

# **The Sea Urchin Supply Chain and the Reuse of Waste for New Products. An Example of Circular Economy on Applications Deriving from Marine Collagen**

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## **Abstract**

The classic linear economy model based on extraction, processing, production, and waste no longer seems to be functional in a world where natural resources are starting to run out. Therefore, the aim of this study is to analyse the transition from a linear system to the circular economy, providing an example of reuse of sea urchin waste for the creation of new eco-sustainable products. The reuse of sea urchin scraps represents a valid aid in reducing waste, considering that every year tons of inedible parts are discarded along the entire supply chain. Some experiments carried out on marine collagen have shown how this material could be used as biomedical devices and cosmetic products (Ferrario et al., 2020). For these reasons, this study considers sustainability as a strategic driver and a key to generate profits. To make their core business effective, companies should not consider only the financial perspectives but also the social and environmental aspects. Therefore, this work aims at analysing these three frameworks using the Triple-Layered which is a useful tool to support the creative exploration of sustainable and innovative business models (Joyce and Paquin, 2016). The environmental and social benefits can be several. The innovative products produced with discarded sea urchins materials can contribute to limiting the loss of biodiversity, while from a social point of view, the industrial conversion to a circular economy would guarantee new job opportunities for the local community and the possibility to train employees. In conclusion, the reuse of sea urchin waste is a clear example of how companies through this virtuous model can be projected towards a green economy based on a more eco-sustainable vision.

## **References**

Ferrario, C. et al., 2020. From Food Waste to Innovative Biomaterial: Sea Urchin-Derived Collagen for Applications in Skin Regenerative Medicine. *Marine Drugs*, 18(8), 414, doi: 10.3390/md18080414. Joyce, A. and Paquin, R. L., 2016. The triple layered business model canvas: A tool to design more sustainable business models. *Journal of Cleaner Production*, 135, 1474-86, doi: 10.1016/j.jclepro.2016.06.067.

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