



## **Circular Ocean Innovation Laboratories (COINLabs)**

**A new platform for eco-innovation in ports, harbours  
and coastal areas**

**Professor Martin Charter, Scott Keiller  
& Søren Femmer Jensen**

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**[www.circularocean.eu](http://www.circularocean.eu)**



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# Circular Ocean

In pursuit of innovative and sustainable solutions for marine plastic waste, the Circular Ocean project seeks to inspire enterprises and entrepreneurs to realise the hidden opportunities of discarded fishing nets and ropes in the Northern Periphery & Arctic (NPA) region.

As increasing levels of marine litter is particularly pertinent to the NPA region, the Circular Ocean project will act as a catalyst to motivate and empower remote communities to develop sustainable and green business opportunities that will enhance income generation and retention within local regions.

Through transnational collaboration and eco-innovation, Circular Ocean will develop share and test new sustainable solutions to incentivise the collection and reprocessing of discarded fishing nets and assist the movement towards a more circular economy.

Circular Ocean is led by the Environmental Research Institute, [www.eri.ac.uk](http://www.eri.ac.uk) (Scotland), and is funded under the European Regional Development Fund (ERDF) Interreg VB Northern Periphery and Arctic (NPA) Programme <http://www.interreg-npa.eu>. It has partners in Ireland (Macroom E [www.macroom-e.com](http://www.macroom-e.com)), England (The Centre for Sustainable Design [www.cfsd.org.uk](http://www.cfsd.org.uk)), Greenland (Arctic Technology Centre [www.artek.byg.dtu.dk](http://www.artek.byg.dtu.dk)), and Norway (Norwegian University of Science and Technology [www.ntnu.edu](http://www.ntnu.edu)).



The Centre for Sustainable Design\*



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# Table of contents

<b>1</b>	<b>COINLabs.....</b>	<b>4</b>
	Catalysing local innovation with products from <i>used</i> FNRC's .....	4
	Utilising <i>used</i> FNRC's to generate income and jobs within local NPA regions .....	5
	Establishing Circular Ocean Innovation Labs (COINLabs) within existing local innovation ecosystems .....	6
	Funding, set-up and physical location .....	8
	Encouraging continuous collaboration.....	9
<b>2</b>	<b>The concept of COINLabs.....</b>	<b>10</b>
	Circular Ocean Innovation Laboratory – a definition .....	10
	The COINLab value chain .....	10
	Organisational set-up .....	13
<b>3</b>	<b>COINLab modules .....</b>	<b>14</b>
3.1	DESIGN-Lab .....	14
	An open innovation platform .....	14
	Start-up as a shared facility to gain critical mass .....	15
	Activities.....	15
3.2	PROCESSING-Lab .....	16
	Key recommendations for the PROCESSING-Lab:.....	16
3.3	MANUFACTURING-Lab .....	17
3.4	STARTUP-Lab.....	18
	Shared sales and distribution .....	19
<b>4</b>	<b>Appendix: COINLab stakeholder interviews .....</b>	<b>20</b>

# 1 COINLabs

In this report the concept of Circular Ocean Innovation Laboratories (COINLabs) is presented with a series of alternative approaches for a possible implementation. The report has been designed to be an open-source document aimed at initiating thinking on the COINLab concept (which builds on the initial idea of Eco-innovation Lab) that utilises *used* Fishing Nets, Ropes and Components (FNRCs) to make products.

The report is based upon findings from Circular Ocean project <http://www.circularocean.eu/> activities undertaken from late 2015 to September 2018 – many of which can be found in reports on <http://cfsd.org.uk/projects/circular-ocean/>. In addition, six qualitative interviews with experts from Ireland (local government), Norway (NGO), Canada (NGO), Belgium (trade association), UK (design agency) and UK (specialist company) that have been working with *used* FNRCs have helped form the recommendations and suggested concepts in the report. Summaries of each interview are given in the Appendix.

## Catalysing local innovation with products from *used* FNRC's

COINLabs focus on establishing locations for the design and development of products, services and/or artefacts utilising *used* FNRCs as a material and/or as processed material source.

The possible reuse options range from simple repair and re-use of fishing nets to finding new applications and making “upcycled” products that utilise existing fishing net properties in a new product such as jewellery, bags, mats, footwear, garden accessories and alike<sup>1</sup>. At the other end of the scale there are the options for reprocessing fishing nets into filaments and pellets that can be transformed to new products using techniques such as 3D printing, injection moulding or 2<sup>nd</sup> life nylon fibre production for clothing, swimwear, carpet tiles, etc.

Even though there appears to have been a lot of experiments and prototyping of products from *used* FNRC's, there still appears to be relatively few commercially available products made from *used* FNRCs worldwide. Therefore, there is a need to sell the business opportunity of developing and commercialising products from *used* FNRCs in port area, harbours, fishing communities and elsewhere. Research by The Centre for Sustainable Design® at UCA within the Circular Ocean project during 2017 identified only 20 different types of products from 19 companies that are being produced and sold worldwide that are utilising *used* FNRCs.

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<sup>1</sup> See Circular Ocean Report: “Products from Waste Fishing Nets: Accessories, Clothing, Footwear, Home Ware, Recreation”, April 2018 <http://www.circularocean.eu/research/>

However, the authors are aware, at the time of writing, that a growing number of designers and companies are now, for example, using Econyl fibre in clothing and swimwear products. These figures exclude those involved in the recycling or (re)logistics of *used* FNRCs.

There are few company using pellets and filaments from *used* FNRCs for injection moulding and 3DP printing of products. Bureo use injection moulding to produce skateboards, frisbees and other products. Fishy Filaments are producing filament for 3DP printing from *used* FNRCs to make a range of products and The New Raw<sup>2</sup> have created digitally crafted artefacts depicting sea creatures such as seashells and corals using adapted 3DP printers. In addition, R&D within Project Net:Worth adapted Precious Plastics machines (<https://preciousplastic.com/>) to produce a door handle from polypropylene FNRCs. (<http://www.clairepotterdesign.com/theecospot/category/project-net%C2%B7worth/>).

However, many concepts are still at the prototype stage. During three open innovation events organised The Centre for Sustainable Design ® at UCA a series of 17 prototypes were developed that illustrate potential opportunities. The concepts were uploaded on a Digital Platform (<http://cfsd.org.uk/projects/circular-ocean/digital-platform/>) under Creative Commons to encourage further co-design and co-development.

For further inspiration on product solutions please see the Circular Ocean report "A Review Of Products Created From Fishing Nets & Ropes" (the report can be downloaded from <http://www.circularocean.eu/research/>).

### **Utilising *used* FNRC's to generate income and jobs within local NPA regions**

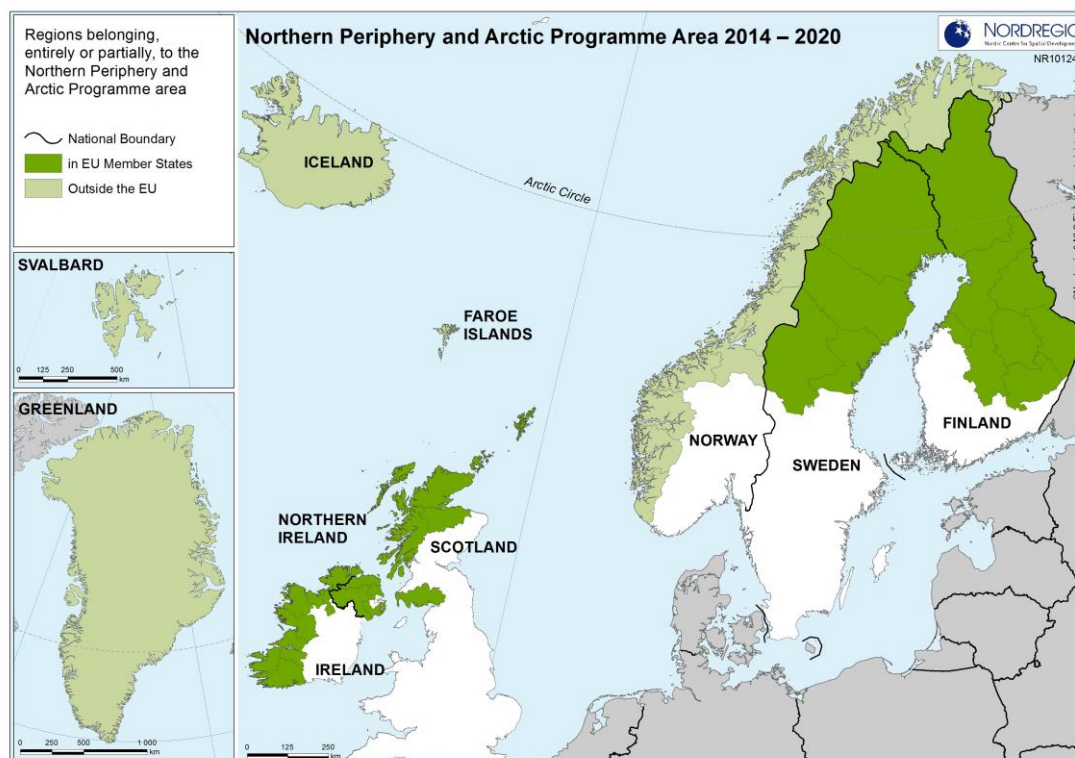
The development of products and/or solutions from *used* FNRCs should aim to be revenue and profit generating to support the creation of jobs and wealth within fishing communities e.g. port areas, harbours, coastal cities and towns in the NPA region and elsewhere. To kick start activities there is likely be a need for investment e.g. through local governments, grants or raising funds through crowdfunding.

Despite its geographical differences, the NPA region shares a number of common features, such as low population density, low accessibility, low economic diversity, abundant natural resources and high impact of climate change. This unique combination of features results in joint challenges and joint opportunities that can best be overcome and realised by cooperation. For example, there are likely to be similar issues associated with establishing COINLabs within ports, harbour, etc across the NPA region and therefore setting-up a platform to share

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<sup>2</sup> <http://www.thenewraw.org/work/second-nature>

knowledge on lessons learnt might be a useful idea.



**Table 1: NPA region map**

Additionally, lessons may be more widely applicable and the use of open source knowledge may instigate collaboration and exchange of knowledge and best practice in international networks with NGO's, researchers and other innovation communities involved in the issue of *used* FNRCs.

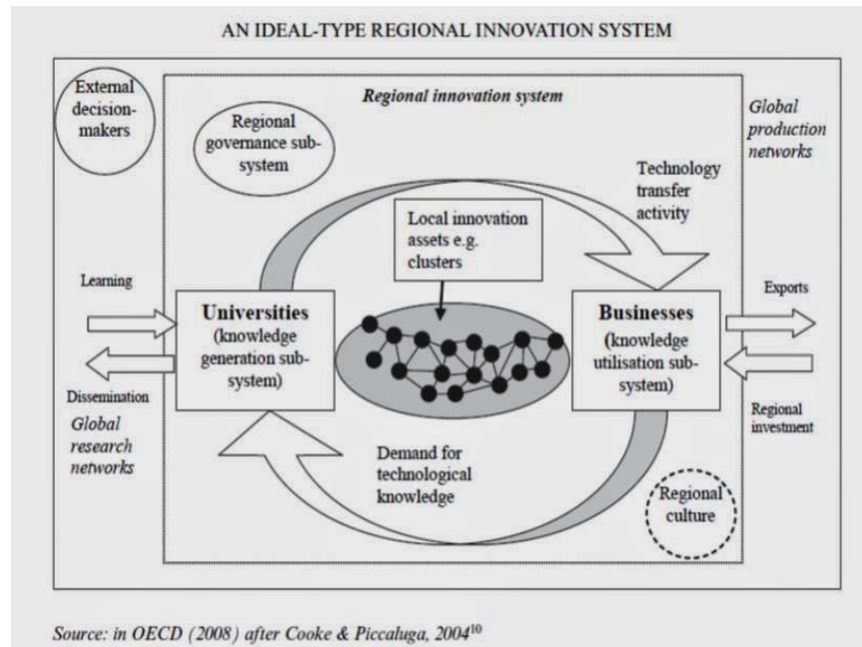
For inspiration on governmental, public and private organisations worldwide that have built knowledge about issues related to collection, recycling and re-use of *used* FNRCs - please see the "Circular Ocean Knowledge Base Report", which can be downloaded from the Reports section on <http://cfsd.org.uk/projects/circular-ocean/>.

### **Establishing Circular Ocean Innovation Labs (COINLabs) within existing local innovation ecosystems**

Circular Ocean Innovation Laboratories (COINLabs) are a means of bringing together expertise and motivation in local fishing communities to catalyse the design and development of products and/or services that utilise *used* FNRCs as the source of raw materials. The focus of COINLabs is on value creation rather than waste management. When setting up a COINLab to re-utilise *used* FNRC's in ports and harbours in the NPA region key issues relate to how to establish critical mass in terms of human resources, capital and materials. Human resources



and capital can be scarce in remote NPA regions lacking advanced technological and innovative companies that can be drivers for creating local solutions. Therefore when searching for a suitable locations to set-up COINLabs, it is useful to consider to the COINLabs might interact with existing local innovation systems that may already operate in port areas, harbours or coastal areas..



**Table 2: Local Innovation System**

***What is a local innovation ecosystem?***

*“A local innovation ecosystem comprises a diverse range of stakeholders, including the public sector, business sector, universities, citizens and civil society organisations. These can be both organisations and individuals. It also includes existing networks and brings together the competences and capabilities of its stakeholders and networks. Then there are institutions, policies and practices; commercial, political, research, administration and civil sector ‘markets’; and physical assets, such as incubators, labs, test and demonstration sites.”*

Source: Mikael Edelstam, CEO at Miljöstrategi AB and author of *Local Innovation Ecosystems for Smart Cities*, 2016 <http://www.eurocities.eu/eurocities/news/Interview-with-Mikael-Edelstam-Local-innovation-ecosystems-driving-smart-cities-WSPO-AABA7R>

Local innovation systems in port areas might consist of, for example, plastic moulding companies that could be useful in the production of products from *used* FNRCs. COINLabs might also considering being anchored or sited near to organisations that are likely to be existing players in local innovation systems e.g. universities, technical colleges and/or business incubators and accelerators.

In addition, Community Workshops might be key stakeholders in the local innovation systems e.g. Hackerspaces, Makerspaces, FabLabs and Repair Cafés. Community Workshops could present an opportunity for people living in the vicinity of fishing communities to become involved in finding local solutions to the challenges posed by *used* FNRCs. For example, local Makerspaces, Hackerspaces and FabLabs might be able to develop product prototypes from locally accessible FNRCs. Networks of Community Workshops might choose to collaborate on finding solutions to the challenge, perhaps using digital fabrication technologies, like 3D printing or the manufacture of moulds.

The development of new Repair Cafes in fishing communities might help to attract repair skills from the community that might be further utilised to repair FNRCs alongside other products. There might also be opportunities to start to incorporate FNRC upcycling work stations in new Repair Cafés based in fishing communities to create new ideas for both products and craft items that might feed into COINLabs. Also even specific FNRC Upcycling Cafes in fishing communities might be developed to specifically develop new ideas for products and craft items from *used* FNRCs. More broadly repair services related to fishing nets might be further developed in fishing communities as part of the location innovation systems that surround COINLabs.

Community Workshops e.g. Hackerspaces, Makerspaces, FabLabs and Repair Cafés aim to bring the community together and are a repository of local skills and experience that might be leveraged in new ways to directly support COINLabs or act as catalysts for others to become involved. See also the report from The Centre for Sustainable Design® at UCA that identified the potential for Community Workshops in the vicinity of selected fishing ports within the NPA region – see Community Workshops report downloadable from Reports on <http://cfsd.org.uk/projects/circular-ocean/>.

## **Funding, set-up and physical location**

There are a series of points that need to be considered before setting a COINLab started in a physical location. Start-up costs can be high due to required investment in production equipment and prototyping technology as well as building costs. Seed funding from e.g. local governments, chambers of commerce, private investors or locally targeted crowdfunding campaigns is likely to be required for set-up and early-stage operation.

Setting-up a COINLab is likely to need collaboration and partnerships with organisations that have existing facilities and are willing to host the platform e.g. perhaps identifying an abandoned harbour building, that can be repurposed as a workshop facility. A harbour authority or local authority might be identified that could be willing to provide a building or a



series of rooms. Harbour and port areas in the NPA region seem to offer promising opportunities for spaces and places to start a COINLab, as the business structures in these areas are changing, and surplus buildings are available in many places. Other options include looking for a facility within a local university or a technical school; this would also provide potential benefits of having access existing knowledge infrastructure, and students and researchers who might be interested in engaging in COINLab activities.

There will also challenges on funding COINLabs on an on-going basis. In the early phases, funding would most likely be dependant upon grants (local, national, European) and/or from economic development funds from local or regional authorities. Other targets for funding might include local stakeholders and investors interested in supporting a more resilient local communities and local circular economies based on potential of new job opportunities in port areas.

With probable relatively high start-up costs related to labour intensive operations in certain parts of the value chain, it might be difficult to establish COINLabs as a profitable private business in the short run. This also relates to the cost structure of collecting, reusing and reprocessing *used* FNRC's on a local and small scale. Therefore, alternative organisational entities/legal structures may be considered such as a social enterprises, community businesses or a collaborative approach based on partnerships with local companies (e.g. injection moulders) and/or local industries (e.g. marine).

### **Encouraging continuous collaboration**

As the concept of creating a Circular Economy around *used* FNRC's is a subject still in its infancy, it is suggested that this report may act as an open source working document that can be improved as ideas described are tested and iterated. This may be of growing significance in Europe and NPA region, if the European Commission implements proposals for Extended Producer Responsibility related to end of life fishing nets and ropes.<sup>3</sup>

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<sup>3</sup> Source: "Proposal for a Directive Of The European Parliament and of The Council on the Reduction Of The Impact Of Certain Plastic Products On The Environment", 2018. <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:52018PC0340>

## 2 The concept of COINLabs

In the following section the overall elements that help define the concept of a Circular Ocean Innovation Laboratory (COINLab) are described. Also, some overall recommendations related to how to structure COINLabs are proposed in a way that is practically and economically feasible for potential launch and anticipated early-stage operation.

### **Circular Ocean Innovation Laboratory – a definition**

COINLabs are a means of bringing together expertise and motivation in local fishing communities to catalyse the design and development of products and/or services that utilise *used* FNRCs as the source of raw materials. The focus of COINLabs is on value creation rather than waste management.

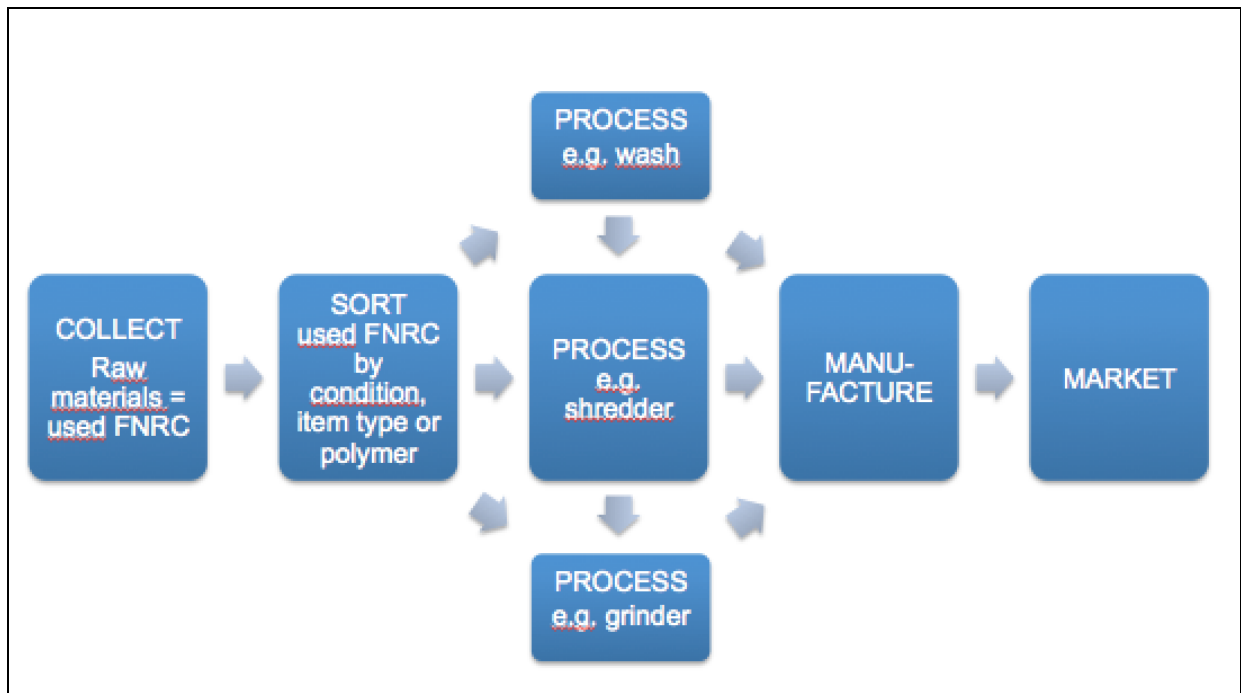
COINLabs should aim to be revenue and profit generating to support the creation of wealth and jobs in the fishing communities in the NPA region (and elsewhere) that have a stake in the challenges and opportunities presented by *used* FNRC's.

Within COINLabs the term “Lab” is used in the broadest sense of depicting an innovation environment rather than specifically a technical laboratory. The “Lab” is also understood as an entity concerned with systemic innovation and interdisciplinary collaboration involving both technical experts, designers, businesses and civil society.

### **The COINLab value chain**

The concept of COINLabs span the entire value chain from collection and processing of *used* FNRC's to design, manufacturing and marketing of the finished products. Instead of focusing on waste streams the focus is on the value that can be created in each step from recovering the waste, washing it, reprocessing and the development of prototypes/final products and their marketing, sales and distribution.

The COINLab value chain is illustrated in the diagram below, where each different type of polymer (e.g. polyamide (nylon), polypropylene, polyethylene)) will have a separate route of reprocessing, remanufacturing and final product (re)use. Potential reprocessing processes include several different technologies and methods from water-based cleaning and shredding, to advanced chemical reprocessing.

**Illustration: The COINLab value chain****Illustration: The COINLab value chain**

COINLabs can be designed to broad-based and/or include separate modules to make a gradual implementation possible as well as accommodate potential limited access to seed funding for full scale project development. The four suggested modules that correspond to different parts of the COINLab value chain are as follows:

**A. DESIGN-Lab:** A module focused on ideation and iteration and/or prototyping to produce solutions for any stage of the processing of *used* FNRCs.

**B. PROCESSING-Lab:** A module focused on processing *used* FNRCs (eg washing, shredding, depolymerisation, etc) to provide intermediate materials to feed into higher tiers in B2C or B2B supply chains or the MANUFACTURING-Lab.

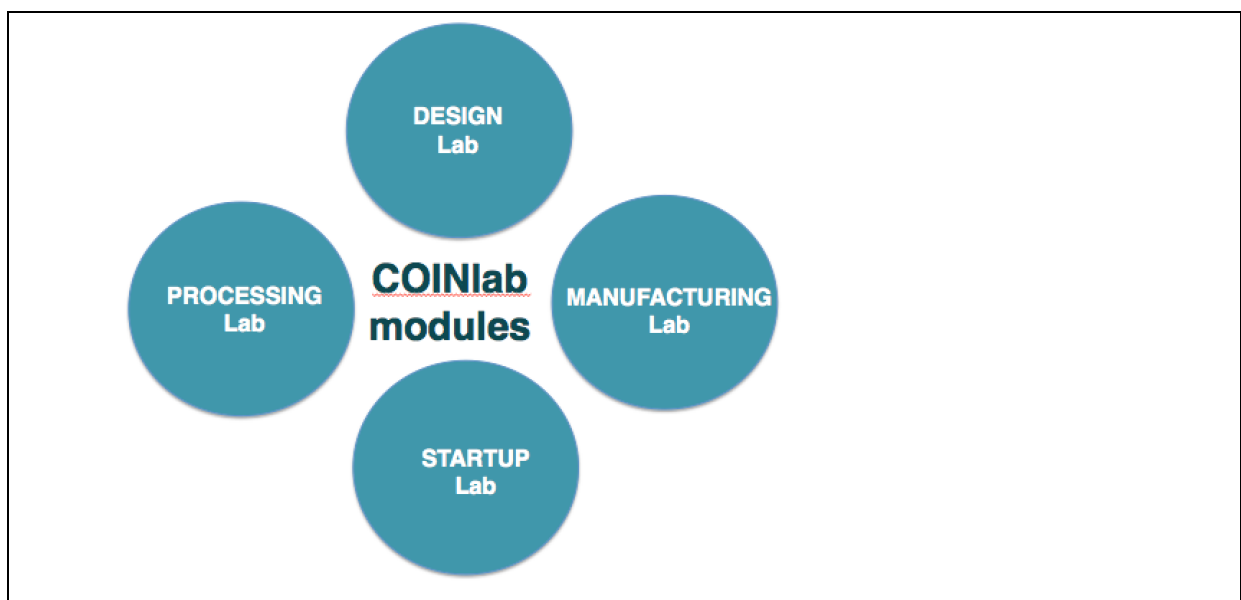
**C. MANUFACTURING-Lab:** A module focused on full manufacturing operation (probably at job or batch level) with the aim of taking *used* FNRCs, and producing B2C and/or B2B products.

**D. STARTUP-Lab:** A module focused on business incubation and/or acceleration aimed at the development of start-up companies and viable micro-businesses based on one or more product ideas and/or services.

It should also be mentioned that a possible 5<sup>th</sup> module – SOCIAL-Lab – might be included

which be a café designed for socialising, networking, hot desking, meetings and interaction with the community. The SOCIAL-Lab might be designed to convertible for events linked to the DESIGN-Lab.

Splitting the activities into separate modules along the COINLab value chain will allow for a greater flexibility in the initial stages of establishment. All four modules can come together and in other instances two or three modules can be established in different combinations or permutations. They might be centralised or decentralised in different spaces in a port area with the possibility that some of the functions of the modules may be performed by or in cooperation with other entities. The modular structure means that a COINLab can have a very flexible model, that can be executed in a variety of different formats fitted to specific contexts dependant on infrastructure of local innovation systems within fishing communities.



#### **Illustration: COINLab modules**

Initially a COINLab might be simply separate rooms in existing unused buildings in a harbour area and/or cooperative access to external production facilities in the local innovation system with access to shared or rented tools and/or machines needed for processing. This will make it possible to move product development forward without having to wait for the other parts of the value chain to be all figured out. Working on a longer timescale some modules might be funded initially and others later, or potentially developed in sequence. Such an approach will also open possibilities for the engagement of different organisations and business models to suit each part of the value chain.

Another part of the COINLab model is to network and connect with other COINLabs (and other local innovation systems) in separate geographical locations. The goal is to create to value

from *used* FNRCs through product development that incorporates polymer re-use and recycling systems at a decentralised and localised level. This will create an alternative to the existing *used* FNRC recycling infrastructure that is based on one large mechanical recycler in Denmark (Plastix Global) and one large chemical recycler in Slovenia (Aquafil). This might also encourage Plastix Global, Aquafil and others to consider decentralised, local solutions.

### **Organisational set-up**

Another key issue that will need to be addressed when setting up a COINLab is the organisational/legal structure. A COINLab could either be a standalone organisation and separate legal entity which is a private company, a public-private enterprise, a social enterprise or an initiative carried out through an existing organisation, or it could be established as a project within a Community Workshop e.g. Makerspace, university or other stakeholder in the local innovation system.

Deciding which model is the right one will however depend on the local innovation system, specific stakeholders and other circumstances in a specific location.

# 3 COINLab modules

Each of the four modules of the COINLab value chain are further explored in the following sections.

## 3.1 DESIGN-Lab

The DESIGN-Lab is concerned with ideation and iteration and/or prototyping and testing to produce solutions for any stage of the processing of *used* FNRC's. The main output of the COINLab would be near final product prototypes that are ready to move into the value chain focused on setting up a real production and/or assembly of products at an appropriate scale.

### **An open innovation platform**

- The DESIGN-Lab concept is based on a collaborative, explorative and engaging living lab philosophy that is dependent upon the participation and open access from a range of different stakeholders in local communities e.g. NGO's, citizens, beach cleaners, divers, fishermen, schools, grassroots innovators, fishing net manufacturers, university students and researchers as well as local government, social enterprises, chambers of commerce, large companies, SMEs and members from local start-up networks (local stakeholders).
- The DESIGN-Lab could be run as an open innovation environment characterised by interaction and sharing of ideas, knowhow, tools and technology among different users, sponsors and collaborators. At the same time it would be important to focus on the commercialisation of innovative ideas to create income for the projects that might be part of the COINLab.
- DESIGN-Lab activities and workflow should be designed to allow for an ongoing documentation of solutions and knowledge produced, allowing for any IPR and/or commercial, confidentiality issues.

### **Collaborative platform - engage students, volunteers, associations.**

- The DESIGN-Lab is envisaged as a platform that facilitates activities from other user groups in the existing local innovation system
- The DESIGN-Lab should be planned and marketed to attract and involve a broad range of different stakeholders including local grassroots innovators, universities and research institutions, NGO's, governmental organisations and other local stakeholders (see above). This could be done through connecting with local stakeholders and/or business networks e.g.



chamber of commerce or business breakfast clubs.

### **Start-up as a shared facility to gain critical mass**

- A key challenge for the DESIGN-Lab is how to gain momentum and develop a critical mass of users and activities to sustain a pulsating and alive innovation environment.
- Bearing this in mind, it is recommended that collaborative approach is developed with the DESIGN-Lab established as part of an existing facility and innovation environment (at least initially). This could be, for example, an existing Makerspace, a FabLab or a university already having an established user-base, physical facilities, tools and machines.
- A location in close physical proximity to a port or harbour area would make access to *used* FNRCs easier including storage and cleaning of the *used* FNRCs (see Circular Ocean Port Related Feasibility Studies on <http://cfsd.org.uk/projects/circular-ocean/>).

### **Activities**

The production of products for sale and scale into production/assembly is touched upon in the next section, however is key focus of the DESIGN-Lab will be to facilitate experimentation aimed at producing early stage prototypes, mock-ups and/or models, and research as an ongoing activity for further development.

The DESIGN-Lab should generate knowledge, designs and new solutions in a symbiosis where innovative people and organisations are attracted.

The DESIGN-Lab should to be designed to be a creative and playful environment that includes broad mix of different events targeted towards different stakeholders. This would allow both DESIGN-Lab users that have a permanent work place, temporary project holders and “external” guests to participate in talks and social events. The place could offer hot desking with volunteers, visiting scholars and entrepreneurs to participate or even stay for a longer period with a residency programme. As discussed earlier a cafe area – SOCIAL-Lab - might be established to facilitate interaction between local stakeholders including entrepreneurs, fishermen, beach cleaners and schools.

The event types and formats that could be organised within DESIGN-Labs with COINLabs might include:

- Hackathons or Design Sprints with focus on developing solutions.
- Start-up Weekends with focus on building a business.
- Pecha Kucha type inspiration talks and network events themed on Ocean topics.

- Repair cafes.

### 3.2 PROCESSING-Lab

The second module of the COINLab value chain concept is the PROCESSING-Lab that would establish a space for the collection and processing of the *used* FNRC's. This could be in the form of preparing washed and dried pellets for injection moulding and filament for 3D printing or preparing *used* FNRCs to be cut into sections/modules for re-use and/or reprocessing.

The different activities of a PROCESSING-Lab will require specialised equipment, advanced machinery, storage space, vans, trucks, containers and vehicles for distribution as well as access to manual labour.

#### Key recommendations for the PROCESSING-Lab:

- The PROCESSING-Lab should be ideally be located on or near to a harbour close to where *used* FNRCs are sourced from fishermen and other local stakeholders. This will eliminate/minimise the need and costs of transportation. But even more importantly it provides the best conditions to enable the cleaning of the fishing nets while they are still wet and before the organic compounds dry up and make cleaning a much more difficult task.
- Another important technical issue is that if *used* FNRCs are going to be converted into pellets for injection moulding or filaments for 3D printing they also need to be dried properly as some of the polymers absorb water that might be released under heat and cause problems to the production process.
- The PROCESSING-Lab will require capital to enable establishment and operation and is likely to require a high degree of manual labour dependant on the scale of activities. As the PROCESSING-Lab module within the COINLab value chain is likely to be costly to implement and operate, alternatives to establishing a traditional private company might be considered. Other options might include cooperation with community re-use schemes and/or projects linked to mental health and aiming at getting long-term unemployed back into work or society.
- Running the PROCESSING-Lab as a social business or an NGO-run activity might make it easier to get the financing needed to invest in machinery and other physical facilities. Collaboration with social services within local government might identify opportunities to employ people with special needs, learning difficulties and social problems (as indicated above).
- An option may also be to establish partnerships with existing local social enterprises and/or charities who might utilise local unemployed people and/or disadvantaged groups to prepare

the cleaning of nets and/or sections for nets for potential re-use. The work would be a means to an end of getting people back into work and/or society.

- Another way to establish the PROCESSING-Lab could be to partner up with existing harbour and/or port related companies, who might already have the relevant facilities and space and/or might be interested in setting up a collaboration or formal partnership. This could be fishery related businesses and/or plastic moulding companies that have been identified in several harbour areas throughout the NPA Region.

### **3.3 MANUFACTURING-Lab**

The third module of the COINLab concept involves setting up a MANUFACTURING-Lab for the manufacturing and/or assembly of products for sale.

As the MANUFACTURING-Lab will also demand a specialised series of production machines, technology and will most likely require capital, it is again suggested that collaboration with stakeholders within local innovation systems in fishing communities is considered.

A key strategic decision relates to which types of products, the COINLab should produce in the MANUFACTURING-Lab, which will depend on the proposed products arising from the DESIGN-Lab, the type of FNRC fractions collected and manufacturing technologies chosen or available within in local innovation systems. Using injection moulding would call for a small number of products that can be produced in larger quantities; whereas filaments for 3D printing would allow for a greater variety of product types but perhaps on a smaller scale. Another way to approach the issue would be to map the types of relevant machines that are already in the local innovation system and based on that decide what machinery to buy, what to rent and what might be shared based on underutilised machines in local businesses.

To enable the MANUFACTURING-Lab to get up and running it is recommended that a specific product strategy is selected that will allow for creating an efficient production run with e.g. small batches to start with. Working with what could be termed “plug and play local products” that tried and tested solutions e.g. frisbees, etc.

One strategy for the COINLab might be to focus on a narrow series of products with a simple and proven production and/or assembly method(s) that is easy to execute and replicate in different MANUFACTURING-Labs. This might include the production of products such as door handles, skateboards, frisbees, small surfboards, etc. that have shown a proof of concept around the world.

Another option for MANUFACTURING-Labs would be to create a technological platform with specialised machine specifications that match the needed production set-up and that could be replicated across different COINLabs throughout the NPA region. A similar example is found in the Precious Plastic project where blueprints for building your own plastic reusing machine is shared online ([www.preciousplastic.com](http://www.preciousplastic.com)). This has now has been applied to *used* FNRCs in Project Net:Worth<sup>4</sup> to produce a prototype handle.

As mentioned earlier another route would be to explore the possibilities of utilising the manufacturing capacity in local innovation systems e.g. identifying plastics moulders and producers that have experience in working with recycled polymers.

In addition to products produced using injection moulding and possibly 3D printing, other products based on manual production/assembly might be considered e.g. repurposing *used* FNRCs into crafts, accessories and garden products. This option seems like a viable route if there are social businesses or community re-use organisations with access to manual labour and / or involving local volunteers.

### 3.4 STARTUP-Lab

The final COINLab module is a start-up business incubator and/or accelerator programme themed around innovation related to *used* FNRCs. The incubator and/or accelerator could include 5-10 selected projects that participate in a facilitated programme for a 3-6 month period aiming at getting their ideas to market (see also the Circular Ocean Eco-Innovation Guide – see <http://cfsd.org.uk/projects/circular-ocean/>).

The STARTUP-Lab would be aimed at the development of start-up companies and viable micro-businesses based on one or more product ideas and/or services that utilise *used* FNRCs. The STARTUP-Lab would also aim incubate start-ups for a fixed period e.g. 6 – 12 months. Start-ups who joined the programme could access about competence and skills building, business development activities and preparing marketing and branding materials, completing product development and developed new business focused on, for example, local customer bases and tourists. Even more importantly the STARTUP-Lab could be about connecting participating entrepreneurs with local industries, suppliers and running matchmaking activities to find co-founders, team members, investors, advisors, mentors and other key persons in the start-up ecosystem in the local area.

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<sup>4</sup> <http://www.clairepotterdesign.com/theecospot/category/project-net%C2%B7worth/>

Advisors could be connected to the STARTUP-Lab, who provide services related to marketing, legal, intellectual property rights, financing advise (e.g. crowdfunding or grant fundraising) and other key start-up disciplines. The STARTUP-Lab might also include free or cheap access to production facilities and tools, that can be shared and booked in relation to other modules within the COINLab.

The STARTUP-Lab might also facilitate or host pop-up shops for participants in nearby areas of high 'traffic' near the location of the STARTUP-Lab. An option might be to involve local crafts people and designers in the STARTUP-Lab and/or DESIGN-Lab to provide customised designs and layouts for some of the products. This would help to raise attention and heighten the perceived value of the products compared to a hobbyist styled product made and designed by volunteers.

### **Shared sales and distribution**

The STARTUP-Lab might offer its participants a shared platform for collaboration on sales and distribution. This could be in the form of a built-in factory-shop in the location and/or a digital web-shop. Also, a collaborative dealer network could be set up to sell the products from COINLabs into design stores, apparel stores, outdoor gear stores locally, regionally, nationally or internationally. Another option could also be to develop the COINLab brand as a shared approach and/or a "quality stamp" for products made according to the COINLab model.

# 4 Appendix: COINLab stakeholder interviews

Interviews were undertaken in 2018 by Scott Keiller (SK) and Martin Charter (MC), lasted for approximately one hour and were conducted over the telephone or skype. Interviews followed a structured set of questions. However, in the table below, where answers to specific questions are left blank, this area was not discussed or was touched on in answers to other questions. Interviews names have been anonymised.

Interviews	Q1. Ventures that could provide insight into how COINLabs could be established	Q2 Strength & Opportunities of COINLab approach	Q3. Potential partners in COINLab	Q4. How to attract COINLab volunteers	Q5. Potential barriers to success
<b>Interview #1</b>  <b>Interviewer SK</b> <b>Date: 13<sup>th</sup> July 2018</b>	There is nothing directly comparable to COINLabs but some social enterprises in skills/ support for long-term unemployed could provide insights eg project in Cork on breaking down bed mattresses into constituent parts to enable resource recovery. Also <i>E-Centres</i> in Cork that provide space	Future potential incentive to develop approach from new EU requirements on Port reception Authorities. The COINLab concept is good, but from an Irish point of view – maybe ahead of its time due to lack of continuity of supply of waste nets (data on waste net collection in Ireland are not routinely	Port waste management companies, Dept. of Marine (manage ports), Local Authority (eg Cork County Council), that might be interested from an economic development viewpoint., University of Cork, Cork Institute. of Technology, Creative Colleges – St Johns, BIM – Government. Agency Marine, National	Education of all potential stakeholders on the scale and threat from ocean plastics and opportunities presented	Lots of PE netting in Ireland – more difficult to recycle/find solutions than for Nylon 6.  Net cleaning & removal of contaminants  Large Shredding machines not available



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	for people to work out of home in office/workshop environment – there is also one in Castletownbere and also a Makerspace in Cork.	collected). Also there may not be companies that can shred waste nets at the scale required.	Maritime College Castletownbere.		Obtaining seed funding
<b>Interview #2</b>  <b>Interviewer: SK</b> <b>Date: 12<sup>th</sup> July 2018</b>	An organisation is developing a floating platform for harvesting discarded/lost nets from the Ocean. Fishermen log GPS locations. Cleaning the nets when freshly harvested is easier than cleaning when they have dried when stored on-shore. Clean Coast AS also recover discarded/ waste plastic pleasure boats. The harvesting model could provide	Strength – bringing stakeholders together. Vitally important to engage and use the knowledge of the fishermen.	Engage and benefit from the knowledge of the fishermen. Also very important to have input of creative partners/ creative industries.  In Norway, the Runde Research Station, Innovation Norway – agency supporting innovation. Norwegian Coast Directory who hold GPS locations of snagged nets. Keep Norway Clean – an agency that supports/	Engage fishermen and through general education of the challenge of waste fishing nets.	Funding

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	specific insights on collection, and processing and a source of material.		promotes waste reduction/minimisation/removal		
<b>Interview #3</b>  <b>Interviewer: SK</b> <b>Date: 20<sup>th</sup> June 2018</b>	Key is to be very locally focussed. Involve local partners. Start by engaging with local hub/interest group eg beach clean group and through their connections slowly grow the concept.	Could use an online project management group application like Slack or Trello – an online space to work through the concept/idea. Could set these groups up concurrently in different locations/regions and include an opportunity for cross-pollination between regional groups			
<b>Interview #4</b>  <b>Interviewer: SK</b> <b>Date: 12<sup>th</sup> July 2018</b>	Work by Precious plastics and proof of concept work undertaken a design agency that include injection moulding of PP trawl nets. On South Coast of England PP & PE are	Strong concept, which needs to be hyper-local. Start small and scale-up to minimise costs and use local recycling infrastructure.	Port Authorities – control the land (eg quays & surrounding surrounding) where fishermen work. It is very important to engage from the outset and ensure	See answer to Q3	Creating the wrong product(s) –product story very important.  Cost of testing products for pollutants – as <i>used</i> FNRCs can

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	<p>most commonly used rather than N-6.</p> <p>Not aware of other ventures 'within this sphere'. Although Makerspaces could provide guide for comparison. Also the Bureo skateboard, as a good product example, which transforms marine plastics and helps empower communities.</p> <p>Local to Brighton, there is a thriving community of innovation spaces, eg FUSEBOX, like a hackspace that operates takeback of techno products – helps</p>	<p>Could be focussed on producing a product/ products eg moulded cabinet handles – as produced as proof of concept by the design agency re: Precious Plastics work. The product needs to be 'cause-connected' – providing a product story/narrative that makes it more attractive – so that the buyer is contributing to the solution to marine waste.</p> <p>There is an incredible desire amongst consumers for solutions to the marine plastics problem. Need to educate at the same time as</p>	<p>that the project is talking to the right persons.</p> <p>Fishermen – as above start engagement with the benefit of insight, eg who is key ie formal or informal leader.</p> <p>Fish wholesaler(s)</p> <p>University partners – materials research (pyrolysis), engineering, marine</p> <p>Creative industry practitioners – helpful, insightful on design and marketing</p> <p>In Brighton – the Green Party. Would be helpful in</p>		<p>accumulate organic and metal pollutants</p> <p>N-6 is less of a problem than PP and PE as it less prone to absorption of marine pollutants. For PP &amp; PE some product applications might be excluded.</p> <p>Pollution to air during manufacture – are VOCs emitted during melting of polymers – how are they monitored and controlled?</p>

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	community to recover/retain data from end of life electronics - The project has good educational elements. Education is so important to COINlabs to ensure that people do not see this as a problem caused by fisherman – which it is not!	tackling. The right product must be produced - not something that will end up in landfill soon after purchase – ie keyrings etc. Lifecycle thinking in product choice/design.  BUREO has a great product that lasts and materials can easily be recovered at end of life.	communications and connections  Local government- particularly re: economic development		
<b>Interview #5</b>  <b>Interviewer: SK</b> <b>Date: 19<sup>th</sup> June 2018</b>	Nothing similar, but net manufacturers could provide valuable insights on many levels	Strong concept – one which some net manufacturers might be very interested in providing support / involvement. Look forward to being able to present concept to members of Industry Association – European rope and net	Net manufacturers potentially.		

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		manufacturers. Members are already involved in harvesting waste nets and ropes – including projects in Norway and Iceland			
<b>Interview #6</b>  <b>Interviewer: MC</b> <b>Date: July 9th</b>	Nothing similar	<p>Diverse strengths.</p> <p>Some Makerspaces in the SW of England have failed because they have not achieved ‘critical mass’ of users and participants. Spaces will only survive where there is sufficiently large population, so COINLabs might increase chances of success if they are set up in larger port areas/coastal cities.</p> <p>Need to link to existing local players eg Plymouth</p>	<p>Skills agencies – apprentice development, job centres, etc</p> <p>Bodies working with unemployed</p> <p>Local authorities</p> <p>After school science clubs – manufacturing not such a profile</p> <p>Supplying or include Injection moulding companies in networks may provide opportunities</p>		<p>Capex and cash</p> <p>Finding a place – however, there are sometime spare places in ports eg semi derelict warehouses – but sorting out ownership issues can be difficult as well as access to space</p> <p>Harbours and ports can be politically powerful stakeholders in port areas (fishing and trade)</p>

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		<p>University, which might provide an anchor and have existing relevant facilities.</p> <p>Could also explore COINLab as a plug-in to exiting makerspaces, rather than as a stand-alone.</p> <p>COINLab would need to have very clear aims and focus.</p> <p>Dependent on overall concept there may be a need to split Labs into two aspects</p> <p>a) Manufacturing using powders, granulates, pellets and filaments from used FNRCs</p>	<p>Fishy Filaments (FF) using process for nylon but NOT proven for PP/PE</p> <p>The “New Raw” (Netherlands) – using nylon gill nets to 3D print shell-like baskets - process nets manually - using adapted multi-maker 3DP made from kit</p> <p>One can produce powder and granules from WFNRCs which is much easier than filament</p> <p>3DP technology over next 3-5 years – technology will continue to improve and prices will come down</p>		<p>Washing issues dependant on the type of FNRC</p> <p>Knots in WFNRCs are a problem</p>



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		<p>(3DP, adapted Precious Plastics machines using PP/PE trawl nets – see the work by Claire Potter Design on proof of concept – producing door handles)</p> <p>b) Incubators for start-ups for products based on WFNRCs without job/batch manufacturing – eg Craft businesses</p> <p>Plastic lumber – process that produces polymer logs – could potentially use used FNRCs as input</p> <p>Marmax near Southampton? – use plastic lumber for outdoor furniture and playgrounds</p>	<p>Last year, Texas ex NASA crowd-funded 3DP using granules – produces kg of product – metre by metre</p> <p>Gigabot (uses recycled polymers) – price reduced to £6k with flat-pack delivery</p> <p>Fishy Filaments process factory in container – washing, drying, extruding, etc – fishing (technology) accelerator in Vigo? in north Spain have expressed interest [in development, looking to franchise the concept out outside the UK]</p> <p>ECOALF – potentially ships used FNRCs to Korea – where 2<sup>nd</sup> life fibres made</p>		

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		Potentially use plastic lumber from used FNRCs for construction products related to targeted port local authority green procurement needs	and/or clothing from the 2 <sup>nd</sup> life fibres are made?  Fishy Filaments - 100% recycled and local material		









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**Contact:**

Professor Martin Charter

Director

The Centre for Sustainable Design @

Business School for the Creative Industries

University for the Creative Arts

Farnham, Surrey, GU9 7DS

[mcharter@ucreative.ac.uk](mailto:mcharter@ucreative.ac.uk)

Søren Femmer Jensen

Director at Co-Creative

[www.cocreative.com](http://www.cocreative.com)

Email: [soren@cocreative.com](mailto:soren@cocreative.com)

Phone: +45 30 279 111



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