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New path development for forest-based value creation in Norway

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SUSVALUEWASTE Book

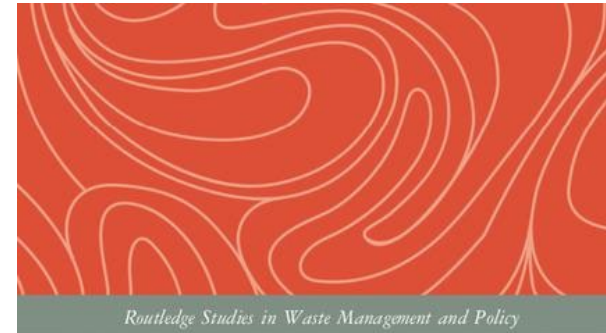
From Waste to Value - a Study of Valorization Pathways for Organic Waste Streams in the Nordic Bioeconomies

Antje Klitkou, Arne Martin Fevolden and Marco Capasso (Editors)

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FROM WASTE TO VALUE

**VALORISATION PATHWAYS FOR ORGANIC WASTE
STREAMS IN CIRCULAR BIOECONOMIES**

Edited by
Antje Klitkou, Arne Martin Fevolden and
Marco Capasso



Pulp and paper industry (PPI) crisis

- A window of opportunity for the emergence of local (later regional) innovation networks and driving to the bioeconomy transition
- Different mechanisms of path development
- Development of new industrial paths is influenced by existing conditions, but can break out of former paths through strategic focus on innovation, regional networks, collaboration in the value chains and through crossing existing sectoral boundaries

Path dependence and path development

- We use here the taxonomy introduced by Isaksen (2015):

Path extension - continuation of an existing industrial path based on incremental product and process innovations in existing industries and well-established technologies

Path renewal - when existing local industries restructure and branch into new, but technologically related industries

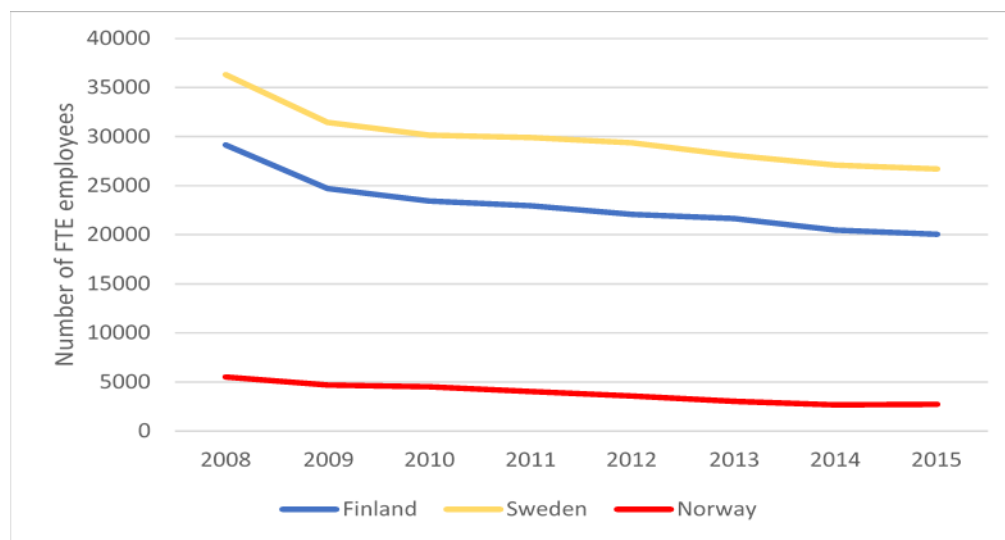
Path creation - the emergence of industries based on radically new technologies and scientific knowledge, new business models or user-driven innovation (especially important in the context of local innovation networks)

Path exhaustion

Pulp and paper industry (PPI) in Norway

- Over decades, the forestry-based industry in Norway has been specialized in pulp & paper production, especially in newsprint paper
- European pulp & paper production: significant decline in the last decade

Figure 1: Manufacture of paper and paper products in Norway, Sweden and Finland – numbers of employees in full time equivalents (Source: Eurostat)



European PPI – an “industry in full transformation”

- Pulp and paper production had a historical growing trend in Europe until mid-2000s
- The Confederation of European Paper Industries (CEPI) reported a substantial downsizing of the European pulp and paper industry
- Affected by the economic crisis of 2008
- Recent restructuring and shutdowns among pulp and paper mills Europe, USA and Canada (Machani, Noureifath, & D’Amours, 2015)

European PPI – an “industry in full transformation”

European PPI competitiveness strained by a number of factors:

- Lower costs of pulp production in Latin America as well as lower costs of paper and packaging in Southeast Asia
 - *Natural vegetative conditions. Long forest rotations in the boreal zones compete with fast-growing plantations in the South*
 - *New markets and investments: pulp plantations investments in Latin America and Southeast Asia*
 - *High paper manufacturing investments in China*
 - *Rising production and consumption capacities in emerging economies (Zhang, Toppinen, & Uusivuori, 2014)*
- Media digitalization, changing consumer habits
- EU bioenergy production

Case studies

Empirical cases:

Norske Skog in Skogn

Treklyngen in Hønefoss

Borregaard in Sarpsborg



Norske Skog Skogn

- Norske Skog: est. 1962, has been the main pulp and paper producer in Norway
- It put all efforts into becoming the world leading paper producer, acquiring many foreign pulp and paper mills globally; lost its economic power due to the diminished demand for paper globally
- While the mother company declared bankruptcy, Norske Skog Skogn still remained in business
- Cooperation with Biokraft AS, exploring rest resources from the pulp and paper plant and from salmon aquaculture for producing biogas and upgrading it to liquefied biogas LBG, production of fertilizer

-> **PATH EXTENSION** – incremental improvements in traditional pulp and paper production (still the core product). Elements of **PATH RENEWAL** (collaboration with a new industry)

Treklyngen

- Est. 2011 by forest owner cooperative Viken Skog (11 000 forest owners)
- Bought a pulp and paper mill in Follum from Norske Skog under the condition that pulp and paper production had to be stopped
- Industrial symbiosis, collaborating with:
 - *Avinor to produce bio-jetfuel,*
 - *Arbaflame for a production plant for biochar,*
 - *Elkem, Avinor & energy company Vardar to develop a new value chain for producing biochar & biooil,*
 - *ST1 to build a bioethanol plant,*
 - *Ringeriks-Kraft for an international data centre,*
 - *Termowood in a technology for wooden construction,*
 - *Saga Wood in thermo-treated wood,*
 - *Norwegian Firewood for wooden briquets*

-> **PATH RENEWAL** (restructuring, bioenergy and wood for construction) and **PATH CREATION** (biorefining and data center)

Borregaard

- Est. 1889, specialised in pulp & paper, in late 1930s started producing chemicals based on spruce timber as raw material, exploiting hemi-cellulose in feedstock
- The biorefinery started already in 1938
- Is now the world's leading manufacturer of wood-based chemicals such as specialty cellulose, lignin, vanillin and bioethanol. In addition, the Group produces fine chemicals for the pharmaceutical industry etc.

-> **PATH CREATION:** Borregaard has realised much more potentials of path creation than the two other cases, transformation from a pulp and paper plant to an advanced integrated biorefinery producing a wide scope of products and relying on the development and commercialisation of advanced scientific knowledge.

Conclusions

- Crisis in the PPI as a window of opportunity for local innovation networks and developing bioeconomy
- Traditionally the PPI had strong **vertical relations** (long-term buyer-supplier partnerships). But the future projections imply integration that is more **horizontal** (new partnerships with energy, bio-refineries, food, chemical or textile industries)
- We can distinguish between three pathways:
 - (1) replacing pulp and paper production by an integrated biorefinery, which produces chemicals and materials (Borregaard)
 - (2) integrating pulp and paper production with liquified biogas production (Norske Skog Skogn)
 - (3) developing an industrial cooperation of different firms for replacing pulp and paper production with new forest-based products from logs and residuals, such as bioethanol, biochar, wooden construction (Treklyngen)

Future of PPI

- A Delphi study of the European PPI in transition to bioeconomy revealed that experts from both academia and industry unanimously agree that:
 - *R&D should be more strongly directed to developing new innovations and that the profitability of the companies will depend on their ability to change the current business logics*
 - *the traditional products (pulp, paper, board, tissue, packaging) need to be accompanied by energy, biofuels, innovative bio-chemicals, bio-materials and intelligent packaging*
 - *the necessary change in products and in business logic, shifting from incremental innovation to more radical, novel and capturing value solutions (Toppinen et al., 2017, p. 12)*
- **WASTE!**
 - *Efficient use of waste resources will be an important component of any future strategy*
 - *Current PPI waste contains useful elements for both value-added products and energy*
 - *Some producers already “capitalise on these opportunities”, current best-practices are still “far from gaining the maximum value from paper resources”*

THANK YOU!

Questions?

Comments?

