Socio-Economic Cost-Benefit Analysis of Renovation Wave

Summary

We invite applications for a fully funded PhD position focused on the socio-economic cost-benefit analysis of the European Commission's "Renovation Wave" initiative. This PhD project aims to analyze the economic, social, and environmental impacts of large-scale building renovations targeted at enhancing energy efficiency, particularly within urban districts. The successful candidate will contribute to developing robust analytical frameworks to assess the costs and benefits of renovation projects, thereby informing policy and investment decisions.

Research field:	Building and civil engineering and architecture
Supervisors:	Jarek Kurnitski Prof. Dr. Ergo Pikas
Availability:	This position is available.
Offered by:	School of Engineering Department of Civil Engineering and Architecture
Application deadline:	Applications are accepted between June 01, 2024 00:00 and June 30, 2024 23:59 (Europe/Zurich)

Description

The built environment and construction industry significantly contribute to climate change. The "energy efficiency first" principle is pivotal in reducing energy consumption and transitioning from non-renewable to renewable energy resources. Despite new buildings meeting nearly zero energy requirements, they play a minor role in overall GHG emission reductions. The primary challenge is the existing stock of energy-inefficient buildings, which comprise 75% of the European building stock and are expected to remain in use until 2050. Sustainable energy renovation is crucial for climate change mitigation and reducing carbon emissions. CO2 reduction potential through renovation varies across regions, with possible reductions of up to 70%, depending on the renovation depth and energy mix. Renovation, coupled with the circular economy, minimizes new resource extraction and waste generation.

Renovation, however, not only reduces climate impact but also has economic benefits. It is often more cost-effective than new construction and stimulates economic activity, generating employment within the construction sector. Government grants are vital in promoting renovation activities, with studies showing that grants covering approximately 30% of project costs are economically neutral. Despite the benefits, renovation faces challenges, primarily due to the current annual renovation rate of 1%, which needs to increase to 3% to meet the Green Deal 2050 targets. Barriers include a lack of owner willingness, funding, understanding, specialized services, and clarity on renovation benefits. From a supply perspective, studies often focus on individual building renovation, including indoor climate impact, building performance, and cost-benefit analysis.

The EU's Renovation Wave strategy promotes widespread building renovation and aims to double annual energy renovation rates, shifting focus from individual buildings to district and neighborhood levels. Positive Energy Districts (PEDs) and district-level interventions leverage economies of scale and integrate renewable energy technologies. Studies highlight the need for innovative legislative, technical, and financial strategies to address the complexities of district-level renovations. Research gaps include understanding the economic and operational impacts of such large-scale interventions.

Research Objectives:

1. **Cost-Effectiveness Analysis:** Investigate the economic viability of different renovation strategies, including minimal integrated and comprehensive cost-optimal measures.
2. **Socio-Economic Impact Assessment:** Analyze the broader social and economic impacts of the Renovation Wave, including job creation, tax revenue implications, and changes in asset values.
3. **Policy and Investment Frameworks:** Develop policy recommendations and investment frameworks that maximize the benefits of renovation projects while ensuring economic neutrality or gain for governments.
4. **Case Studies:** Conduct comparative analyses of various district renovation projects to identify success factors and best practices.

Responsibilities and (foreseen) tasks

- Conduct a comprehensive review of current methodologies and frameworks used in socio-economic cost-benefit analysis for building renovations.
- Identify and assess available data sources related to building energy performance, renovation costs, and socio-economic impacts and develop a comprehensive database to support the analysis of renovation projects.
- Create and improve models to evaluate the cost-effectiveness of various renovation strategies at different levels of scale; and develop metrics and indicators to measure the socio-economic impacts of renovation initiatives, including job creation, tax revenue implications, and changes in property values.
- Apply the developed frameworks to real-world case studies to test validity and reliability and conduct sensitivity analyses.
- Formulate economically neutral or beneficial policy recommendations and investment frameworks.
- Organize and participate in research and practitioner workshops and work collaboratively with a multidisciplinary research team to integrate various perspectives and expertise into the project.

Applicants should fulfill the following requirements:

- A Master's degree in Civil Engineering, Construction Management and Economics, or a related field.
- Strong analytical skills with experience in socio-economic analysis, cost-benefit analysis, and impact assessment.
- Proficiency in statistical modelling and analysis and experience with building and building performance modeling tools.
- Excellent written and oral communication skills, with the ability to present research findings to diverse audiences.
- Ability to work collaboratively within a multidisciplinary research team.

(The following experience is beneficial:)

- Working knowledge of statistics
- Working knowledge of modeling and simulation of buildings
- Basic knowledge of programming and data analytics

The candidate should submit a research plan for the topic, including the overall research and data collection strategy. The candidate can expand on the listed research questions and tasks and propose theoretical lenses to be used.

We offer:

- Join our 4-year Ph.D. program within our dynamic research group.
- Engage in cutting-edge research focused on building design and permitting processes.
- Benefit from opportunities to attend conferences, research stays, and networking with top-tier universities and research centers worldwide.

About the research units

The Department of Civil Engineering and Architecture at the Tallinn University of Technology is a leading research institution committed to addressing global challenges through interdisciplinary research and collaboration. Our vibrant academic community and state-of-the-art facilities provide an excellent environment for doctoral studies.

(Additional information)

For further information, please contact Professor Ergo Pikas at ergo.pikas@taltech.ee and Professor Jarek Kurnitski at jarek.kurnitski@taltech.ee.

To get more information or to apply online, visit https://taltech.glowbase.com/positions/810 or scan the the code on the left with your smartphone.