



EUROPEAN UNION

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Professor Martin Charter, UCA

DTU Technical University of Denmark



NTNU Norwegian University of Science and Technology





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BCE Online Conference 5th October 2020



Professor Martin Charter

Director

The Centre for Sustainable Design[®]

Business School for the Creative Industries

(7th highest ranked Business School (Guardian Rankings)

University for the Creative Arts

UK

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- Welcome: All (Muted)
- Host: Background
- Objective: Introductions & connections
- Breakout rooms: 2 rounds x 10 minutes
- Connections: LinkedIn, Twitter, Facebook, Instagram
- Chat: Breakout rooms
- Broadcasts: Host messages
- Lessons learnt: 5 minutes

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Process (10 minutes)

- Introduction each participant (1 minute x 5)
- Someone needs to lead e.g. go first!
- Identifying synergies & connections (5 minutes)

Introductions (1 minute)

- Your name
- What are your interests outside work
- How does your work related fishing gear?
- What issue are you looking to solve related to waste fishing gear?
- If you were animal, what animal would you be & why?
- One item you might create from waste fishing nets

Synergies & Connections (5 minutes)

- Articulate any 1:1 inter-connections
- Write-down names, interest & follow-up
- Discussion

Contact

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EUROPEAN UNION Investing in your future European Regional Development Fu

CREATING BUSINESS OPPORTUNITIES FROM WASTE FISHING GEAR

5

Online Conference: 5th October 2020

DTU Technical University of Denmark



NTNU Norwegian University of Science and Technology





Creating Business Opportunities from Waste Fishing Gear

Opportunities for Circular Business Models & Circular Design Related to Fishing Gear

5th October 2020

BCE Online Conference

Professor Martin Charter

Director, The Centre for Sustainable Design ®

Business School for the Creative Industries

University for the Creative Arts (UCA)

FIGURE 6 The circular economy—an industrial system that is restorative by design





DESIGNING FOR THE CIRCULAR ECONOMY

Edited by MARTIN CHARTER



VALUE



EXTENDED LIFECYCLE PERSPECTIVE

Focus on Use phase not 'End of Life'



European Commission

Circular Economy 1.0

Closing the loop – An EU Action Plan for the Circular Economy – December 2015

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Circular Economy: Comn plastics to reduce marin	nission weld e litter	come <mark>s</mark> European Parliame	nt adoption of new rules on sir	igle-us	e

Brussels, 27 March 2019

The European Parliament today agreed on the ambitious measures proposed by the Commission to tackle marine litter coming from the 10 single-use plastic products most often found on European beaches, as well as abandoned fishing gear and oxodegradable plastics.



Circular

Design

ISO TC 323

Design Problem **Product, Service, Systems**







CREATING BUSINESS OPPORTUNITIES FROM WASTE FISHING NETS

OPPORTUNITIES FOR CIRCULAR BUSINESS MODELS AND CIRCULAR DESIGN RELATED TO FISHING GEAR

Professor Martin Charter, Director, The Centre For Sustainable Design®, Business School For The Creative Industries, University For The Creative Arts, and Jude Sherry and Dr Frank O'Connor, Founders and Directors, annis,

May 2020

















FNRCPs

Fin- and Shell-fish: Fishing nets, ropes, components & peripherals (FNRCPs)

www.bluecirculareconomy.eu

Functionality



Materials

Durability

Supply chains

Customisation

Failure modes

Repair &

Modification

Closed Loop 8 **Open Loop**

























RE-USE











RE-GEN

Chemicals Recycling





Socks





Swimwear







RECYCLE

Mechnical Recycling










Fishy Filaments

"A BUSINESS MODEL DESCRIBES THE RATIONALE OF HOW AN ORGANISATION CREATES, DELIVERS AND CAPTURES VALUE"



drawings by JAM

Circular Economy



Source: Eco-innovate (2016), The Eco-innovation Observatory





REMANUFACTURING





AN IDEAL-TYPE REGIONAL INNOVATION SYSTEM



Source: in OECD (2008) after Cooke & Piccaluga, 200410



















BCE Lab



Science and Technology

The Centre for Sustainable Design®





The BCE_Lab © Value Chain

















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Thank You





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Northern Periphery and Arctic Programme



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Investing in your future European Regional Development Fur

Prof. Lisbeth M. Ottosen, Post doc Ida M.G. Bertelsen

Use of waste fishing nets in construction materials

Motivation

- Waste fishing gear is piling up in the Greenlandic dumps
- All construction materials transported to Greenland at high costs
- Can waste fishing gear be utilized in construction materials as a local resource?



Arctic DTU Sisimiut Ilinniarfeqarfik Sisimiut



Characteristics of fibres from discarded fish nets



Density	Length	Diameter	Tensile strength	Stiffness
$\rho [g/cm^3]$	L [mm]	d [µm]	σ_t [MPa]	E [GPa]
~0.95	$15 \pm 9 (1-65)$	280 ± 30	380-450	1.0-2.0



Idea and research

- to use waste PE fibres from discarded fish nets for reinforcement in concrete and adobe bricks

Use in *concrete* to control plastic shrinkage cracking

- Testing mortar specimens with and without fibres under controlled environmental conditions in laboratory (temp., humidity, wind)
- Method: Casting on top of rough concrete block to "restrain" the fresh mortar overlay





Results in brief

Reference (no fibres)

y [mm]









Use in adobe bricks

Characterisation of fine-grained rock material (GP) from Greenland Influence of waste polyethylene (PE) fibres from discarded fish nets






Flexural strength of adobe specimens





Variability in characteristics of discarded nets – ongoing research

Technical quality

UV degradation and changes in properties

Variability in properties from discarded nets in dumps



Environmental issues

Heavy metals adsorbed?

Composition of wash off particulate matter







Thank you for your attention 😊

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Eco-label effectiveness

Mark Pasquine Associate Professor Department of International Business Norwegian University of Science and Technology (NTNU) http://www.ntnu.edu/employees/mapa

Eco-Labels



"A common marketing practice used by manufacturers to emphasize a product's environmental attributes is to display an environmental seal of approval (ecoseal) endorsed by an independent organization." (*Teisl et al., 1999*)

Benefits of eco-labels



Can help consumers find products with a lesser environmental impact (Moo, Costello & Koo, 2017; Salzman 1997)



May lead to price premiums under certain circumstances, or at least a positive point of differentiation (*Gutierrez, Chiu & Seva, 2020; Thøgersen, 2000*)

Eco-label effectiveness

 Some evidence that eco-labels work, but effectiveness in driving sales of environmentally friendly products remains questionable

(Brécard, et al., 2009; Grolleau, et al, 2016; Moo, Costello & Koo, 2017; Rex & Baumann, 2007)

• Consumers' can be skeptical of an eco-label's assurance of environmental friendliness if the source/certifier is not recognized as trustworthy, and are then less likely to buy (Atkinson & Rosenthal, 2014, Darnall, Ji, & Vázquez-Brust, 2018)



Will consumers prefer products with a recycled fishing nets eco-label?



Pro-environmental consumer behavior



- PECB is a general measure, not a direct measure of intention to purchase a specific product
- To our knowledge, no studies have examined this model for purchase intentions for specific products
- We expect that...
 - H_{1a-c}: an increase in (a) attitude towards the environment b) trust in ecolabels c) PECB will lead to an increase in purchase intentions (for specific products)

PECB model plus our addition...



Information and trust



- The amount of information provided to consumers about an eco-label can influence their level of trust in the eco-label; USA context
- Teisl (2003) found that adding information increases trust in an eco-label's, depending on the type of information
 - Amount of information varied on:
 - 1) an eco-label logo,.....+
 - 2) adding contact information,.....+
 - 3) adding a summary score, and.....
 - 4) adding a detailed table of information.....+
 - Employed a labelling scheme in which rating scores could be used (e.g. a product could be rated 75 out of 100 on a Forest Management rating)
 - Adding rating had a negative effect on purchase intentions, reversed by adding even more information



PECB and purchase intentions

 Our study looks at eco-labels that certify a product has simply met a certain standard, not a certain level of that standard

- Additional information about an eco-label, without the addition of a rating score, should have an even greater influence on increasing purchase intentions over less information than observed by Teisl (2003)
- When a product has a pro-environmental image or is explicitly labeled as green, participants with high ecological motivation have stronger preferences for the product when product information is provided (*Hahnel, et al. 2015*)
- We also expect an indirect effect of an increase in information availability through trust to lead to an amplification of the increase in purchase intentions suggested by the model
 - *H*_{2*a-b*}: The model will explain more variance in a) purchase intention and b) PECB as the level of eco-label information increases

Developing vs developed countries



- Several authors have suggested that there may be differences between how eco-labels are used in decision making in developed vs developing countries (*Carrete, et al., 2012, Göçer & Sevil Oflaç, 2017, Sonnenberg, Erasmus, & Schreuder, 2014*)
- We will test the model in both types of countries
 - Expect differences in knowledge of eco-labels between developed and developing countries, with respondents in developed countries having more knowledge of eco-labels
- Hence, the model should explain more in developed vs. developing countries
 - H₃: the explanatory power of the model will be higher in developed relative to developing countries





- Online surveys using conjoint analysis
- Randomly assigned respondents evenly split between developed and developing countries and several product categories
 - UK/Scotland and Norway (developed) vs. Indonesia and Ghana (developing)
 - Products differ on level of involvement
- Manipulation in level of information provided
 - 1) minimal: eco-label seal only,
 - 2) vs. increased: the addition of contact information,
 - 3) vs maximum: the addition of a paragraph explaining the eco-label
- H₁ will use structural equation modeling (SEM) to test the conceptual model, whereas we will test H₂ and H₃ using chi-square difference tests of models
- The survey will go live in a few weeks

Intended contribution

- 1. We intend to extend the model to include purchase intentions
- 2. Clarify moderating influence of ecolabel information
- 3. Determine if effects are stronger in developed countries





BLUE CIRCULAR ECONOMY

Green Supply Chains – Arron Wilde Tippett NTNU arron.w.tippett@ntnu.no

2018-2021









NTNU Norwegian University of Science and Technology





Green Supply Chains

Focus of Green Supply Chain Management

Key Elements

- Reducing environmental/ecological impacts
- Improving waste management efficiencies
- Designing sustainable/circular products
- Lowering costs for future generations

<u>KPI (s)</u>

Environmental Impact (Global Warming Potential, Ecotoxicity etc.?) Methodology

Life Cycle Assessment

Green Supply Chain

Environmental Life Cycle Assessment (eLCA)

- Holistic method for understanding the environmental impacts of a product/service
- Considers the impacts across a product life cycle:
 - Raw material extraction
 - Transport
 - Manufacture
 - Delivery
 - Use
 - Reuse, repair, recycle, incineration, etc.

Green Supply Chain

Noprec – Norwegian Plastic Recycling Company

Noprec, the Norwegian Plastic Recycling Company supplies recycled fishing gear to companies across Norway and Europe.

- Established: 2017
- Location: Ottersøy, North Trondelag, Norway
- Employees: 4 (plus 26 shared with Containerservice Ottersøy, the local waste management company).
- Company Structure: Private company led by two local entrepreneurs



Noprec - Norwegian Fishing Gear Recycling

Noprec recycle plastic from the aquaculture and fishing industry to produce HDPE, PP and PE/PP mix granulates made from recycled fishing gear for companies across a range of industries in Europe, including:

- Nordic Comfort Products (Furniture)
- Kiwi (Supermarkets)
- Plasto (Plastic Product Design),
- **Partner Plast** (Aquaculture and Offshore industries)
- Ørskog Plastindustri (Construction)





Green Supply Chain

System Boundaries

<u>Upstream</u>

- Collecting waste fishing/aquaculture gear

<u>Core</u>

- Segregation, washing, grinding, granulation of the waste gear
- Packaging and storage of the granulate product

Downstream

- Shipping of the recycled fishing/aquaculture gear to the customer



Green Supply Chain

Attributional Assessment



Upstream processes (Torquise)

- Polluter Pays Principle (PPP)
- Impacts mainly due to waste collection processes.

Core processes (Light Green)

• Main impacts associated with ozone depletion and ionizing radiation as a result of electricity generation.

Downstream processes (Dark Blue)

 Impacts due to delivery processes, several customers spread across Norway and Europe.

Next Steps

Model Optimisation

Can we make Noprec's supply chain greener by using multiple environmental impacts as criteria for decisions within the supply chain?

What materials are currently available for recycling in Norway and what may be available in the future?



Thank you

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A Quadruple Helix model of BCE innovation clusters Hajnalka Vaagen, Arron Wilde Tippett (NTNU)

2018-2021







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NTNU Norwegian University of Science and Technology





A Quadruple Helix model of BCE innovation clusters

Theoretical and methodological approach

Triangulation of:

- 1. Cluster Development Policies (CDPs)
- 2. the Quadruple Helix an established theoretical model for innovation, built on the **relations** between *University–Industry–Government–Society* (ex. Silicon Valley)
- 3. Organisational Network Analysis (ONA), to better understand the micro level relationships, combined resources and value creating activities in the quadruple helix.

Source:

Elaborated by the authors based on Etzkowitz and Leydesdorff (1995)



From formal ties in Quadruple Helix...



...**to the informal (true) micro level relationships** Organizational Network Approach



These relations can explain:

- knowledge transfer
- learning
- facilitating innovative ideas,
- support with decision-making
- cooperation
- untapped expertise
- brokers, gatekeepers
- ...

How can we contribute to a more sustainable society?

Think global/local challenges Think life cycle and circular Think multi-disciplinary

Thank You

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