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Title: Exploring the Potentials and Challenges of Retrofitting Existing Housing Stock for Achieving CO₂ Reduction Targets: A Comparative Research on Turkey and Scotland

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Climate change became a major global challenge by reaching unprecedented levels, which led to the declaration of climate emergencies in major cities around the globe. Reducing carbon emissions remains as the main challenge to tackle climate emergency. Various means for this reduction have long been debated. These debates span from individual changes such as taking less frequent flights to more structural ones such as carbon neutrality target set by many cities. Despite these efforts and increasing awareness, the built environment remains a key producer for carbon emissions, and perhaps among the hardest to restructure in the short term due to its long-term use and fixed status. The fifth assessment report of the Intergovernmental Panel on Climate Change (IPCC) reveals that buildings accounted for 32% of total global final energy use. Statistics present that 34% of the global end-use energy consumption in residential buildings and 40% in commercial buildings are used for space heating and cooling. Therefore, IPCC puts forward building retrofitting as a key priority for climate change mitigation. Carbon emissions released by existing building stock stand as a major challenge for climate change mitigation in both developed and developing countries, particularly to achieve CO₂ reduction targets while providing better living environments for inhabitants. This challenge becomes even more clear regarding old and historical buildings as these are even harder to adapt due to limitations set by their heritage status. The challenge also branches out depending on socio-economic, geographical and climatic conditions, such as health issues due to damp in homes, fuel poverty due to high energy costs, low living standards and poverty through high maintenance costs and higher carbon footprint due to high energy consumption.

Reflecting upon these challenges, our research explores the problems experienced in existing housing stocks in Scotland and Turkey regarding retrofitting for carbon reduction. The research identifies the problems and requirements to be explored in the two cases while also identifying the sub-actions of the retrofitting requirements in both cases. We discuss alternative solutions and actions by creating reciprocal learning platforms in both cases. We also compare and contrast common and divergent problems of, and policy solutions to retrofitting existing housing stock in these contexts. This will be achieved through two case studies, one Glasgow City and the other Kadikoy Municipality (Istanbul). The two cases provide a comparative opportunity regarding their scale and the climate change adaptation policies being adopted in both cases.

The expert workshops were held in Istanbul and Glasgow in October and November 2019 respectively. While the former was hosted by Istanbul Policy Centre at Sabanci University, the latter workshop was hosted by the UK Collaborative Centre for Housing Evidence at the University of Glasgow. The participants from academia, public service, civil society and architecture practices working on retrofit issues were invited and participated in these workshops. The workshops were half-day events including brainstorming discussions on problems associated with retrofitting existing housing stock for carbon reduction, solutions to these problems and policy recommendations as well as networking lunch. The networking element of the workshops was valued regarding the participatory methodology of our research, since the research aims to facilitate engagement and collaboration beyond academia.

Initial results from the workshop show that there are convergent and divergent problems in the two contexts. Measuring energy consumption correctly and timely was identified as a key challenge in both cases. In the Turkish case, a leading problem is identified as data collection challenges for energy consumption due to conflicting spatial databases. In the Scottish case, on the other hand, data-related problems were more about real-time access to already collected energy consumption data. Another converging issue from both cases emerged as planning-related problems. Planning was presented as a key area where solutions to retrofitting challenges can be produced. However, top-down approaches

in Turkey and piecemeal approached in Scotland hinder this potential.

A diverging issue was identified as tenure structure and property ownership pattern. In Scotland, various tenures within the same district and buildings limit the intervention options for retrofitting housing for carbon reduction. In Turkey case, variegated tenure was not a key challenge although private property ownership pattern remains as a challenge for local authorities' remit for enforcing retrofitting. Another diverging issue is identified as funding challenges in Scotland case, while in Turkey case this did not emerge as a key challenge. On the other hand, in Turkey case, problems associated with existing legal and regulatory framework were identified, therefore, restructuring of these are required for a better retrofitting policy.

Converging solutions emerged within the expert workshops as well. A highlighted one is that incentives are required to promote retrofitting in two cases. These incentives vary depending on the context and policies such as monetary incentives, tax incentives or zero-interest credit provision for retrofitting costs. Another converging solution from the two contexts emerged as a better planning system that enables local authorities to implement more comprehensive retrofitting policies. Therefore, a holistic planning approach was recommended as a solution to organisational problems to retrofitting existing housing stock.

With the generous support of the British Institute at Ankara, this research revealed that the two cases from Scotland and Turkey have both common and differencing challenges in retrofitting existing housing stocks. This gives us the opportunity of rethinking the retrofitting action together with the inputs from a developing and developed country point of view. In addition, this research also revealed the potential future sub-research areas that could be explored through the involvement of different actors from both countries. Further details regarding the varying issues and the discussions on the ways in which two countries learn from each other will be published in a report in 2020.