APPROACHES TO THE COLLECTION AND RECYCLING OF END OF LIFE FISHING GEAR: An Overview with Contacts and Case Studies

GLOBAL GHOST GEAR INITIATIVE

INTRODUCTION

This document was created by the Catalyse and Replicate Solutions Working Group of the Global Ghost Gear Initiative (GGGI). The purpose of the document is to assist prospective solutions project managers by providing a general overview of challenges and opportunities surrounding the collection and recycling of fishing gear, building on the assumption that finding appropriate solutions to the management of end of life and recovered fishing gear will have a direct impact on the amount of gear that ends up lost or otherwise discarded at sea.

BACKGROUND

With an estimated 640,000 tons entering our oceans annually, discarded fishing gear has become recognized as one of the most harmful forms of plastic pollution to marine mammals and ecosystems. One of the main reasons for this material becoming such a large source of plastic pollution is the limited waste management infrastructure available in coastal areas for when the fishing gear meets its end of life. By working together with fishermen, organizations around the world are finding ways to transform this material that was once considered a harmful burden into a valuable resource through the innovative process of collecting and recycling discarded and end-of-life fishing gear.

The recycling of fishing nets is currently taking place in a number of countries, with several models scaling up and providing a viable case for their sustainability. This circular economy approach has created a buzz around the issue of lost and discarded fishing gear, now known as ghost gear, and has been an area of innovation for the past few years. Companies are turning recycled fishing nets into skateboards, trainers, socks, sunglasses, swimwear and carpet tiles, with innovators even looking at opportunities to use recycled net filaments in 3D printing. Elsewhere in the world, people have focussed on re-purposing nets for use in arts, jewellery and sports nets where recycling is not viable. For more information on emerging approaches, Circular Ocean has conducted research into applications of fishing nets in construction, 3D printing and fibre reinforcement and open-sourced their findings on their website.

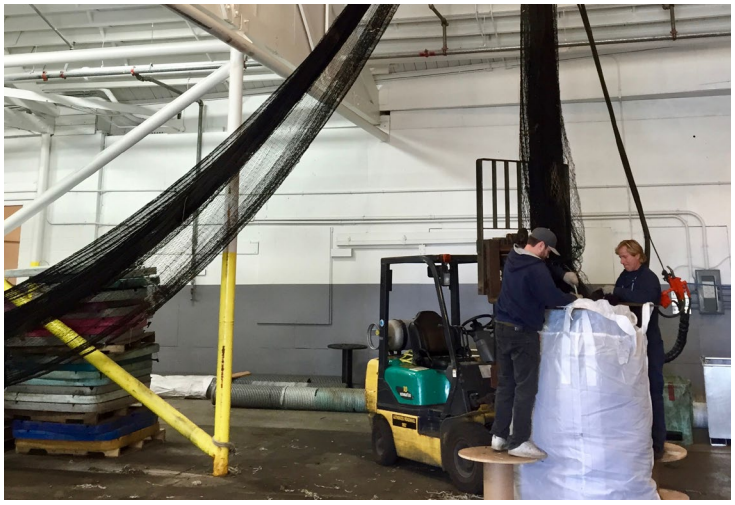


Photo courtesy of Nicole Baker

Fishing nets are made from a variety of materials, which will impact their suitability for recycling. For example, nets made from Nylon 6 (PA6) (often monofilament gillnets, for example) have a high value as a waste resource and are appealing for recyclers to work with, whereas nets made from polyethylene (PE), polypropylene (PP) and other similar plastics have a lower value as a recycled material and are thus less appealing due to the prohibitive costs involved with shipping this material and lower profit margins. Furthermore, nets recovered as part of dive and beach clean-ups are often in a greater state of degradation and may be heavily fouled, which adds another layer of complexity for dealing with them in the recycling process. Recycling fouled nets is still possible, though they need to be approximately 85% clean or better to be considered viable for recycling.

NET COLLECTION AND LOGISTICS

Organising the collection, cleaning, segregation and transportation of large volumes of nets presents unique challenges in each region and will influence the success of any recycling project. The process of identifying the material types and ascertaining the best method to undertake the labour-intensive task of separating and cleaning fishing nets before disposal is a critical component of the collection process prior to recycling.

Installation of portside reception facilities, establishing partnerships with surrounding fishing syndicates, ensuring nets are appropriately cleaned and separated by material type, high transportation costs and the high volumes of nets required to make the numbers work are common themes across regions. Most of the current successful models focus on collecting the nets directly from the fishermen as soon as they meet their end of life, as opposed to seeking them for collection on beaches and waterways, as recovered ghost nets are usually heavily fouled and thus require an extra layer of labour (cleaning) before they can be reliably recycled.

In Europe, there are two main companies working with the fishing industry and aquaculture to collect, dismantle and recycle fishing nets and other related products made from a range of source materials:

- Nofir AS is a Norwegian company that collects and recycles or repurposes discarded equipment from commercial fishing and fish farming around Europe and Turkey. Collected material is transported to the factory in Lithuania or Turkey where it is dismantled and prepared for recycling. Nofir work in partnership with Aquafil in Slovenia to turn the recycled nets into regenerated polymers which are then used in products such as socks, swimwear, and carpet tile.

- Plastix Global has created a recyclate called OceanIX HDPE made from discarded fishing nets. They work with partners around the world to collect and recycle a range of fishing gears to create their OceanIX pellets. At their facility, they are able to handle the cleaning, separation, cutting and recycling of a variety of different net materials.

While Norfir AS and Plastix Global can handle logistics for sourcing nets from outside of Europe, not much information is available about companies operating in other regions utilising a similar model. The establishment of more recycling facilities across the world will greatly enhance the scope of replicating successful net recycling models by reducing logistics costs and improving access for prospective project managers.

Photo courtesy of Plastix

CHEMICAL VS MECHANICAL RECYCLING

Setting aside re-use or re-purposing of nets (e.g. using the actual nets or fragments of them in artwork, etc.), there are generally two approaches to the recycling of fishing nets and ropes: chemical and mechanical recycling. Chemical recycling, as used by Aquafil in their de-polymerisation process, transforms a nylon fishing net back into its virgin form, enabling the company to sell a yarn just like virgin nylon. Mechanical recycling, on the other hand, can be used for a range of fishing net materials, such as Nylon, HDPE and PP, as long as they are separated.

The separation by each material type is essential since each material has different properties and mixing them would compromise the quality of the final recycled plastic. Mechanical recycling is a more common process where the nets are mechanically shredded and the melted back down to pellets. The process is more widely available but does not result in the same high quality as the chemically recycled nets. A mechanically recycled fishing net necessarily retains the same colour as the original net and its lower quality limits its applicability to injection, extrusion and rotor moulding.

Case Study: ECONYL® Yarn

Nylon 6 waste is collected all over the world and sent to the Aquafil's ECONYL® waste treatment center in Ajdovščina, Slovenia. As part of the cleaning process, materials other than Nylon 6 are removed and sent to other supply chains. The cleaned nylon waste is shredded, compacted, bagged and transported to the regeneration plant in Ljubljana. Compared to mechanical recycling, the chemical process allows the plastic to return to the state of raw material removing all foreign substances for 100% virgin quality. ECONYL® is used in socks, swimwear, carpet tile, and a range of other products sold around the world.

INCLUSIVE COMMUNITY IMPACT MODELS

Case Study: Net-Works

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The Net-Works project is a collaboration between global carpet tile manufacturer Interface Inc., the Zoological Society of London (ZSL), global synthetic fibre manufacturer Aquafil and local partners.

Using an inclusive business model, Net-Works provides an alternate income source for participating communities, creating incentives to ensure waste nets are no longer discarded in the ocean. It does this by enabling fishing communities to sell waste nets to Aquafil, who use their depolymerisation process to turn the discarded nylon 6 fishing nets into 100% recycled nylon yarn. Interface then uses that recycled nylon yarn in their Net-Effect™ carpet tiles. Net-Works works to develop socio-economic infrastructure at each collection site as a platform for net collection, either by setting up new community banking systems or strengthening existing programmes, which provide financial services and valuable savings education for men and women in developing countries.

Case Study: Bureo

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Faced with a dynamic range of polymer-based pollution in the ocean, the Bureo team became aware of the complications, risks to the marine environment and lack of infrastructure for the proper disposal of waste fishing nets in Chile. Seizing an opportunity with the Chilean government through the Start-Up Chile programme, the team launched 'Net Positiva', Chile's first ever fishing net collection and recycling programme.

Net Positiva provides fishermen with environmentally sound disposal points, while Bureo receives highly recyclable and durable raw materials which they use to create skateboards and sunglasses. Additionally, the programme provides fishermen with easy options for disposal of old nets and helps them generate local funds through a material buyback program.

Photo courtesy of Bureo

HARBOUR BASED SOLUTIONS

Case Study: Steveston Harbour Authority

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Steveston Harbour formulated a net recycling program with global synthetic fibre manufacturer Aquafil Group and global carpet tile manufacturer Interface. This project situated on the west coast of British Columbia, collects end-of-life fish nets and sends them to Aquafil's ECONYL® plant in Slovenia to be regenerated into nylon 6 fibre.

The pilot project has provided good insight into the logistical and financial challenges associated with collecting, preparing and shipping nets, and how to streamline the process to make it efficient and sustainable for everyone. It is now understood how much nylon 6 can be recovered from a full seine net; how much labour is required to strip the net from its other parts (cork line, bunt, lead line); and how to efficiently load a container to maximise the amount of net that can be sent to Aquafil's regeneration plant in Slovenia in a single trip.

Steveston Harbour has now sent three full loads of nylon (~18,000 kg / load) to Aquafil and has also sent a load of PE material to Plastix Global. They are currently attempting to grow the reach of the project up the coast of British Columbia.

Photo courtesy of Rob Trendiak

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