# 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.

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

Green Chain Project: Blockchain technology for a Sustainable Management of Supply Chains in the Construction Industry

2. Region(s) of project *

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

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

Brazil

4. Your name *

Elaine Varela

5. Your organisation *

Universidade Federal da Bahia / Cátedra UNESCO de Sostenibilidad - UPC

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
- [x] Not related

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

Not related

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). *

In contrast to a world that lives the era of integration, transfer and interpretation of data and values almost simultaneously, the construction industry is the second least computerized industrial sector in the globe. Thus, concepts, such as Industry 4.0, Society 5.0, and Blockchain Technology, are yet to be fully adopted by the construction sector, bring relevant windows of opportunities for developers that understand the pains, desires and the complex context of this industry.
The Green Chain Project aims to sole this real file problem: the lack of efficient, auditable and distributed systems to foster Circular Economy in the Construction & Demolition Industry (C&D industry).

9. Keywords *

- [ ] Policies promoting circularity
- [x] 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. *

Management of material and waste flow

10. Life Cycle Phase(s) *

- [ ] (re-)Manufacturing of building materials
- [ ] (re-)Design
- [x] (re-)Build
- [ ] (re-)Use
- [ ] (re-)Purpose
- [x] 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). *

The major pains points to be addressed by the Green Chain Project are: (1) inefficient mechanisms for registration, trade and traceability of all construction systems used in a building; (2) the search for a decentralized system to promote the best results with the lowest possible cost, creating a favorable environment to flourish Circular Economy business opportunities.

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). *

The aim of the project is to develop a platform that will connect, in a sustainable way, buyers, suppliers and waste managers, automatizing the quotation, trading and waste destination processes. It aims to guarantee trust, transparency and social responsibility, through the use of blockchain technology.

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). *

The platform will allow the registration and traceability of all construction systems used in a project. This will support the transformation of the buildings into banks of materials that can be reused after its disassembly, leading to higher levels of economic circularity of the C&D sector.

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

Ongoing

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 recyclate 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). *

So far, the project has carried out a systematic review of the literature, a process mapping through interviews and field observations and a proposal of framework. Algorithms for smart contracts are being developed to implement the model. The performance of the framework will be evaluated through simulation and quantitative and qualitative indicators.

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). *

Buyers, suppliers, and waste managers related to construction industry in Salvador – Bahia – Brazil. The project expects to develop a strategic support from the Association of Directors of Companies of the Real Estate Market of Bahia (ADEMI). Through this partnership, we can apply our prototype and product early versions with members of ADEMI. We also count with the scientific knowledge and credibility associated with the two academic partners of this project – Federal University of Bahia and UNESCO Chair in Sustainability at UPC, adding scientific knowledge and credibility.

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 recyclate and to certify products incorporating recyclate composites. 5. A large number of companies experience a relatively small percentage of composite production scrap material). *

The project is still under development. Our vision is to have a MVP (Minimum Viable Product) developed, tested, improved and launched and to reach the one-year timeframe with at least 30 clients in the State of Bahia in Brazil (5 free trails and 25 first adopters). In a one-year picture we expect to have a solid performance indicators and apply for funding (i.e. venture capital, etc), in order to grow and expand to new markets.

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

Yes. The platform is being developed based on the design science research methodology. Considering the regional aspects, a similar artifact can be developed in other regions.

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). *

Yes. The platform is being developed considering the supply and waste management processes of the construction industry in Brazil, but it can be adapted for use in other regions, as these processes have similarities around the world.

20. What are the 3 main challenges (1000 characters) you encountered? And why?(e.g. Quality assurance of recyclate and to certify products incorporating recyclate 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 recyclate and product certification incorporating recyclate composites was a hindrance). *

The main challenges include: (1) the complexity of the construction sector and its various stakeholders; (2) the lack of technological infrastructure, knowledge and expertise in the sector; and the uncertainties about governance, security and privacy, and (3) interoperability in processes.

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 recyclate and product certification). *

The main successes include: (1) the use of a structured methodology based on applied problem solving; (2) the work focused on delivering a remarkable and intuitive user experience (UX) that seeks to influence users to join our community, using design elements that evoke familiarity and the feeling that the platform is responding to their pains and desires; (3) the high potential of impact once the platform is launched. In Bahia, the construction sector handles $ 2.2 billions per year in materials. In Brazil the construction retail sector handled $ 110 billions per year.

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

10.500

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). *

The construction industry is a highly relevant sector for the economy. In Brazil, in particular, the sector stands out for representing 4.5% of the national GDP. The sector also stands out for its intense consumption of natural resources and for the environmental degradation caused. About 40% of the total waste generated worldwide comes from the construction industry, as well as 50% of the CO2 emitted into the atmosphere. The adoption of a circular economy perspective to this sector would allow to be kept the materials in productive cycle through their reuse, recovery, repair, and recycling.

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

No.

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 recources. Verified by one of the authors, namely Al Amin Mohamed Sultan). *

Partial results of the project have already been presented in 4 articles, approved in national congresses to be published this year. Another 2 articles in an international congress are currently in progress and should be published next year. It is also expected to develop one or two indexed journal articles with the final results of the project for publication next year.

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