Then was prepared analysis of BIM mandatory/ planned mandatory/ mandatory for selected investments/ by public agencies for each country of Eastern Europe.

3. BIM POLICY

In Eastern European countries only the Czech Republic plans BIM mandatory and Poland proposes MacroBIM requirements for public procurements. The others do not have or planned a BIM mandate in their regulations, strategies, nor will they set a specific date for these requirements.

In 2020 in Bulgaria published *the Digital Transformation of Bulgaria for the period 2020-2030* [7], because of noticing the lack of competences in ICT. The need for legislative changes in the digitalization of the construction sector was remarked, taking into whole life cycle of building and relating to all new buildings and the renovation of existing. The Digital transformation concept of the Bulgarian industry (Industry 4.0) was attached. However, the authors did not find any obligatory BIM requirements, including the planned ones.

In the Czech Republic responsible for BIM implementation is the Ministry of Industry and Trade [8]. The strategy from 2017, with a later updates, now envisages the BIM mandate with partial effect for project above the EU threshold from 2024 [9–12] (thresholds for 2024-25 for works contracts, subsidised works contracts: €5,538,000 [13]).

In Poland public tenders with required BIM are introduced to the Directive 2014/24/EU of the European Parliament and of the Council [14] and Polish public procurement law [15]. In 2019 started the project *Digitization of the construction process in Poland*. Completed in 2020 with e.g. road map [16], which assumes by 2025 a level of BIM adoption similar to the British and more specifically, proposes of introducing the MacroBIM for risky or complicated, public projects with budget exceeding EUR 10 million since 2025 and for all investments since 2030. Currently the BIM implementation strategy is being developed by the BIM group of the Ministry of Development and Technology (established in 2022). It is also worth adding that from 2023 is possible to apply electronically for building permit and then keep and close a construction daily site log using the free government EDB application [17] or via website [18], as part of the implemented “SOPAB” system. As part of this digitization plan, work is also underway to develop and implement a uniform, national CCI construction classification [19].

Eastern European Member States of the European Union are Bulgaria, Czechia, Hungary, Poland, Romania, Slovakia. In 2014 published the Directive 2014/24/EU [14], encouraging BIM requirements in public procurement. The European Commission has released a number of strategies, handbooks and cost estimation for the implementation of BIM in the construction sector [20–24].

Fig. 2 shows a map of Eastern Europe with the above-mentioned information on BIM mandate for public procurement.

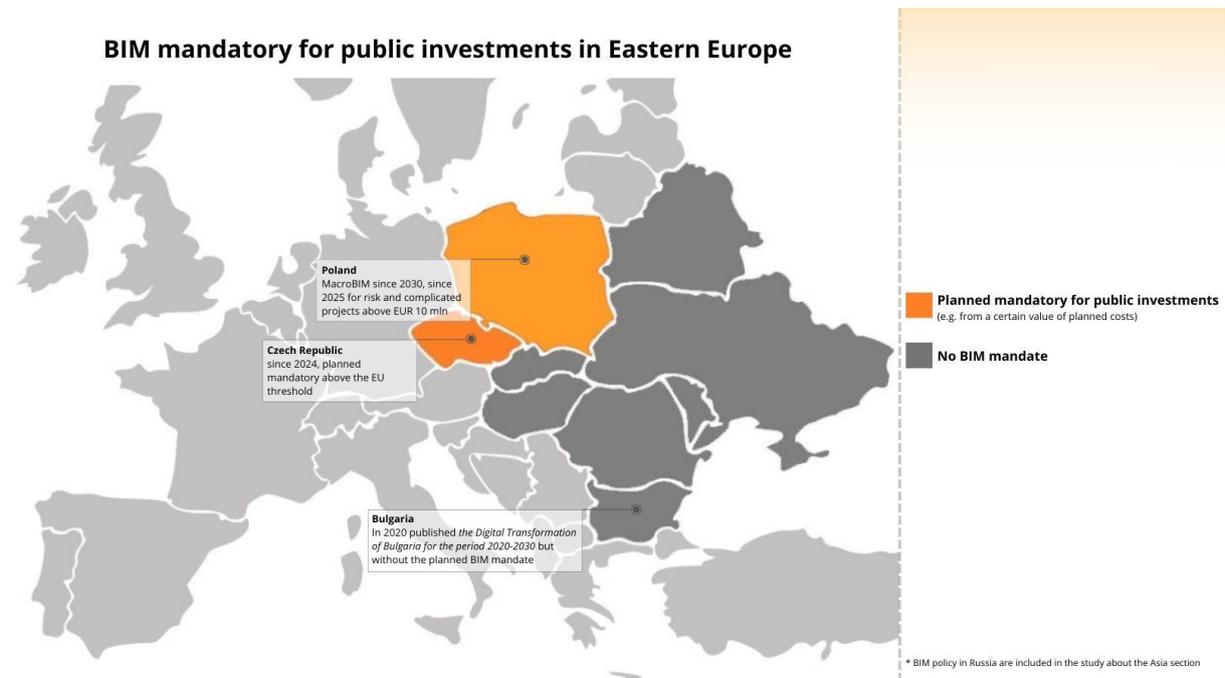
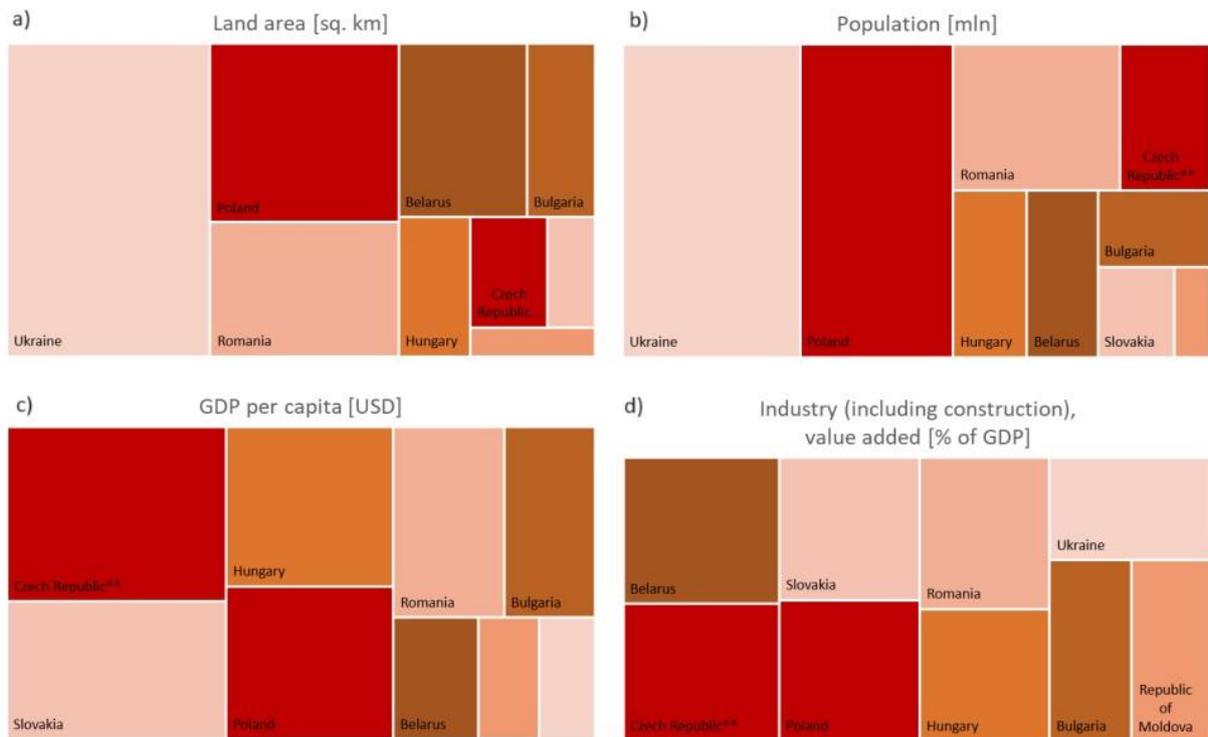


Fig. 2. Map with BIM mandatory for public investments in Eastern Europe. Own study based on [7–12, 14–16]

4. COMPARISON WITH OTHER INDICATORS

Figure 3 presents other indicators characterizing Eastern European countries. Czech Republic and Poland, where BIM plans be obligatory for selected investments is marked in red.



Comments:

a) Data from 2020. b) Data from 2021.

c) "GDP per capita is gross domestic product divided by midyear population" [The World Bank], data from date: 2021, currency converter 2023 10th May.

d) Value added according the International Standard Industrial Classification's ISIC (revision 4) definition. Data from date: 2021, currency converter 2023 10th May.

Fig. 3. Charts with Eastern European countries in term of a) land area [sq.km] b) population [mln] c) gross domestic product GDP per capita [USD], d) percentage of industry (including construction) in GDP value added. Own study based on data from [25].

5. DISCUSSION

An important turning point was the publication the Directive 2014/24/EU [14], which led to changes in some EU Member States regarding BIM implementation strategies and/or requirements. Public procurement, however, above all, should be competitive, therefore the BIM mandatory should be preceded by preparation of the industry, in the understanding of companies that are potential bidders of the tender. The investor's information requirements should be an important document that, when properly written, helps to avoid disappointment with the product received [26], and is also adapted to the contractors' capabilities. Due to looking at the whole life cycle of built asset, it is complicated and it is worth approaching its development meticulously. It is worth using data from global BIM implementation, policy and standards, so a broad spectrum arranging decision criteria in several layers [27]. Planned BIM mandatory was observed in Czech Republic and in Poland for MacroBIM. In charts from Fig. 3. with other indicators for Eastern European countries i.e. GDP per capita, the size of the industry in the country, area and population, two should be distinguished. Of these countries, the Czech Republic has the highest GDP per capita, the Poland is in the top three. This is a good topic to explore in future research. Projects in which BIM is used are usually large and complex, and therefore expensive.

Moreover, Poland and the Czech Republic are among the countries of Eastern Europe with a high percentage of the industrial sector (including construction) in gross domestic product. It is worth adding that in the FTSE Russell's report, that classifies markets as Developed, Advanced Emerging, Secondary Emerging or Frontier, classified Poland as a developed, and the Czech Republic and Hungary as Advanced Emerging [28]. This annual review within the FTSE global equity indices can illustrate the condition of the country and the possibilities of the implementing modern technologies, which, especially at the beginning is an expensive undertaking.

6. CONCLUSIONS

The authors were performed a scientometric analysis based on an extensive database of over 20 thousand records. After verification and analysis data collection was presented BIM policy in Eastern Europe. Should add here the difficulties that were associated with the research. ICT *Information and Communications Technology* is innovative, so during the process it was necessary to verify the information obtained to make sure it was not outdated. In addition, the regulatory language of each country is non-English. Afterwards it shows a comparison other indicator characterizing individual countries, such as land area, population, GDP per capita, impact of industry (including construction) in GDP value added, FTSE Russell's market classifications.

Few planned BIM mandatory were observed. Only 22% of Eastern European countries (excluding Russia, which will be analysed in the study on Asia) plan BIM requirements in public procurement. In the Czech Republic plans to introduce BIM mandatory gradually, from 2024, for project above the EU threshold. Poland proposes a MacroBIM requirements since 2030, and from 2025 for risk or complicated projects with budget above EUR 10 million. However, the plan is not an executive act and may change in the future, e.g. by postponing the implementation date and due to the fact that in Poland the BIM implementation strategy is still being developed, and the presented plan results from the Roadmap from 2020. Despite the project of digital transformation in Bulgaria, not yet been decided to introduce BIM mandate. Comparing with other indicators of given countries noticed in Czech Republic and Poland with planned BIM requirements high GDP per capita and percentage of the industrial sector (including construction) in GDP value added. Poland is classified also as a developed market according the FTSE Russell's report. This may have an impact on digital transformation, which is a demanding project due to investment costs. *The Industry 5,0* proposal encouraging the implementation of digital technologies and the positive results from case studies of countries that have already applied BIM mandatory, such activities should be motivated and supported.

Due to the fact that the global quantity of BIM implementations is growing, strategies and regulations of countries are changing, more and more often assuming BIM mandate, the analysis as in this article can be helpful various stakeholders, policymakers, researchers.

An analysis of BIM policy for other countries is planned in future publications, including doctoral dissertation.

REFERENCES

1. Deng H, Xu Y, Deng Y, Lin J 2022. Transforming knowledge management in the construction industry through information and communications technology: A 15-year review. *Automation in Construction* **142:104530**. <https://doi.org/10.1016/j.autcon.2022.104530>
2. Zhu Z-Y, Xie H-M, Chen L 2023. ICT industry innovation: Knowledge structure and research agenda. *Technological Forecasting and Social Change* **189:122361**. <https://doi.org/10.1016/j.techfore.2023.122361>

3. European Commission, Directorate-General for Research and Innovation, Renda A, et al 2021. Industry 5.0, a transformative vision for Europe – Governing systemic transformations towards a sustainable industry
4. Vanlande R, Nicolle C, Cruz C 2008. IFC and building lifecycle management. *Autom Constr* 18:70–78. <https://doi.org/10.1016/j.autcon.2008.05.001>
5. Borkowski AS 2023. Evolution of BIM: epistemology, genesis and division into periods. *Journal of Information Technology in Construction* **28:646–661**. <https://doi.org/10.36680/j.itcon.2023.034>
6. Zima K, Mitera-Kielbasa E 2022. Level of Information Need for BIM Models: Australia, New Zealand and ISO 19650. *Civil and Environmental Engineering Reports* **32:1–3**. <https://doi.org/10.2478/ceer-2022-0041>
7. 2020. Digital Transformation of Bulgaria for the period 2020-2030. Bulgaria, Sofia
8. Government of the Czech Republic 2016. [Resolution No. 682 on the importance of the BIM method for construction practice in the Czech Republic and a proposal for further procedures for its introduction]. Czech Republic, Prague
9. Ministry of Industry and Trade 2017. [BIM Implementation Strategy in the Czech Republic]. Czech Republic, Prague
10. Government of the Czech Republic 2022. [Resolution No. 1087 The implementation of the concept of introducing the BIM method in the Czech Republic]. Czech Republic, Prague
11. Government of the Czech Republic 2023. [Resolution No. 298 Proposal of the substantive plan of the Act on the management of construction information and the information model of construction and the built environment]. Czech Republic, Prague
12. Ministry of Industry and Trade 2023. [RIA Final Report Proposal of the substantive plan of the Act on the Building Information Management and Building Information Modeling and built environment]. Czech Republic, Prague
13. European Commission 2023. Commission Delegated Regulation (EU) 2023/2497 of 15 November 2023 amending Directive 2014/23/EU of the European Parliament and of the Council in respect of the thresholds for concessions. Belgium, Brussels
14. Council European Parliament 2014. Directive 2014/24/EU on public procurement. Belgium, Brussels
15. Marshal of the Sejm of Poland 2021. Dz. U. poz. 1129 Announcement of the Marshal of the Sejm of Poland on the Public Procurement Law
16. European Commission, Ministry of Development, Pwc 2020. Roadmap for the implementation of the BIM methodology in public procurement. Digitization of the construction process in Poland. Belgium, Brussels
17. Minister of Development and Technology 2022. Dz.U. 2023 poz. 45 [Regulation on the construction site log and the Electronic Construction Site Log]
18. General Office of Construction Supervision 2023. [eConstruction portal]. <https://e-budownictwo.gunb.gov.pl/>. Accessed 11 Dec 2023
19. BIM working group for the Ministry Development and Technology 2023. The concept of implementing the CCI construction classification in Poland. Draft
20. European Commission 2012. Strategy for sustainable competitiveness of the construction sector and its enterprise. Belgium, Brussels
21. European Commission 2020. A Renovation Wave for Europe - greening our building, creating jobs, improving lives. Belgium, Brussels
22. European Commission 2020. A New Circular Economy Action Plan. Belgium, Brussels
23. European Commission 2020. Europe investing in digital: the Digital Europe Programme. Belgium, Brussels

24. European Commission 2021. Calculating Costs and Benefits for the use of Building Information Modelling in Public Tenders. Methodology Handbook. Belgium, Brussels
25. The World Bank Data The World Bank Data. <https://data.worldbank.org/>. Accessed 29 Aug 2023
26. Zima K, Mitera-Kiełbasa E 2021. Employer's information requirements: A case study implementation of bim on the example of selected construction projects in Poland. *Applied Sciences* (Switzerland) **11**:. <https://doi.org/10.3390/app112210587>
27. Skiba M, Mrówczyńska M, Sztubecka M, et al 2023. The European Union's Energy Policy Efforts Regarding Emission Reduction in Cities—A Method Proposal. *Energies* (Basel) **16**:**6123**. <https://doi.org/10.3390/en16176123>
28. FTSE Russell 2023. FTSE Equity Country Classification