



Building Information Modelling (BIM) for Eco-Construction and Sustainable Development

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Introduction

Building Information Modelling (BIM) is a 3D digital process to design, record, monitor and manage an asset's geometric and non-geometric information. This model is called a Building Information Model (also BIM). BIM promotes the information coordination through the whole life-cycle of the project and enables all project members to design and manage their data via a shared and federated model.

BIM improves a project's efficiency and reduces human-made errors.



Geometric information:

- 3D geometry,
- Topology,
- Spatial relationships, and ...

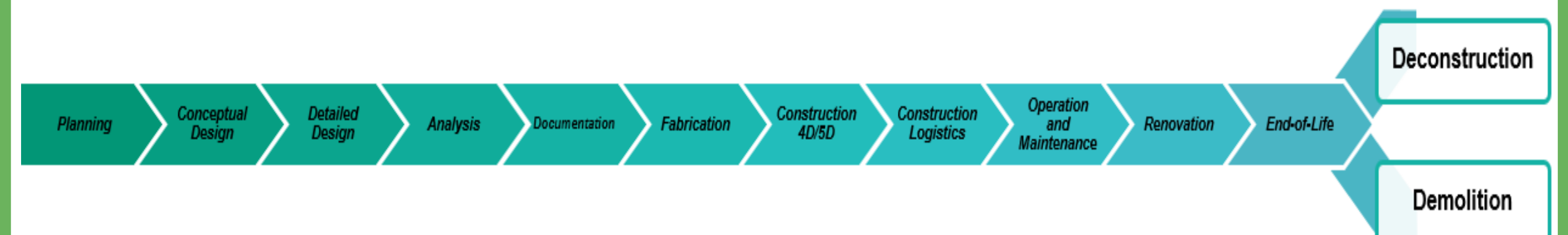
Non-geometric (Semantic) information:

- Components and Materials' Characteristics,
- Schedules and Budget,
- Environmental parameters, and ...

Research Aims

This project aims to use BIM in an innovative approach for end-of-life scenarios of buildings. This aim is achieved through the following objectives:

- 1) Developing a Building Information Model with the information designed through ECON4SD work-packages,
- 2) Developing a systematic approach for designing BIM-enabled components and elements,
- 3) Developing a link between BIM and Material/Component Bank (also known as M/C Bank),
- 4) Developing end-of-life scenarios through BIM.



World Green Building Week

One of the aspects of Green Building design is the *Material and Resource Efficiency*. To reach a better understanding of the material and resource use in buildings, modern technologies (e.g. BIM) offer multiple opportunities. For instance, BIM assists engineers in visualizing the building before construction in order to optimize the material-flow and to reduce waste. BIM can also be used for estimating the credits that are required for achieving green building certificates, such as LEED or BREEAM.

Powered by the *World Green Building Council*, World Green Building Week aims to motivate and empower everyone to deliver greener buildings.



Find out more at: <http://www.worldgbc.org/worldgreenbuildingweek/map>

Methodology

Realizing above objectives requires different methodologies:

- 1) BIM, itself, is a methodology to create an intelligent building information model.
- 2) With BIM, it is possible to create a digital twin for each material/component, while the real-world twin is either used inside the building or is stored in the physical M/C Bank.
- 3) Firstly, a BIM-M/C Bank integration framework needs to be developed to elaborate the exchange formats for seamless transfer of information between BIM and M/C Bank. Secondly, the Level of Details (LOD) of components and the whole building model should be defined.
- 4) BIM's current level of maturity requires further expansion to encapsulate assets' end-of-life fates. For this, literature review and case studies are necessary in the first step. Second step consists of API programming for extending BIM capabilities.

About ECON4SD

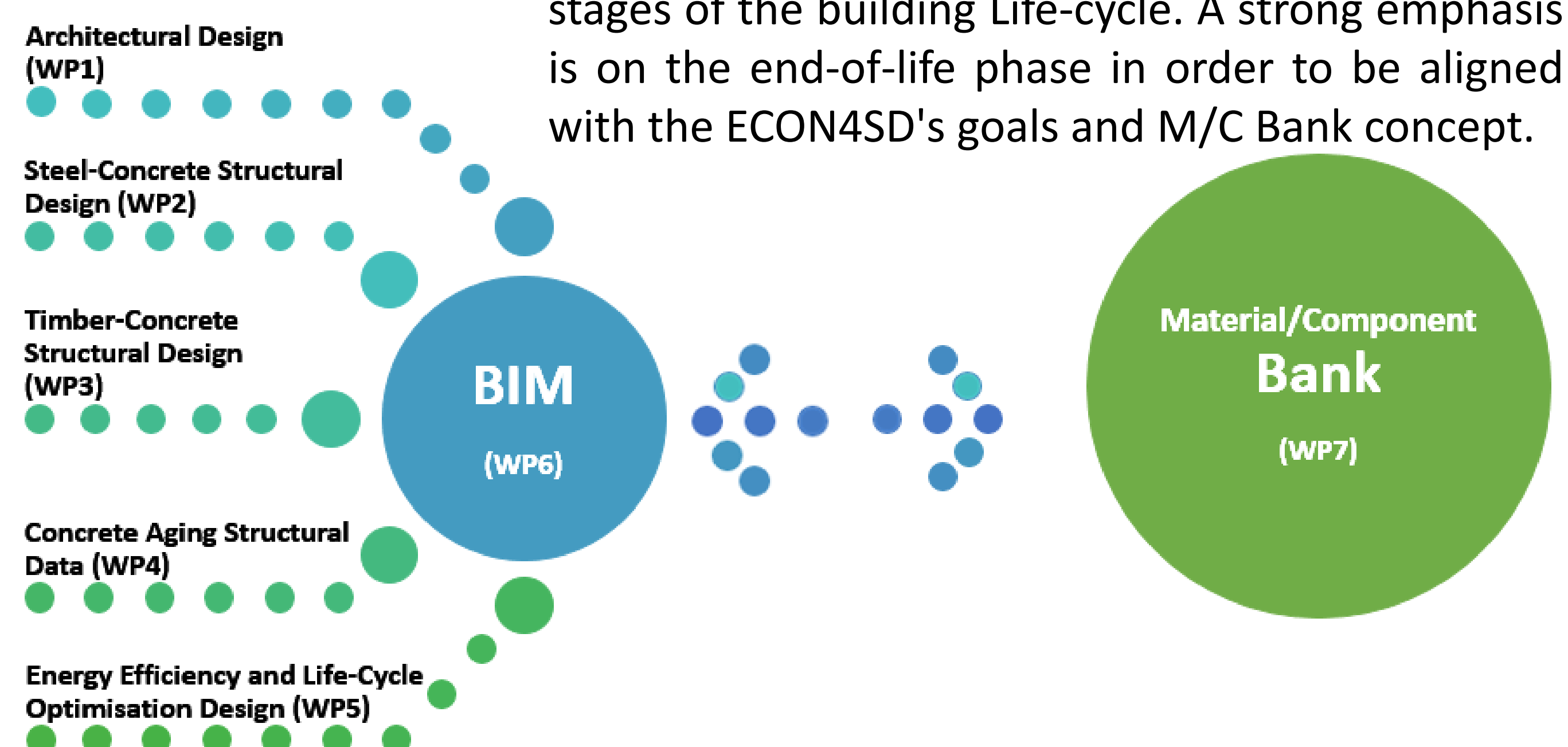
- ECON4SD stands for *Eco-Construction for Sustainable Development*.
- This project aims to develop new building components and design models to achieve maximum efficiency of resource and energy use based on the vision of re-usability of materials and components at the end of a building's life-cycle.
- The concept of a Material/Component Bank is to be developed to help with the modularity, flexibility, adaptability, and upgradability of future building designs.



Details:
Start date: 2017
Duration: 48 Months
Principal Investigator:
Prof. Danièle Waldmann

Applications and Results

Although the ECON4SD's Building Information Model is to be created during or after the design phase, it will be used throughout the various stages of the building Life-cycle. A strong emphasis is on the end-of-life phase in order to be aligned with the ECON4SD's goals and M/C Bank concept.



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