COMPARISON OF BUILDING STOCK RELATED DATA SOURCES AND INDICATORS

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SUMMARY

Consistency and comprehensiveness of datasets have significant importance in building stock modelling and defining building stock indicators. Therefore, this study aims to identify the consistent and inconsistent points of existing building stock datasets and to assess the deviations between various datasets. In addition, while creating a detailed building stock data platform, identification of innovative indicators relevant for policymaking was also studied as well as the evaluation of existing building stock indicators. Evaluation and comparison of existing indicators are carried out within the scope of the BuiltHub project.

Keywords: building stock, data comparison, building stock indicators, building stock observatory.

INTRODUCTION

The presence of comprehensive datasets on building stock has great potential for building stock modelling, policymaking, and achieving the net-zero GHG emissions target in 2050. One of the essential resources in building stock data is the Building Stock Observatory (BSO), initiated by the European Commission. BSO contains detailed information about building stock characteristics, building shell performances, energy consumption, energy poverty, and efficiency. All this information is required to increase the effectiveness of building stock policies and to interpret if these policies had the intended outcome. BuiltHub[20] is a H2020 project that aims to develop a robust and flexible web platform that allows collecting and exporting EU-level building stock data. In this regard, as a part of Builthub, BSO indicators were considered, and various data sources to derive these indicators were examined in this study. We are working on evaluating the building stock indicators and assessing the quality of each data source. Furthermore, comparing the building stock-based data sources, identifying the inconsistencies, and making the indicators consistent are other purposes of this conference contribution beyond the scope of the Builthub project. Therefore, this work intends to create EU building stock related indicators and evaluate existing ones while assessing the existing data sources and defining their consistent and inconsistent points.

METHODS

EU-level building stock related data sets are compared in two main groups: the number of units by the construction period and floor area by the construction period. In order to compare building stock data, different data sets were considered. The data sources included in this work are EU Census [1], Hotmaps [2], Invert [3], ENER/C1/2018-494 [4] , Odyssee [5], and BSO [6]. In order to compare all data sets in a joint and organized way, necessary arrangements were made in the data sets. For instance, included countries, common construction periods, building types are defined, necessary unit conversions are performed, and each data is manipulated accordingly. The data sets to be analyzed are arranged

[20] Dynamic EU building stock knowledge hub – BuiltHub - https://builthub.eu/

according to these predefined parameters. After the data became comparable, inconsistencies in the data sets were determined, and possible reasons for these deviations were identified. The systematic combination of different data sources to build consistent indicators is also aimed in this work. For this purpose, indicators created by the BSO have been considered. Then, to examine each indicator in more detail and well-roundedly, six different categories were created and indicators levelized. The required data to calculate each categorized indicator were determined. Subsequently, each indicator is calculated with the specified required data. Indicators with more than one calculation method are compared. Furthermore, we discuss options for the novel, innovative indicators relevant for policymaking in light of the revised Energy Performance of Buildings Directive (EPBD), e.g., related to the smart readiness of buildings or e-loading stations.

RESULTS

As an exemplary result of the calculations, the deviations in floor area and the number of dwellings between the data sets for each building category were calculated. The average deviation between the data sources in terms of the "floor area" for Single Family Houses is 46%, for Multi-Family Houses is 77%, for Educational Buildings is 69%, for Health Care Buildings 74%, for Hotels and Restaurants is 57%, for Offices 69%, for Trade Buildings 59%, and for other non-residential buildings is 64%. In addition to this, the average deviation between the data sources in terms of "number of units" for Single Family Houses is 53%, for Multi-Family Houses is 73%, and for all the service sector is 61%. The possible reasons for these deviations can be listed as the difference in the data sources used in the datasets and base years or the differences in the definitions of the building category among the datasets. The full paper will include a comprehensive discussion of the main reasons for these deviations. Furthermore, indicators created within the scope of the BuiltHub project were calculated using the data sets whose deviations were calculated. The results of indicators with more than one calculation method were compared. For example, the indicator "All-end-uses Energy consumption for the residential sector" has three different calculation methods according to the scopes of each data source. In addition, during these calculations, necessary unit conversions between the data sets were made. An exemplary calculation is performed for Austria. The first method is based on Datasets 14[21] and 16[22], which contain this indicator as a whole, and the second method is based on the sum of end-uses in the Dataset 16. For both methods, this indicator was calculated as 273.9 PJ. In the third and last method based on end-uses and construction periods, this indicator was calculated as 242.3 PJ in Dataset 1[23]. It is observed that there was an 11% deviation between these three calculation methods. Also, while there is no deviation between Dataset 14 and Dataset 16, there is an 11% deviation between Dataset 1 and the aforementioned two datasets. Similar deviations will be reported and discussed in the full paper also for other indicators and countries.

CONCLUSIONS

There are considerable deviations between different building-stock related data sources as anticipated at the beginning of this work. However, these deviations can be explained if further investigated. Differences in primary points such as the data source, base year, or the scope of the building categories are the main reasons for these deviations. In addition, partly, the data is not sufficiently explained in each data source to allow for a proper comparison. It is essential to document the data sets in detail so that they can be compared more consistently. Combining additional data sources, e.g., EPC databases, etc., would also be important to ensure consistency. Future research should be devoted to the addition of further data sources and data items such as based on building energy consumption etc., not yet

[21] Final Energy Consumption in Households (2021), EUROSTAT Data Browser.
[22] Disaggregated Final Energy Consumption in Households (2021), EUROSTAT Data Browser.
[23] HOTMAPS Toolbox (2016). Available: https://www.hotmaps.eu/

analyzed. In addition, working on approaches to dealing with uncertainties in building stock data and assessing for which type of policy questions and research questions which type of uncertainty is problematic might prove an important area for future research.

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