

Responsibly Sourced Materials in a Circular Built Environment Project Template

The Sustainable Buildings and Construction Programme (SBC) aims at improving the knowledge of sustainable construction and to support and mainstream sustainable building solutions. Through the programme, all major sustainable construction activities can be brought together under the same umbrella. The work involves sharing good practices, launching implementation projects, creating cooperation networks and committing actors around the world to sustainable construction. The purpose of this template is to capture, report and publish case studies related to circular economy in the built environment for the purpose of knowledge and information sharing including cross collaboration.

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The SBC Programme is one of six programmes under the One Planet Network (UN 10YFP).



One planet
build with care

Please give us more information on the project.

1. Title of project (e.g. Circular Economy Ownership Models: A view from South Africa Industry). *

GREEN TRANSFORMABLE BUILDING LAB (GTB LAB)

2. Region(s) of project *

- Africa
- Asia/Pacific
- Europe and Central Asia
- Latin America
- Middle East
- North America
- Central America
- Caribbean
- Global/All regions

3. Country/countries of project(s). (e.g. South Africa) *

NETHERLANDS

4. Your name *

Teodora Capelle

5. Your organisation *

Brussels Environment, Belgium

6. Other than the SBC Programme, is this project related to any of the other 10YFP/One Planet Network Programmes? *

- Sustainable Tourism Programme
- Consumer Information for SCP
- Sustainable Food Systems
- Sustainable Lifestyles and Education
- Sustainable Public Procurement
- Not related

7. If this case study is related to any other program, please list the program. *

Project BAMB – Buildings As Material Banks funded by H2020-EU.3.5.4 programme: Enabling the transition towards a green economy and society through eco-innovation

8. Overview/Summary (1000 characters). (e.g. Waste materials are not remanufactured, reused or recycled successfully. This study focuses on the South African industry's view on composite waste. The study found that cost reduction was a major driver and sustainer for recycling of composites). *

Realised in the framework of the GTB innovation centre for circular building in Heerlen, the Green Transformable Building Lab (GTB Lab) module has been developed around a reversible multifunctional steel frame which was filled by independent, exchangeable, standardised and reversible floor, facade and roof components.

9. Keywords *

- Policies promoting circularity
- Construction and demolition waste management
- Design for disassembly, reuse and easy to recycle
- Adaptability, flexibility and refurbishment of buildings and neighbourhoods
- Sharing and multi-use of spaces
- Use of reused or recycled content in new products and buildings
- Circular water
- Circular energy
- Financing circular processes
- Reconstruction

9.1 If the keywords above are not adequate, please specify other keywords. *

10. Life Cycle Phase(s) *

- (re-)Manufacturing of building materials
- (re-)Design
- (re-)Build
- (re-)Use
- (re-)Purpose
- Dismantling

11. What do you want other people to know about your project? (e.g. To develop appropriate national models for circular economy, it is important to reduce cost for recycling composites to encourage South African companies to transition towards circular economy). *

To date, a single module has been built with the newly developed components: universal steel profile, standardised reversible wooden cassette, glass heated façade. Since its construction in December 2018, the flexible and evolving structure was transformed once. In the future, the construction is intended to be scaled up, receive a specific functionality, and eventually be transformed several times.

12. What is the aim of the project (50 words/350 characters)?(e.g. To identify the drivers and sustainers for the South African industry to consider reuse and recycling of production waste materials). *

Testing the transformation of the shape, size, and function of a building through the use of Reversible Building Design protocols and standards
Investigate needs and requirements of the local stakeholders to develop new business models

13. Explain what is special/unique about this case? (1000 characters) (e.g. This case study focuses solely on composites. Apart from the general reuses of recycled composites in a circular economy, it is also a good strategy to avoid or reduce high energy demand linked with the production of raw materials). *

GTB Lab investigates the development of entirely new circular products by completely switching from the traditional construction approach. The Lab was designed as an open platform. By introducing plugins in building components, the structure was and will be able to change form and function. It can adjust its configuration to the required performance without substantial loss of value of materials while providing optimal comfort, healthy climate, and local energy production.

14. Year of delivery or ongoing?(e.g. 2018 or ongoing). *

2018, the scaled up project -on going

15. What did the project achieve (1000 characters)? Please give an example.(e.g. The study identified that a large number of companies in the South African industry experience a small percentage of composite production scrap material and that quality assurance of recycle and product certification for the composites was a major barrier.With these key identifications, the SA industry can conduct future research on how to overcome this barrier and would ensure the use of materials more efficiently to reduce production costs). *

Today, the footprint of the metal as a material for construction is assessed based on the end of life recycling scenario. The biggest achievement of the GTB Lab is to demonstrate the necessity to change these assumptions. Not only should the reuse scenario be taken into consideration, but the impact of upgradable standardised modular systems and exchangeable components should be integrated and enhanced in the calculation.

16. Who was involved/who were your stakeholders, and what was their contribution?Please list the entire supply chain of stakeholders/actors.(e.g. Directors and senior managers in South African composite material users sector). *

The joint participation of the construction industry (six active manufactures) in the development of the GTB LAB enabled the investigation of new business and operational models that makes a circular project feasible.

17. What were the output(s)/outcome(s)? Please list examples of any outcomes achieved.(e.g. A purely theoretical study, but outcomes are: 1. Identification of cost reduction as the biggest driver. 2. Sustainers for a circular economy cannot be assumed from a global perspective but have to consider the local environment. 3. The different ownership models could be assessed though detailed knowledge of the supply chain and composite volumes.4. The need for quality assurance of recycle and to certify products incorporating recycle composites. 5. A large number of companies experience a relatively small percentage of composite production scrap material). *

The GTB LAB CIRCULAR MODULE achieves full reversibility and high reuse potential of all its building parts. Four strategies were investigated and applied.

REVERSIBILITY AT MODULE LEVEL

Constructive systems of the module can play different roles as facades, roofs and floors. For example, the wooden facade structure was used to create a floor/terrace during the transformation of the module, extending its useful surface.

REVERSIBILITY AT COMPONENT LEVEL

Individual components can be reconfigured for instance within a facade transforming a door into a window or a shelf.

DESIGN - PRODUCTION MEASUREMENT

Coordination between the design and production of elements cuts waste generation by 98%.

REPLICABILITY

The standardisation and the ease of assembly-disassembly facilitate replication. Moreover, the 3D-module can be transported and extended easily.

18. Is the project replicable? If yes, how? (1000 characters)(e.g. Yes, with the application of similar cost reduction methods in different countries). *

The standardisation, universal connections between different elements, and the correlation between the lifespan of materials are solutions developed by GTBL that can be integrated in the construction industry of tomorrow.

19. Is the project scalable? If so, please explain (1000 characters)?(e.g. Yes, it has not been implemented in South Africa yet as this is a purely theoretical study). *

Due to its modularity, the GTBL is intended to be up scaled subsequently. Modules can be stacked in different spatial setups.

20. What are the 3 main challenges (1000 characters) you encountered? And why?(e.g. Quality assurance of recycle and to certify products incorporating recycle composites, no consensus in the survey of composite manufacturing companies, government, local authority, product retailers/distributors, end users or third parties, should take responsibility for managing end-of-life product waste. Lack of QA for recycle and product certification incorporating recycle composites was a hindrance). *

1. Testing innovative solutions can lead to delays in terms of planning
2. Risk related to the innovative solutions implementation is considered high
3. Building procedures and policies are often barriers for circular building implementation

21. What are the 3 main successes (1000 characters) of this study? And why?(e.g. 1. Circularity can be progressed in SA. 2. Identification of cost reduction as a driver and sustainer for CE. 3. Quality assurance for recycle and product certification). *

1. Test Reversible Building Design protocols developed within BAMB
2. Test of innovative products that combine circularity with comfort, energy efficiency, energy production, etc.
3. Emphasise the need for qualitative architecture
4. Test the assessment of reversibility of buildings and automate it through the use of BIM

22. Please indicate the cost of the project in USD. *

23. Would you like to add any other relevant information (1120 characters)?(e.g. While this study is purely theoretical, it mainly identified the drivers and sustainers in CE for composite material users and also elements that would encourage the adoption of CE in South Africa). *

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24. Are there any additional sources or websites for this project? If yes, please state. *


<https://www.bamb2020.eu/wp-content/uploads/2019/03/20190228-BAMB-D14.pdf>


25. Has this project been verified? If yes, please state. If verification is ongoing, please indicate how long this may take.(e.g. Journal paper through RMIT University online library resources. Verified by one of the authors, namely Al Amin Mohamed Sultan). *


Yes, the project was checked by different public organisations: BE Brussels Environment, TUM Technische Universität München, EC European Commission


26. Please upload any relevant images for the project. Please acknowledge credits for the photographer or source of images.


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