

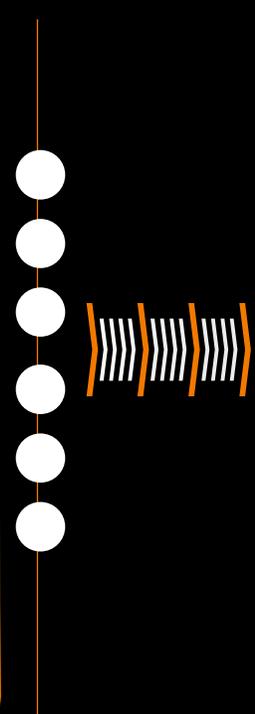
DEVELOPMENT OF A MULTI-CRITERIA OPTIMIZATION APPROACH FOR THE SELECTION OF GREEN BUILDING MATERIALS INTEGRATED INTO BUILDING ENVELOPE ASSEMBLIES

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● Background of the Study

- ❑ Rapid growth in the construction industry has been seen in the last decade due to the development of globalization and urbanization in the whole world. This growth will be coupled with large manufacturing of basic materials and depletion of natural resources and economic advances. Hence, it is expected to cause continual intense environmental and social impacts, and certainly, rising the demand for balanced solutions to meet the requirements of these growths and to attain global sustainable development.



↑ +3 BN



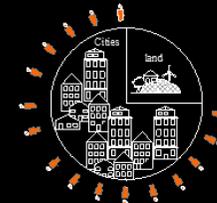
middle class growth in 2020

35-40%



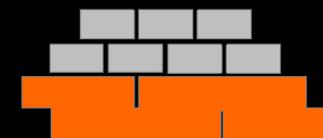
of the total materials used by the construction industry in the world

75%



of the world's population will be urbanized

↑ +70%



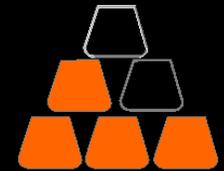
growth of demand for global construction in 10 years

↑ +5 BN



the projected world population in 2050

↑ x 1.5



more resources used than planet can provide

“The selection of building materials is considered one of the most important factors affecting the sustainability of the building”

“Selecting inappropriate materials and assemblies when designing a building will affect the people as well as the built environment”



“

The extraction and processing of raw materials are often entailing extensive use of energy, materials, water and chemicals; and all this turns into pollution. Hence, these impacts can be reduced substantially by creating a multi-criteria assessment tool to be used by the construction stakeholders in every stage starting from the strategic definition of the project up to the **in-use** stage

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● Problem Relevance

- ◆ Current building materials selection methods fail to provide appropriate solutions for two major issues: an assessment based on sustainability principles, and the process of prioritizing and assigning weights to relevant assessment criteria
- ◆ Presently, building material selection stays constrained to specific performance criteria, and a limit range of properties control the selection process.

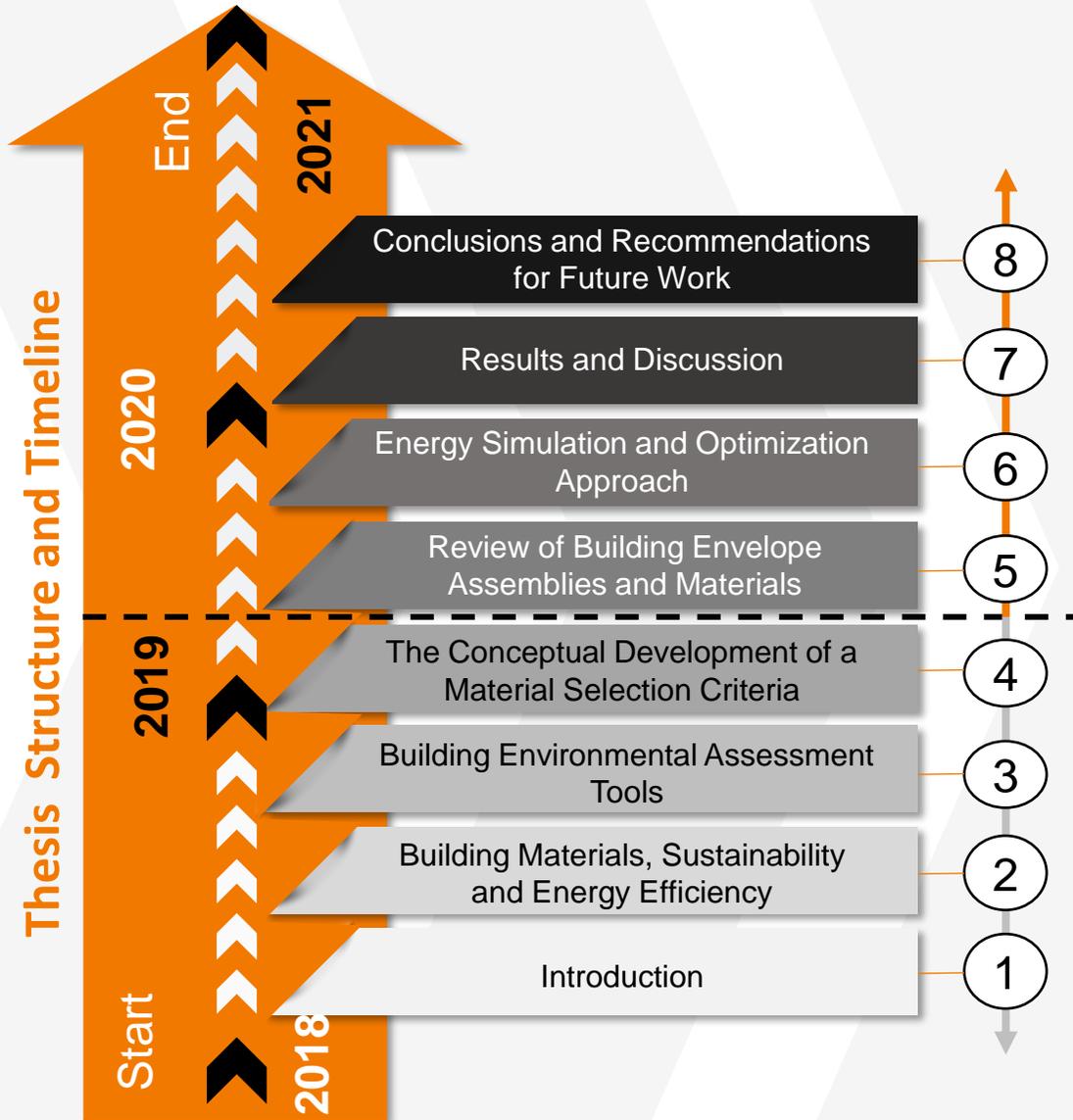
● Research Aim and Objectives

This research aims to create a **multi-criteria optimization approach for the selection of green building materials in the early design stages**, in an attempt to establish a starting base-knowledge for policy-makers, designers and developers to achieve long-lasting sustainable development outcomes. The thesis is intended to **estimate the environmental impacts of various building materials, as an individual or as assemblies, based on scientifically recognized sustainability indicators.**

● Significance and scope of the research.

This research will be important for the construction stakeholders including designers, consultants and contractors as well as society and the users of the building. It will make a fundamental change in solving many problems related to the selection of green building materials which generally participate in reducing the negative impact of the building on the environment and enhancing the quality of the indoor environment for users.

The new model seeks to broaden the focus of material selection by adding additional characteristics to the selection criteria. These include five groups specifically; materials & resources efficiency, health and wellbeing, socio-economic performance, materials efficiency, water efficiency, and energy efficiency



The new criteria are intended to increase the amount of information existing in the building material industry to support the selection of appropriate green building materials and assemblies and to help in the realization of the 2030 sustainable