

Abstract

- Impacts of Overheating resulted from global warming on indoor environment leads to socioeconomic damages, thermal discomfort, productivity reduction, and in severe cases to illness and death.
- Designing resistant buildings and renovating the existing ones are the solutions in mitigating the overheating impacts.
- Four historical and future overheating climatic scenarios will be used to perform BES-CFD-BEHAM followed by real-time monitoring.

Keywords

Adaptation measures, Building classification, BES, Socioeconomic, Resilience, CFD, IAQ, Belgium

Problem

1. According to IPCC fifth assessment report (AR5), the global mean temperature will increase during the 21st century. And, the extreme short-term events such as heatwaves will be more frequent and severe.
2. High outdoor temperatures will significantly affect the indoor thermal conditions and will lead to essential indoor overheating incidents that deteriorates occupants' comfort, productivity, and health.
3. During the summer 2003, approximately 1175 people died in Belgium [1] mostly because of respiratory and cardiovascular issues triggered by overheating [2].
4. Socioeconomically deprived occupants who cannot afford adequate cooling or adaptation measures are at higher risk

Objectives/Hypothesis

- ✓ Identifying the climate change sensitive overheating indicators and criteria
- ✓ Establishing benchmark buildings for Walloon region.
- ✓ Monitoring the trend of indoor and outdoor thermal environmental parameters
- ✓ Developing a novel method for the integration of BES and CFD numerical modellings
- ✓ Showing the future climate projections under multiple scenarios and overheating health risks for the community along with prioritizing adaptation measures
- ✓ Assessment of future direct and indirect socioeconomic damage and risk of different climatic scenarios for the Walloon region.

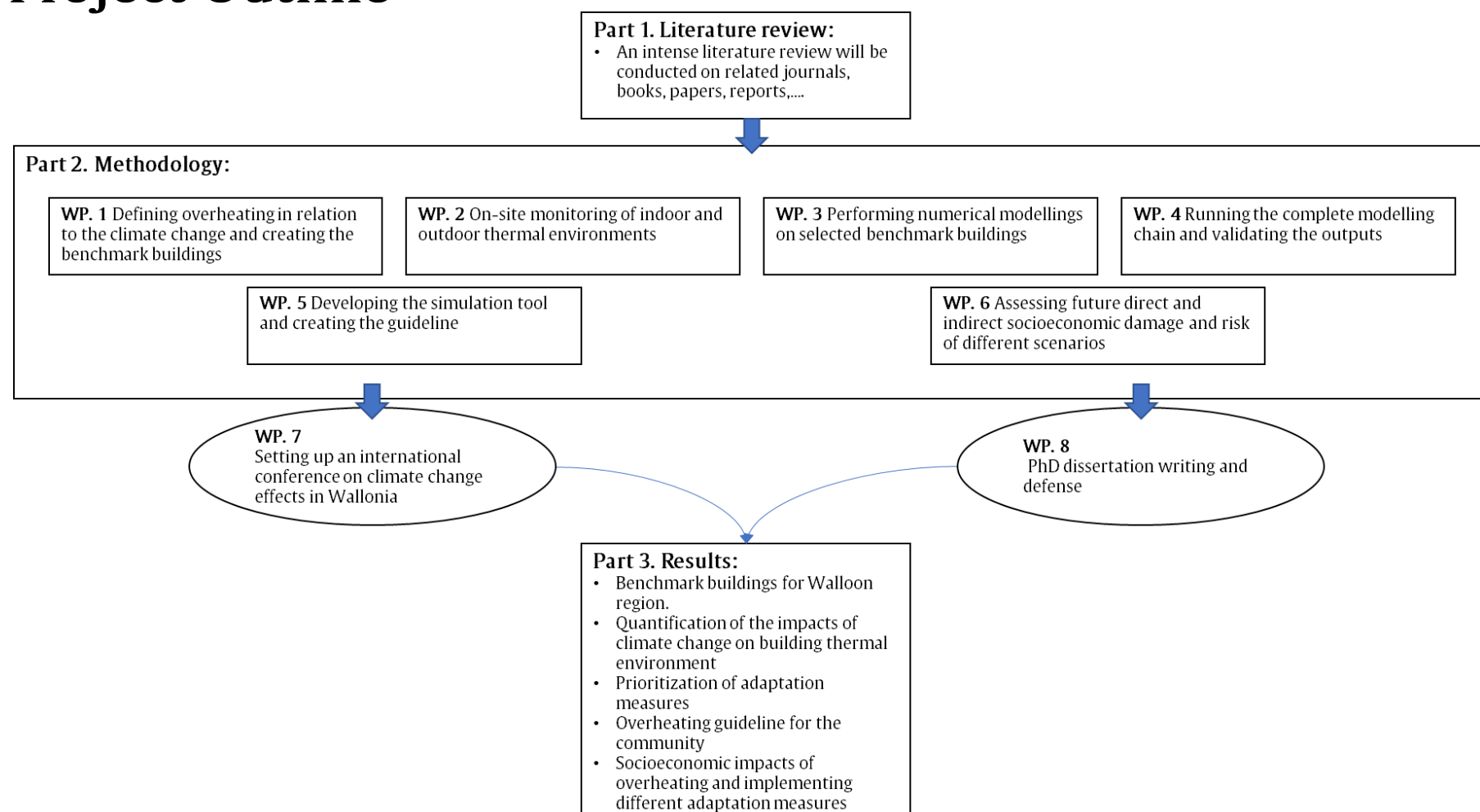
Audience

The overarching aim is to provide guidance for **scientists** and the **policy of local, provincial and regional governments** in, among others, **spatial planning, energy security and public health**. Many **stakeholders** can be identified, such as **local governments, urban designers and planners, health services, housing corporations, building engineers, architects and energy companies**. Specific stakeholders that will be engaged in this project, but also other parties in Liege, Charleroi, Namur, and Brussels.

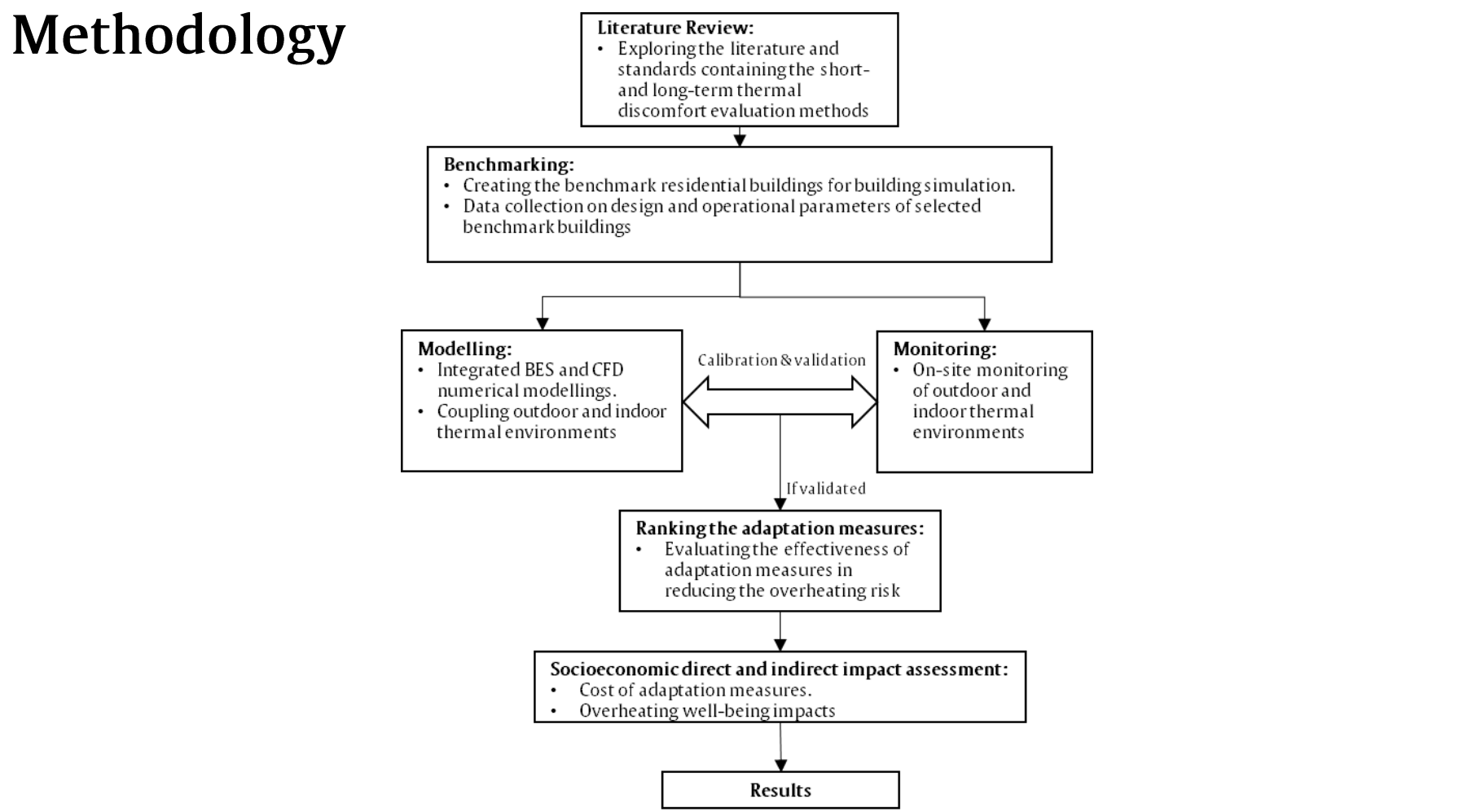
Research Questions

- What is overheating and how to define short-term and long-term overheating phenomena?
- What is the dominant residential building typology in Walloon region?
- What is the trend of real indoor environmental parameters during a year?
- How CFD and BES simulations can be integrated to achieve reliable and detailed modelling of indoor and outdoor thermal environments?
- How to make the community to be aware of the impacts of climate change and associated health risks? How to provide solutions for the community to deal with the overheating risks?
- What will be the socioeconomic consequences of climate change and air-conditioning on the building stock, and what will be the effect of building adaptation (rebound effect) measures?

Project Outline



Methodology



Resources

- [1] Robine, J. M., Cheung, S. L., Roy, S. Le, & Oyen, H. Van. (2007). *Report on excess mortality in Europe during summer 2003 Report on excess mortality in Europe during summer 2003*. 2003(February).
- [2] Gasparrini, A., Armstrong, B., Kovats, S., & Wilkinson, P. (2012). The effect of high temperatures on cause-specific mortality in England and Wales. *Occupational and Environmental Medicine*, 69 (1), 56–61.

Ramin RAHIF

PhD Student at Sustainable Building Design (SBD) Lab
Department of Applied Sciences,
University of Liege, Belgium
E-mail: ramin.rahif@uliege.be

