

## Jessika Souza de Carvalho

### RESEARCH TOPIC

PhD Research Title: 'Quantifying the design life and environmental impacts of downpipe treatment systems for removing dissolved metals from roof runoff'

My research interests include stormwater treatment, environmental protection, and Life Cycle Assessment (LCA), with research in civil and natural resources engineering, investigating the lifespan and environmental impacts of downpipe treatment systems to remove dissolved metals from roof runoff. I completed a Masters in Environmental Science and Technology at the Federal University of ABC Brazil, on a project that also focused on sustainability and LCA. I also have industry experience in Brazil, working on the development of LCA and sustainability projects.



Jessika Souza de Carvalho, PhD Candidate, University of Canterbury, Department of Civil and Natural Resources Engineering.

Jessika originally got interested in LCA and Life Cycle Thinking (LCT) when she was completing her Bachelors degree in environmental engineering in Brazil 10 years ago. Her PhD research project supervisor is one of the Storminator project innovators, so this is a natural collaboration.

Video of University Department:  
YouTube Link [Here](#)



Storminator treatment system cabinet, and Storminator internal filter cartridges

### BENEFITS OF LCHANZ MEMBERSHIP

Membership of LCHANZ gives me peer networking opportunities and access to latest news on research projects, both NZ and international. I have worked on LCA projects in Brazil, and wish to build my New Zealand connections through LCHANZ participation.



## PROJECT SUMMARY

I'm in my third year of a stormwater water quality research program, and am planning to finish in 2024. The 'Storminator' is a stormwater treatment system developed by University of Canterbury researchers, and is patented by the University. It's intended for commercial production in future. I'm investigating the performance of the Storminator for removing aluminium, zinc and copper from different metal roof types. This is to understand the effects of the metal roof type in the contaminant removal efficiency of the system.

The objective is to remove metals from roof water runoff prior to it reaching the stormwater network. This helps protect the aquatic ecosystem by reducing contaminants in waterways and for the protection of ecological species in the aquatic system. Contamination of waterways causes serious ecological damage.

Waste mussel shells from farmed mussels are used as as the Storminator filter media. When used in crushed form, the system has a contaminant removal efficiency of up to 100%. This uses a large scale waste resource, of which half would otherwise be disposed of in landfill.



Crushed mussel shell filter media

The reason to use LCA in the development of the product is to identify the best materials, design, and source of materials for product manufacture, and to determine the lowest environmental impacts. The LCA study outcomes will identify what are the important focal points for carbon emissions and ecotoxicity impacts. A focal point will be plastics, in particular PVC, and this information can be used to compare environmental performance with other systems available.

Implementing circular economy in practice is a major part of my research project. The mussel shell filter media material use facilitates a high level of circularity. A full cradle-to-cradle LCA study life cycle analysis is being undertaken, from material extraction, manufacturing, use and End-of-Life (EoL), leading to a full circular economy appraisal. Future Storminator marketing and promo collateral will highlight this advantage. It is too early to determine the actual EoL fate of the used mussel shell filter media, but use as a concrete aggregate is being considered as a possible application.

My preliminary results have been presented at the New Zealand Stormwater Conference, and at the Canterbury University waterways postgraduate conference.

Jessika Souza de Carvalho - Student Member

