Theme: 19. Renewable Energy Strategies, Scenarios, Financing, and Policies

Summary

In this study, the targets in the current energy efficiency action plans and regulations in Turkey were examined and compared with the European Union directives. Based on the EU directive, passive house practices in Germany and their results were examined. Passive house applications in Turkey, which have a higher solar radiation intensity compared to Germany, were examined, but it was noticed that they were insufficient. Considering the share of the construction industry in total energy consumption and the building stock in Turkey, the potential for energy savings to be implemented by zero-energy buildings or EnerPHit certified buildings is quite high. For this reason, by examining the passive house practices in Germany, some policy suggestions for Turkey in this sense have been put forward.

Keywords: Passivhaus, Passive House, Zero-energy buildings, Solar energy, Energy savings.

PASSIVE HOUSES and ITS IMPLICATIONS in TURKEY - LESSONS LEARNT FROM GERMANY EXPERIENCE

Increasing global warming and the climate crisis we are facing show the importance of renewable energy in terms of both sustainability and environmental concerns. Solar energy is one of the most important renewable energy sources in line with targets such as reducing carbon emissions and greenhouse gas effects. The energy requirement of the building sector, which is responsible for approximately 40% of the total energy consumption in European Union countries, is increasing day by day (Directive EU, 2010). In this context, the “Energy Performance in Buildings Directive (EPBD)” has been published, and accordingly, it is aimed to increase the energy performance of buildings by taking into account the region, climatic conditions, comfort requirements; cost, and using solar energy for energy efficiency in buildings is one of the solutions for enhancing the energy performance of buildings. With the EPBD Recast published by the European Union in 2010, the target of reducing the energy consumption of buildings in European Union countries by at least 20% until 2020 has been set, and the necessity of making required improvements and optimizing the existing building stock has been explained to achieve energy saving in the buildings.

Considering the distribution of total energy consumption in Turkey by sectors in 2017; it is seen that the highest consumption was in residences and services with 24.8%. Following the residence and services; the Industry sector with 24.4%, the energy and cycle sector with 23.1%, transportation with 19.6%, non-energy with 5.1%, and energy consumption by agriculture and livestock sectors with 2.9% were included in the distribution(MEUC, 2017).In 2018, the highest consumption was in the industry sector with 25.3% and the

residential and services sector decreased to 23%, however, still, the rates are quite high, and reaching the EPBD targets needs more effort (MEUC, 2018). In this framework, the strategy of constructing new buildings within the framework of passive houses in terms of energy consumption (zero-energy buildings) and improving existing buildings in line with the EnerPHit certification system is proposed to reduce energy consumption in the residential and service sector in Turkey.

Zero energy buildings are examples of buildings where the necessary thermal comfort is provided to obtain indoor air quality by cooling. Reducing heating and cooling needs in passive houses and appropriate thermal insulation can be provided by a specific design without thermal bridges, high-performance windows, a heat recovery ventilation system, and an airtight building envelope (Waltjen, 2005). Here the key is to minimize the energy needed. With the correct positioning of the building in front of the sun, the energy is obtained through the sun rays entering through the windows, the body heat of the users, and the heat emitted by the electrical devices used. For this reason, passive houses are also called Net Zero Houses (Schniders vd., 2015). Certificates are given by the Passive House Institute as a result of the new building and the improvement of the existing buildings by the standards. The types are Classic for traditional passive houses, Plus for passive houses where additional energy is produced from renewable energy sources, and Premium for passive houses where more than the building's needs are produced from clean energy sources. However, it is not always possible to reach the Passive House Standard in the renovations of existing buildings. For such buildings, the Passive House Institute has developed EnerPHit for certified energy improvements with Passive House Components. For existing buildings, these certifications are called EnerPHit Classic, EnerPHit Plus, and EnerPHit Premium. The first passive house example was built in 1991 in Darmstadt, Germany. As a result of the research, according to the records in the Passive House database, 509 of the 2375 buildings registered as passive structures in Germany are certified and there are only 2 passive structures in Turkey. [1]

Although Turkey's solar radiation intensity is higher than Germany, for passive building applications, the studies on research, development, and innovation are rare in Turkey. In this context, it is important to support Turkey with renewable energy resources, which are emphasized for low-energy, zero-energy building applications in the EU directive, and to produce policy implications in this regard.

In Turkey, which is among the countries with a high import dependency on energy, the ratio of the building sector in the final energy consumption has surpassed the industrial sector with 32.8% (MEUC, Seismic Resilience and Energy Efficiency in Public Buildings Project) In the residences, which constitute approximately 87% of the building type in Turkey, the improvement of the existing structures in line with EnerPHit, will reduce the energy consumption of the building sector and carbon emissions. The "Regulation on Amending the Regulation on Energy Performance in Buildings", published in the Official Gazette on February 19, 2022, in Turkey, defines a building with almost zero energy and contains two articles regarding its implementation. (Article 23 and Article 6). These articles require that buildings of 2000 square meter and above be constructed as zero-energy buildings and that at least 10% of the primary energy needs of these buildings are to be used from renewable energy sources. Accordingly, as of January 1, 2023, licenses cannot be issued for buildings whose projects are not prepared accordingly. [2]

In conclusion, looking at the current statistics, regulations, and studies, it is seen that there is a great potential for energy efficiency in the growing and transforming building sector. The realization of the objectives in the

reviewed regulations and action plans depends not only on constructing zero-energy buildings but also on achieving efficiency in existing structures and using the needed energy from renewable energy sources. Effective and efficient use of energy will be achieved by first improving existing buildings, then constructing only zero-energy buildings, and of course using renewable energies in sectors such as industry, transportation, and agriculture. While this transformation reduces the impact of carbon emissions and greenhouse gases, it will be one of the biggest steps taken to leave a clean world to future generations. For a developing country like Turkey, it will help it reduce its dependence on foreign energy, thanks to the correct use of resources. In this respect for the present study, passive house and EnerPhit applications will be examined based on the examples from Germany, and the lessons learned will be derived for proposing policy implications to support passive house applications in Turkey.

REFERENCES

Cotterel, J. and Dadeby, A., 2014. The Passivhaus handbook. Devon: Green Books.

EuropeanUnion[EU]., 2010. Directive 2010/31/EU of the European Parliament and the Council. On the energy performance of buildings (recast).

Mihai, M., Tanasiev, V., Dinca, C., Badea, A., & Vidu, R. 2017. Passive house analysis in terms of energy performance. Energy and Buildings, 144, 74-86.

The Republic of Turkey, Ministry of Environment, Urbanization and Climate Change, 2017. Environmental Indicators. Retrieved From https://cevreselgostergeler.csb.gov.tr/en/total-energy-consumption-by-sectors-i-86042

Seismic Resilience and Energy Efficiency in Public Buildings Project Information. Retrieved From https://kamuguclendirme.csb.gov.tr/proje-hakkinda-genel-bilgi-i-101905

Schnieders, J., Feist, W., & Rongen, L. 2015. Passive Houses for different climate zones. Energy and Buildings, 105, 71-87.

Waltjen, T. 2005. IBO Passivhaus Bauteilkatalog – A Catalogue of Building Elements Specified for Passivhaus Standard. TT6-135.

[1] This data was retrieved from http://www.passivehouse-database.org/

[2] Retrieved From https://www.resmigazete.gov.tr/eskiler/2022/02/20220219-2.htm