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3D Printing Applications for Creating Products Made from Reclaimed Fishing Nets.

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It is estimated that approximately 640,000 tonnes of fishing nets and gear (Macfadyen et al., 2009) are lost or dumped at sea each year. As modern fishing materials comprise high-quality polymers, this not only represents a significant waste of valuable resources, but also the long-term risk of entanglement by both aquatic wildlife and watercraft. Whilst the presence of unmanned fishing nets in the ocean inevitably leads to a continuous cycle of unintentional catches, exacerbating the dwindling of fish stocks and affecting the livelihoods of fishing communities, there exists a lack of infrastructure and direct incentives to support their widespread return and recovery at present (World Animal Protection, 2014). However, through the employment of eco-innovation and circular economy principles, it has been proven possible to build sustainable businesses around the processing of waste fishing gear into high-quality commercial products. Leading examples include Bureo's skateboards, Interface's Net-Works model and Aquafil's recycled nylon yarn, but the scale of the problem calls for further ideas and product innovations.

As part of the European Union's Circular Ocean project, additive manufacturing or '3D printing' has been explored as a potential tool for localised eco-innovation using reclaimed fishing gear, producing some interesting and promising results. Fishing net materials hold strong potential for 3D printing applications, as they tend to be uniform in composition and come in a range of thermoplastics, including polyamide, polyester, polypropylene and high-density polyethylene (Oxvig & Jansen, 2007), making melting and remoulding possible. However, reclaimed materials, particularly fishing nets, also present additional challenges compared with virgin polymers, such as material identification, presence of fouling and contaminants, and the potential for UV degradation (Macfadyen et al., 2009). The research will therefore address each of these issues and evaluate potential solutions and alternatives, with 3D printing as both a primary and complementary process in the development and manufacture of eco-innovative products (See Figure 1.)