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A PRELIMINARY ANALYSIS OF THE NATIONAL ENERGY CERTIFICATION DATABASE OF THE PORTUGUESE HOUSING

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ABSTRACT

The Portuguese building's sector is responsible for approximately one third of the national primary energy use, becoming an important target in the action towards energy-related global environmental sustainability. Given the evolution of building practices over time, it is possible to detect variations in terms of architecture, building typologies and construction leading to significant changes in their energy performance. This paper presents the results of a preliminary statistical analysis regarding a number of residential building energy certificates aiming at producing a first assessment of the current Portuguese building stock. The analysis further assesses the specific importance of several certification parameters, such as location/climate, year of construction, and others, in regards to the rating outcomes, as well as the impact of suggested improvement measures on the expected energy demand, the certified energy rating, and the estimated energy costs.

INTRODUCTION

Building energy performance assessment has been implicit in Portuguese construction regulations since 1991. In 2006, a certification system was created, adjusted to follow EU's Energy Performance of Buildings Directive of 2002 (EPBD, 2002), later revised in 2010 (EPBD, 2010). The implementation of the certification process has led to the creation of a certificate database, managed by the National Energy Agency (ADENE), today gathering information on more than 1 million certified buildings. The ultimate service of that system is to allow for a better management and subsequent improvement of the national building stock, namely from the energy use point of view. This will be accomplished by starting from the urban planning in new developments, followed by the promotion of better construction quality, to fulfil pre-set minimum technical requirements for new and rehabilitated buildings.

Within this perspective, this paper presents a comprehensive characterization of mainland Portuguese residential building stock regarding geographical location, age, type of construction, insulation level and expert-suggested improvement measures.

METHODS

Two main sources of information are used in the analysis of the evolution of the residential building stock, namely ADENE's national energy certification system (SCE)'s database accessed in May 2016, and the results of the General Census of Population and Housing for the year 2011 collected by the Institute of National Statistics (INE). In order to deepen specific themes, statistical data from other Portuguese sources were also used. The main

geographic unit of analysis was the NUTS II regions. Each ADENE's certificate corresponds to an autonomous housing fraction (detached or semi-detached dwelling) or building. Certificates for new and existing buildings were considered, as were the ones for big interventions. Provisional certificates regarding the project stage for new buildings were also included.

The analysis encompassed 13261 certificates that gathered the right conditions to be included. The Portuguese residential housing stock is, according to INE, the total number of usual residences, secondary residences and non-occupied autonomous fractions.

The paper presents summary indicators and statistics of the housing stock based on new certificates for the month of May 2016. To calculate those indicators, an examination of the EPBD-mandate Portuguese regulations was performed as well as a revision of the relevant literature. These describe how energy certification outcomes vary by housing market characteristics (socio demographics - household size, construction period, etc.). Data analysis encompassed finding mean, standard deviation and 95% confidence interval for quantitative variables and percentages for ordinal and qualitative variables.

RESULTS AND CONCLUSIONS

The results show that among the analysed residential buildings 2745 (20%) were built between 1996 and 2000, and 3771 (28%) after 2006. As expected, buildings constructed after 2006 tend to have better energy performance certificate (EPC) ratings when compared to buildings constructed between 1996 and 2000. The majority of buildings, 4625 (35%) were constructed in Lisbon Metropolitan Area and correspond, mostly, to autonomous detached fractions, 7664 (59%). 6928 (53%) of the buildings had appropriate thermal inertia characteristics, i.e. strong inertia. According to the suggested improvement measures, house owners could save, mean (sd), 927€ (7177€) if all of the measures were retrofitted, which would entail an investment cost of 6467€ (17813€). The most efficient building retrofit measures, with the highest potential to improving the most on the energy performance certificate, are outer walls insulation and changing windows/glazing.

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