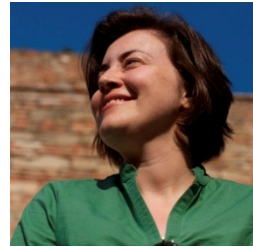


# ECOBIM – Value Driven Life Cycle Based Sustainable Business Models



Pekka Huovila  
Principal  
Scientist  
VTT Technical  
Research Centre of  
Finland  
pekka.huovila@vtt.fi



Carmen Antuña  
Rozado  
Research  
Scientist  
VTT Technical  
Research Centre of  
Finland  
carmen.antuna@vtt.fi

Souheil Soubra, CSTB, France, souheil.soubra@cstb.fr  
Wolfram Trinius, Ingenieurbüro Trinius GmbH, Germany, trinius@trinius.de

## Summary

Value Driven Life Cycle Based Sustainable Business Models (ecobim, 2012-2014) is a European research project coordinated by VTT Technical Research Centre of Finland under ECO-INNOVERA programme. The project consortium includes SMEs from Finland, Germany and France and the French building research centre CSTB. ecobim's main aim is to develop sustainable construction business models to support paradigm change in eco-innovation. ecobim will draw recommendations to policy makers for its successful implementation covering the whole value chain. A roadmap for new business models will be developed for sustainable construction procurement in collaboration with SMEs. The life-cycle approach considers a wide perspective to adapt to different realities accommodating changes and allowing room for innovation.

Case studies in North, Central and South Europe link ecobim's business model to SMEs' daily practice covering the European dimension and providing business opportunities for the common marketplace. The case studies are national but interactive information exchange ensures covering the whole value chain and considering local features. ecobim intends to positively and widely impact the sustainability of the community while focusing mainly in changing the present paradigm of construction business models, therefore resulting in an improved quality of life for citizens and new business opportunities for the participating partners. This will be supported by better integration of ICT tools, based on PLM (Process Lifecycle Management) to foster collaboration between stakeholders. This paper presents first findings and ambitious objectives of the project.

**Keywords:** Sustainable eco-innovative construction business models, sustainable construction procurement, life cycle assessment tools, whole construction value chain, ICT, PLM

## 1. Approach

The construction sector is mainly focused on reducing the initial (investment) costs, rather than applying comprehensive approaches for optimizing total life cycle business models for the benefit of owners, users, the environment and the society. This is partly due to lack of models, methods and tools for total life cycle definition of the design/procurement process, partly due to current business models and contractual frameworks that do not provide space for innovation and novel value sharing schemes.

Currently, there is no tool, any holistic model or method for sustainable eco-innovative construction business models that integrates correctly all aspects of life cycle costs and values (economic, environmental, social and cultural). In addition, creating value is still a rather new concept in the construction industry (particularly for SMEs) and as such it is not yet driving business models or

being enabled by contract forms. This makes a paradigm change to eco-innovation even more difficult although very much needed.

## **2. Objectives**

Paradigm change to eco-innovation within the construction sector means more than technological innovation. Sustainable construction business models can support paradigm change in eco-innovation by means of providing a systemic and dynamic approach including Life Cycle Assessment (LCA) and the use of Information and Communication Technologies (ICTs) covering social, environmental and economic aspects in direct collaboration with SMEs. In addition, and while doing so, ecobim will also provide recommendations for policy makers for its successful implementation covering the whole value chain.

SMEs play a very important role in the construction innovation ecosystem. To create new business opportunities for SMEs in a complex and rapidly changing environment, simplicity and agility are key factors to be taken into account. Therefore, a roadmap for new business models for sustainable construction procurement is innovative through flexible life-cycle assessment tools based on indicators and linked to Building Information Models (BIMs). In ecobim, the life-cycle approach considers a wide perspective, to adapt to different realities while being able to accommodate changes and allow room for innovation. Interactions between information and processes will be in the heart of the expected change and will be an important element of the roadmap.

## **3. Discussion**

ecobim intends to initiate the next generation of integrated (social, environmental, economic) user-oriented sustainability assessment tools to aid paradigm change to sustainable eco-innovative construction business models. It will also provide a roadmap to a sustainable eco-innovative paradigm change for enterprises, particularly SMEs, and recommendations for policy makers. Results obtained are intended to be primarily implemented already during the project. IP issues relate with ecobim tools and will be contractually agreed on before the work starts.

Current tools still lack proper integration of the three dimensions that characterize sustainability, and they are commonly not so easy-to-use by key actors in the construction sector, e.g. SMEs. In addition, they are not flexible enough to accommodate changes or to foresee them.

The main output expected is the development of a set of guidelines based on indicators for sustainable eco-innovative construction business models. This process will also provide as a result a roadmap for enterprises, particularly SMEs, and easy-to-understand recommendations for policy makers.

ecobim intends as wide an impact as possible and therefore is planned to be a free-access tool to foster paradigm change to sustainable eco-innovative construction business models. However, VTT will be responsible for and in charge of the development of the tool and its continuous improvement in the future.

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## 1. Approach

The construction sector is mainly focused on reducing the initial (investment) costs, rather than applying comprehensive approaches for optimizing total life cycle business models for the benefit of owners, users, the environment and the society. This is partly due to lack of models, methods and tools for total life cycle definition of the design/procurement process, partly due to current business models and contractual frameworks that do not provide space for innovation and novel value sharing schemes.

Adopting the terminology as illustrated in the figure that follows, we can maximize the yield, thus increase the client benefit (value for money) and/or provider profit by means of either cutting cost or creating more value. The first one is the prevailing strategy in the construction sector, but it has its obvious limitations in terms of being able to truly satisfy user and society needs (also in terms of

how far down the "control space" can stretch) and it can be an obstacle for the implementation of sustainable eco-innovative business models. The latter one, on the other hand, would inherently be a client-oriented approach, and therefore more directly linked to end user (and society) focus - and there is no present (theoretic) upper limit to yield. Naturally, combining the two approaches will maximize the yield potential.

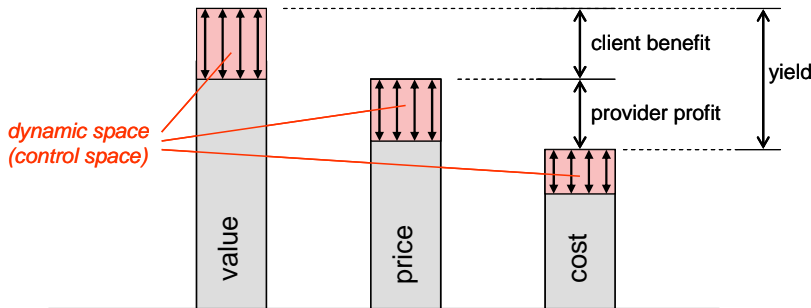


Fig. 1: Cost, price and value [1]

Currently, there is no tool, any holistic model or method for sustainable eco-innovative construction business models that integrates correctly all aspects of life cycle costs and values (economic, environmental, social and cultural). In addition, creating value is still a rather new concept in the construction industry (particularly for SMEs) and as such it is not yet driving business models or being enabled by contract forms. This makes a paradigm change to eco-innovation even more difficult although very much needed.

Value can be defined in different ways. The common definition is linked to financial measurements of how much a customer is willing to pay for a specified product. However, it is individuals and groups that create the product value. Therefore it is necessary to look at drivers for innovation and creativity as well as how to create value for the client or buyer as well as for the company that develops the product or a building. And how does the management empower the delivery organization and build an ideology that supports and directs an organizational behaviour which will be able to meet the client's needs. [2]

The following figure illustrates part of value based procurement listing market features, supplier qualities and process characteristics supporting concurrent activities in target setting, concept development, design and construction. In this process, value plan is formed based on a vision, followed by the value promise to be commissioned. The performance of the product, process and organisations should be monitored to ensure meeting the objectives and to support continuous improvement.

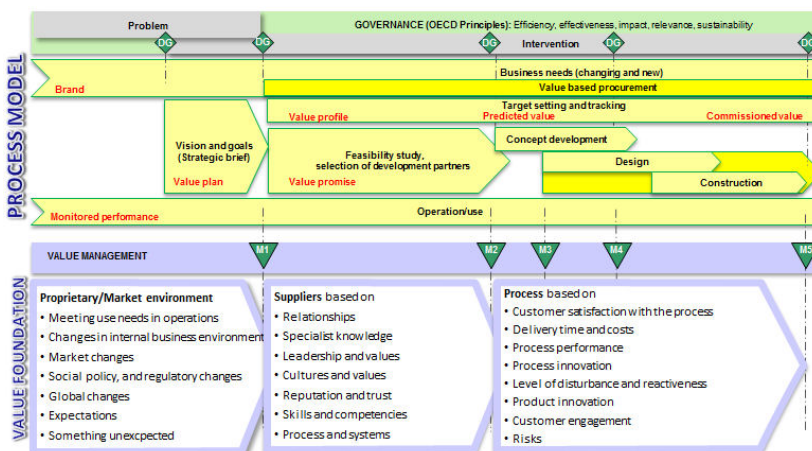


Fig. 2: Value foundation elements supporting concurrent building process [3]

## 2. Objectives

Paradigm change to eco-innovation within the construction sector means more than technological innovation. Sustainable construction business models can support paradigm change in eco-innovation by means of providing a systemic and dynamic approach including Life Cycle Assessment (LCA) and the use of Information and Communication Technologies (ICTs) covering social, environmental and economic aspects in direct collaboration with SMEs. In addition, and while doing so, ecobim will also provide recommendations for policy makers for its successful implementation covering the whole value chain.

SMEs play a very important role in the construction innovation ecosystem. To create new business opportunities for SMEs in a complex and rapidly changing environment, simplicity and agility are key factors to be taken into account. Therefore, a roadmap for new business models for sustainable construction procurement is innovative through flexible life-cycle assessment tools based on indicators and linked to Building Information Models (BIMs). In ecobim, the life-cycle approach considers a wide perspective, to adapt to different realities while being able to accommodate changes and allow room for innovation. Interactions between information and processes will be in the heart of the expected change and will be an important element of the roadmap. Limitations of existing tools and related ecobim objectives are listed in the table below.

*Table 1: ecobim's innovation objectives in relation with current tools*

current existing tools	ecobim's innovation and added value
either lack proper integration of environmental, economic and social aspects of sustainability, or focus only on one of the three aspects	next generation of integrated user-oriented sustainability assessment tools
are normally designed to be used by a particular group of stakeholders	is intended to consider the different stakeholders involved in the design/procurement process
are commonly not considered from a life cycle perspective	flexible life-cycle assessment tool based on indicators and linked to BIMs
have a degree of complexity that makes them difficult to use by key actors, particularly SMEs	easy-to-use set of guidelines based on indicators for sustainable eco-innovative construction business models in direct collaboration with SMEs
are seen as potential risk by companies since ownership and control of information becomes unclear	combining information and processes will allow to support contributions coming from various stakeholders
do not typically include policy makers, or their principles are formulated in such a way that are not useful to them	easy-to-understand recommendations for policy makers
are normally licensed	FREE-ACCESS tool
tend still to the business-as-usual way of doing and focus too much on technological innovation if at all	new business opportunities for construction SMEs by fostering paradigm change to eco-innovation

In this context, ecobim's expected output is a set of guidelines based on indicators for sustainable eco-innovative construction business models. As a result, this process will also provide a roadmap for enterprises, particularly SMEs, at a European level, and easy-to-understand recommendations for policy makers. It will also serve to establish a networking platform with SMEs able to discover new innovation fields within the construction sector and develop the required methodologies and tools to serve the whole value chain.

To make this possible, a close collaboration with SMEs and an understanding of their main challenges, but also of their strong points, what comes to the implementation of sustainable construction business models, is very much needed through the whole process. Selecting the right kind of SMEs is also important in terms of them being representative enough of the variety and complexity of the construction process. In this sense, the SMEs selected for the consortium are an architectural firm from Finland, an eco-consultant from Germany and an ICT consultant from France.

The architectural firm is important to define the design/procurement process correctly from a life cycle perspective and its obstacles regarding the implementation of sustainable eco-innovative

measures beyond commonly adopted energy-efficiency and indoor-environment measures. The eco-consultant helps to introduce a wider scope, bringing also in other views (client - main contractor - supplier). Finally, the ICT consultant can provide an adequate interface according to the needs defined.

All in all, a correct definition of the design/procurement process is of great importance since the decisions made during this process will heavily influence life cycle costs, energy consumption, indoor environment quality, usability, recycling and reutilization of construction waste, etc. So, ecobim's results will try to reach as many stakeholders as possible to maximize its impact enabling a paradigm change to eco-innovation within the construction sector.

The geographical diversity is also important. The work will be carried out in three countries in North, Central and South of Europe, thus covering the European dimension and providing business opportunities for the common marketplace. Case studies form a solid basis to link development to SMEs daily practice. All the partners in the proposed consortium have a wide experience in different high-impact sustainable building case studies around Europe and also access to new potential ones that could be used for the purpose of this research. The case studies are national but interactive information exchange ensures covering the whole value chain even considering local special features.

Interactive face to face workshops and virtual webinars help maintaining ecobim's international nature and to cover the whole value chain. Top down and bottom up approaches are used concurrently to boost the eco-innovation infrastructure. System thinking is at the core of this systemic approach.

Interviews with some key stakeholders outside the proposed consortium carried out during the research will help to complete and refine the definition of the design/procurement process and to inform the decisions regarding the implementation of ecobim's guidelines for sustainable eco-innovative business models.



Fig. 3: ecobim project consortium, results and intended impacts

ecobim will actively disseminate its results to the policy makers (regulators, building control, professional associations etc.), practitioners (both SMEs and large companies), to users (occupants of buildings and citizens) and researchers (research institutes and universities).

### 3. Approach

#### 3.1 The Framework

The delivery process of buildings is regulated by contracts. Client's procurement strategy should support the increase of value, based on project objectives. Applied project delivery systems define the responsibilities of different actors, e.g. who is in charge of design or maintenance – the client or the supplier? The project delivery system has an important role to channel where the innovations have space to take place.

If the owner feels confident to know best available technologies, it may go to construction management or design-bid-build kind of contracts, not expecting major improvements to be proposed by the suppliers. If the owner expects that the market is more familiar with the latest technological possibilities, other procurement modes can be applied, e.g. competitive design-build or design-build-operate where innovation space is bigger amongst suppliers. Alliance contracting offers opportunities for new solutions with early involvement of key actors. Project partnering is an example arising from the need for a closer co-operation between the then too often adversarial project parties. Integrated Project Delivery (IPD) is a recent invention for the efficient utilisation of versatile expertise for the best of the project. IPD associates itself clearly with the nascent tools, techniques and procedures (BIM or Lean design and construction). Development of collaborative construction project arrangements is a result of frustration towards traditional contracting. [4]

#### 3.2 Networking Platform

ecobim will also serve to establish a networking platform with SMEs and other key stakeholders able to discover new innovation fields within the construction sector and develop the required methodologies and tools to serve the whole value chain. The platform will be an online meeting point through which ecobim partners will organize workshops, surveys and discussions together with the target groups listed below. It will also serve to disseminate and discuss information considered of importance for the aforementioned target groups like articles and papers, videos, interviews, etc.

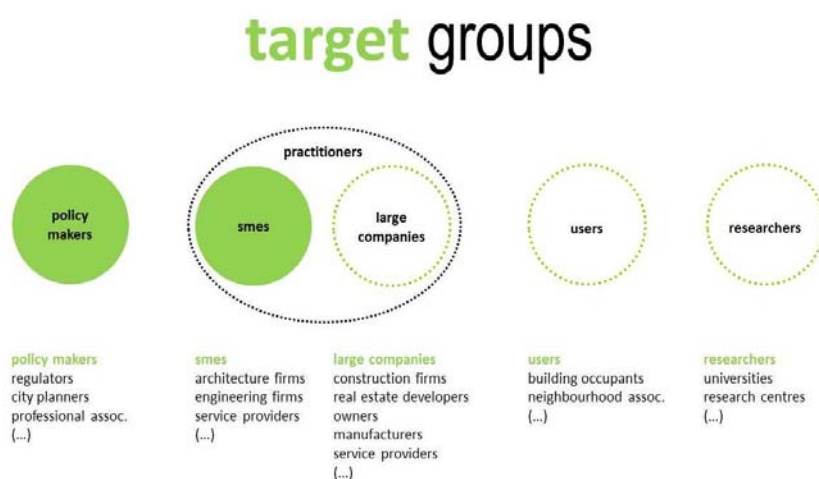


Fig. 4: ecobim's defined target groups for networking platform

When defining the concept for the platform, several examples, related in one way or other to the functionalities needed for ecobim's networking platform, have been used (loosely) as references

- OpenIdeo, an open innovation platform for collaborative problem-solving [5]
- Whatif?, a digital tool (web and mobile application) for promoting and enabling urban participatory and collective creativity processes [6]

- Helsinki Living Lab, to promote user-driven methods and tools for improving the real-world development of products and services [7].

### **3.3 Case Studies**

Due consideration of sustainability aspects in building and construction projects is frequently discussed as one of the key requisites when aiming to significantly reduce adverse impacts and when e.g. aiming to fulfil political targets for energy demand or carbon emissions. ecobim aims to ease the application of sustainability aspects, as identified in ISO 15392:2008 [8] and further elaborated in the ongoing work with ISO DTS 12720 [9] and to assist stakeholders to successfully include these aspects in their everyday business.

The success of ecobim depends on the ability of stakeholders to include ecobim into their business model, or to adapt their business model to the application of ecobim. Equally important are however the project structures, contracting models, roles and responsibilities in decision-making processes. Not only the tools and the knowledge-base available in a project, but also the ability to communicate and work towards a common goal are decisive success factors. Consequently, the challenges to overcome are likely to be slightly different between case study projects.

Ecobim will conduct a series of case studies, including a discussion of the strengths, weaknesses, opportunities and threats (SWOT-analysis) associated with different project constellations. The elements where ecobim can contribute to enforce strengths and to overcome opportunities can be considered as the fields of high potential for ecobim. Case studies will also indicate how the application of ecobim can support an overall building project, as well as the roles of different stakeholders and actors, and to what extent the effort to successfully include sustainability aspects can be reduced.

## **4. Discussion**

ecobim intends to initiate the next generation of integrated (social, environmental, economic) user-oriented sustainability assessment tools to aid paradigm change to sustainable eco-innovative construction business models. It will also provide a roadmap to a sustainable eco-innovative paradigm change for enterprises, particularly SMEs, and recommendations for policy makers. Results obtained are intended to be primarily implemented already during the project. IP issues relate with ecobim tools and will be contractually agreed on before the work starts.

Current tools still lack proper integration of the three dimensions that characterize sustainability, and they are commonly not so easy-to-use by key actors in the construction sector, e.g. SMEs. In addition, they are not flexible enough to accommodate changes or to foresee them.

The main output expected is the development of a set of guidelines based on indicators for sustainable eco-innovative construction business models. This process will also provide as a result a roadmap for enterprises, particularly SMEs, and easy-to-understand recommendations for policy makers.

This is important since current existing tools are not simple and agile enough to be easily used by SMEs and do not adapt to their particular features and requirements. Also, they do not typically take into account policy makers.

ecobim intends as wide an impact as possible and therefore is planned to be a free-access tool to foster paradigm change to sustainable eco-innovative construction business models. However, VTT will be responsible for and in charge of the development of the tool and its continuous improvement in the future.

This is expected to support SMEs within the construction sector which typically has quite limited human and financial resources, in creating new business opportunities and improve their position



in a complex and highly competitive market while contributing to a more sustainable built environment.

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