

SYMBIOSIS IN A CIRCULAR ECONOMY: EXPLORING SOLUTIONS FOR IMPROVED WATER AND NUTRIENT GOVERNANCE



PHOTO: EW63D /GETTY IMAGES

This report provides a summary of the presentations, panel discussion and key outputs from the four interactive group sessions at the second regional exchange and learning event held on 16th May 2019 in Gdansk, Poland. BONUS RETURN brought together a diverse set of actors to facilitate learning exchange, discuss opportunities and challenges for deploying systemic innovations, and engage with all sectors involved in the circular economy of the Baltic Sea region. A total of 58 participants were in attendance, representing various countries and sectors including academia, industry, civil society, public and private sectors.

AGENDA

The agenda consisted of two keynotes to set the scene for the thematic discussions, an innovation panel discussion and four breakout sessions that ran parallel in the morning and afternoon.

- 08:30 – 08:45** Registration and mingle
- 08:45 – 09:00** Opening, Moderator – Sirkka Tattari, Finnish Environment Institute
- 09:00 – 09:15** Welcome remarks – Tomasz Okruszko, Warsaw University of Life Sciences
- 09:15 – 09:30** About BONUS RETURN – Karina Barquet, Stockholm Environment Institute
- 09:30 – 09:50** Keynote 1 – Ludwig Hermann, European Sustainable Phosphorus Platform, ESPP
- 09:50 – 10:00** Workshop Instructions – Brenda Ochola, Stockholm Environment Institute
- 10:00 – 10:30** Coffee break
- 10:30 – 12:00** Parallel Breakout Sessions 1
- 12:00 – 13:00** Lunch

- 13:00 – 13:20** Keynote 2 – Paula Land, Local Governments for Sustainability, ICLEI
- 13:20 – 14:15** Discussion panel with innovators, facilitated by David Nilsson – Royal Institute of Technology (KTH), Sweden.

The panelists:

- | | |
|----------------------------|---------------------------------------|
| Prashanth Kumar | Aquacare (Netherlands) |
| Pär Lärshans | Ragn-Sells (Sweden) |
| Yariv Cohen | EasyMining (Sweden) |
| David Marhauer-Nimb | Kalundborg Symbiosis Center (Denmark) |
| Anna Calo | Advanced Aerobic Technology (Sweden) |
| Kari Koppelmäki | Agroecological Symbiosis (Finland) |

- 14:15 – 14:30** Coffee break
- 14:30 – 16:00** Parallel Breakout Sessions 2
- 16:00 – 16:45** Presentation of results from parallel sessions in plenary
- 16:45 – 17:00** Closing remarks – Olle Olsson, Stockholm Environment Institute
- 19:00 – 23:00** Dinner



LUDWIG HERMANN GIVING THE FIRST KEYNOTE

KEYNOTES

PHOSPHORUS GOVERNANCE – CHALLENGES, FRAMEWORK AND CIRCULAR SOLUTIONS

LUDWIG HERMANN – EUROPEAN SUSTAINABLE PHOSPHORUS PLATFORM, ESPP

Ludwig Hermann started by introducing global trends and challenges related to nutrient use. He presented the concept of the Great Acceleration, showing how material use has increased exponentially over the past 50 years in particular. Driven by this acceleration, humanity has now transgressed the so-called planetary boundaries for both nitrogen and phosphorus, and Europe faces nutrient loss and eutrophication challenges.

He then highlighted some key global and European policy changes within the area of nutrient management, such as the EU Circular Economy Package which includes the new EU Fertilizer Regulations, and the proposed new Common Agricultural Policy.

“For policy makers who want to support a transition towards a circular economy, there are a set of available pathways for incentivizing reuse such as taxes on landfill and nutrient effluents, mandatory phosphorus recycling, binding agreements with industry and municipalities and taxation of CO2.”

Regulations should also consider Nitrous oxide emissions, possibilities to integrate nitrogen recovery, the energy balance of wastewater treatment plants, and life cycle analysis of circular solutions.

After an overview of some key technologies for phosphorus reuse – including struvite, phosphorus recycling from ash and tailings, he concluded that remaining barriers include lack of market demand for more sustainable, circular processes, as well as lack of apparent willingness to accept a premium for sustainability.

CITIES AND NETWORKS IN THE CIRCULAR ECONOMY

PAULA LAND – LOCAL GOVERNMENTS FOR SUSTAINABILITY, ICLEI

Paula Land emphasized the importance of working with cities for a circular economy and why they are well-placed to deliver on circular economy targets.

She explained that cities are well familiar with local markets, stakeholders and goals and have an interest in creating a “liveable city for all”. For instance, Mikkeli in Finland is currently looking to develop the circular economy locally as the city aims to improve nutrient recovery and create business opportunities.

“Cities can be drivers of change. They need political commitment, knowledge and expertise, learning, networking and exchange.”



PAULA LAND GIVING THE SECOND KEYNOTE

In ICLEI’s *The CityLoops* project, they support the implementation of ambitious circular economy demonstration actions in the fields of construction and demolition waste (including soil) and organic waste in six small-to-medium sized European cities. The project assesses material flows and develops circularity indicators for urban areas. Another initiative, *PROCURA+ European Sustainable Procurement Network*, connects European cities and public authorities for exchange of knowledge and learning in terms of actions on sustainable and innovation procurement.

WHAT MAKES INNOVATIONS SYMBIOTIC?



INNOVATION PANEL DISCUSSION

The discussion was moderated by one of BONUS RETURN's advisors, David Nilsson, from Royal Institute of Technology (KTH), Sweden. The innovators in the panel were: Prashanth Suresh Kumar from Aquacare (Netherlands); Pär Lärshans from Ragn-Sells (Sweden); Yariv Cohen from EasyMining (Sweden); David Marhauer-Nimb from Kalundborg Symbiosis Center (Denmark); Anna Calo from Advanced Aerobic Technology (Sweden) and Kari Koppelmäki from Agroecological Symbiosis (Finland).

The discussion focused on the relationship between innovations and existing socio-technical systems and their effects in economic and political contexts. All panelists acknowledged their innovations to be symbiotic – a collaborative process between companies or sectors where waste or waste by-products are turned into a resource, and unanimously agreed that the market is the most challenging aspect in the innovation process.

Kari Koppelmäki, for instance, stated that balancing supply and demand is difficult when production is at a small-scale, as one needs to recover phosphorus of the same quality as that on the market to be able to sell the product.

Yariv Cohen added that the market is indeed important, as an innovator needs to think about the farmer who will be purchasing the product, and therefore recover nutrients in a commercial, usable form in the existing market.

On the question of what needs to happen to drive a transition and broader upscale of innovations, David Marhauer-Nimb explained that development should be economically viable, and legislation can help create new business opportunities by advocating for a symbiotic model. This depends on where one is in the process, as trust and awareness are important in the early stage but legislation can play an important role in the next stage.

“Without trust, there will be no change since a circular economy is about collaboration” – Pär Larshans

Anna Calo demonstrated that it is possible to scale up or replicate a proven working model, giving the example of the wet compost plant in Hölö, Sweden. Being open and sharing your innovation model can result in a wider network and potential clients from all over the world.

[WATCH THE INNOVATION PANEL DISCUSSION VIDEO](#)

PARALLEL BREAKOUT SESSIONS

1. PUBLIC PROCUREMENT FOR CIRCULAR INNOVATIONS

Public procurement constitutes a major share of public spending and is increasingly recognized as an untapped potential for driving a transition towards a circular economy. Some of the strategies raised for supporting circular procurement include the use of circular procurement criteria, procurement of circular products, procurement of services (such as leasing), and procurement that supports the creation of industrial symbiosis and circular systems. However, challenges in putting circular procurement into practice for agriculture and wastewater sectors still exist.

“Sustainable Public Procurement is a procurement for products and services in the ‘normal’ commercial market but with evaluation criteria looking at Best Total Value including social, economic and ecological values instead of the traditional focus on purely economic values.” – Charlotta Möller, Research Institutes of Sweden (RISE)

The different types of innovation procurement are based on the readiness level of the products and services. Development-promoting procurement is the type closest to the ‘normal’ market while Pre-commercial Procurement (PCP) is used for early goods and services which demand research and development. Public Procurement of Innovation (PPI) aims at goods and services that are more validated and market ready.

This session focused on how cities and municipalities can use public procurement to enhance the uptake of circular innovations, and explored questions related to benefits, barriers and challenges of innovation procurement.

BENEFITS OF INNOVATION PROCUREMENT



CHALLENGES AND BARRIERS

Instruments and plans in projects are often not applicable in real-life situations. For startups in cities where products exist but contracts are not easy to come by, it is challenging to upscale them and give testing opportunities as well as make deals with companies.

The need for flexibility in regulations continues to be a challenge as there are ways to build procurement criteria around existing flexible legislations. There are several projects modelling procurements to upcoming products that could be incorporated in a better way.



CHALLENGES AND BARRIERS FOR INNOVATION PROCUREMENT

2. TESTBEDS: INFRASTRUCTURE, FINANCE AND SETUP

Test and demonstration environments referred to as testbeds, allow for cheap, fast and small-scale testing of innovative approaches. As goods and services are developed at a more rapid pace and are increasingly complex, testbeds are becoming more and more important for public and private sectors alike.

Testbeds for circular solutions require adequate infrastructure as well as innovative business models and other agreements between different actors. Testbeds are often found to run into challenges of sustaining the activities beyond project funding and finding business models that are sustainable over time. Furthermore, circular solutions remain a niche market with limited profitability, which may require identifying and establishing innovative partnerships.

The main focus in this session was to evaluate testbeds and associated arrangements for circular solutions in nutrient and water management, as well as to explore the constellation of stakeholders or partners.



ERIK KÄRRMAN FROM RISE, LEADING THE SESSION

PURPOSE AND BENEFITS OF TESTBEDS

Test beds accelerate innovations and act as drivers of change in improving the environment e.g. shortage of water or local symbiosis.

PARTNERSHIPS, ROLES AND RESPONSIBILITIES

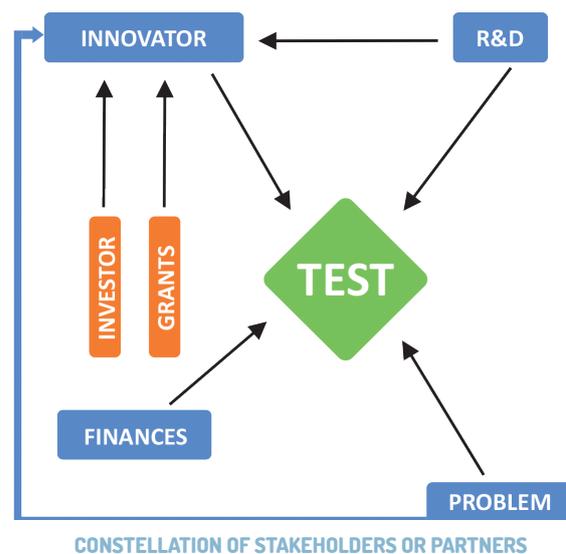
Partnerships help support innovations to increase their Technology Readiness Level (TRL).

PROBLEM OWNER

This is the end user - may be an individual, municipality, region or industry.

RESEARCH & DEVELOPMENT

Research & Development (R & D) helps with the evaluation of results. It recognizes that their solutions help solve specific problems. R & D is crucial in testing stages where the problem may not be entirely understood, or the technology is uncertain.



TRUST

It takes time to develop trust and collaboration. When people leave the municipality one may be required to start the process of generating trust again, and this may be problematic. It may also be that research is produced and a city is invited to join the collaboration. The city should perhaps be the problem owner and thus influence research at a much earlier stage than what is typically the case today.

FINANCE

There needs to be a clear definition of which financial models to use. These are affected by private and public investors or grants. When sharing profits between the four roles, the type of financing can impact the distribution of profits or outcomes. A common solution could be that the innovator gets the main share of the profit. Profits could be beneficial to the general public, for instance by improving the environment.

3. PAYMENTS AND OTHER SCHEMES FOR NUTRIENT AND CARBON RECYCLING

The Baltic Sea Region faces pressing challenges such as nutrient emissions, soil degradation and biodiversity loss resulting from agricultural production processes. These challenges are likely to increase with climate change. There is a growing need for ‘win-win’ approaches that reverse CO₂ emissions, manage nutrients and water sustainably, and provide benefits for farmers. “Carbon farming” has emerged as a potential payment scheme to serve these purposes and enable a transition to a climate-smart agriculture.

Using carbon sequestration as the organizing principle, carbon farming promotes land management and farming practices that bring about multiple benefits: retaining and recycling nutrients, improving soil structure and water holding capacity, thereby enhancing productivity of the land, while at the same time addressing climate change mitigation through carbon sequestration.



A SECTION OF PARTICIPANTS DURING THE SESSION

Carbon farming practices capture excess (waste) CO₂ from the atmosphere and transform this to soil organic carbon (reuse), which is an important component of the global carbon cycle and the basis of soil fertility. Furthermore, under this scheme, farmers that generate carbon credits through on-farm projects can sell the credits to the government through an existing emission reduction framework, or to individuals and organisations that are committed to offsetting their carbon emissions in the voluntary carbon market.

The question raised was “*Is carbon farming feasible to enact in Europe?*”

The participants discussed the opportunities and challenges related to carbon farming in Europe from their perspectives and positions.

CHALLENGES

1. Lack of understanding of carbon farming among different actors.
2. Changing the way farmers think from an economy-oriented to environment-oriented perspective.
3. Need for economic incentives for farmers to participate in a carbon farming scheme.
4. Up-scaling big and fast enough to have a climate mitigation impact.
5. Monitoring, auditing and modelling the effects of carbon farming practices in different soils and climates.
6. Carbon farming might not be accepted as a form of payment scheme at the EU level.
7. Current agricultural policies favor monoculture, which make it difficult to shift to carbon farming practices.
8. Uncertainty about spin-off effects with other nutrients such as phosphorus and nitrogen.

OPPORTUNITIES

1. Animal and crop farmers could potentially increase the cycling of manure across the land use practices in order to increase carbon farming.
2. Underutilised land around the Baltic Sea could be used for carbon farming.
3. Farmers can have higher yields by keeping carbon in the soil. Due to generally low profit in agriculture, this approach can provide extra income for farmers.
4. Carbon sequestration can potentially decrease expenditures for nutrients as it reduces losses of nutrients and water.
5. Peer-to-peer learning could be a way to convince farmers to take up carbon farming practices.
6. Carbon farming is about implementing sustainable soil management practices to enhance soil organic matter and carbon stocks.

4. REQUIREMENTS FOR MARKET UPTAKE OF RECYCLED FERTILIZER PRODUCTS

Recovery and recycling of nutrients from agricultural, industrial and urban waste has been strongly promoted in EU circular economy policies. Within the Baltic Sea region, in recent years, HELCOM has called for enhancement of phosphorus recycling especially from manure and sewage. Despite this, most of the Baltic Sea countries do not yet have a holistic strategy for nutrient recycling. The use of recycled products such as recycled phosphorus, as agricultural fertilizers, is still limited.

There have been concerns about high costs compared to traditional mineral fertilizers, contaminants (e.g. residues of pesticides, pharmaceuticals, heavy metals), or consumer perception related to food safety. To increase the adoption of recycled fertilizers, there is a need for greater understanding of the fertilizer market as well as the end-users' requirements and their decision-making processes. This involves not only farmers as primary end-users of reused fertilizer products, but also secondary end-users such as food-processing companies, food retailers, consumers, and agricultural suppliers (e.g. fertilizer and feed industry).

This session discussed the perceptions, requirements and choices of end-users to enable market uptake of recycled fertilizer products. The following is a summary of the discussion.

REUSE PRODUCTS NEED TO BE ATTRACTIVE TO FARMERS IN TERMS OF PRICE AND QUALITY

1. Make reused products more attractive to farmers either through higher quality, or lower price so that they can become a first-hand choice and not a risk.
2. Mineral fertilizers have low efficiency and often use technologies that are old-fashioned. This could be an opportunity to introduce recycled fertilizers – if we can get a higher efficiency, farmers may be willing to pay more.
3. The format of fertilizers affects their applicability. Fertilizer producers need to take

into account how it will be applied by farmers.

4. Change the legislation – need a subsidy to enforce more recycling. Why not impose a tax on mined phosphorus in order to increase user efficiency and reuse?
5. Most companies have focused on the recycling component, but not the product quality. The fertilizer industry has been reluctant to share know-how, although this seems to be changing.

QUALITY CRITERIA SHOULD FOCUS ON THE PRODUCT, NOT THE ORIGIN

1. There are regulations in place at EU and national levels for reuse products based on origin rather than content quality. For example, it is not allowed in the EU regulation to use recycled phosphorus from wastewater for animal feed.
2. The price of phosphorus from waste sources is higher than conventional fertilizer sources, but rock phosphate typically has a “natural” heavy metal content, for which there is little restrictions in the EU. Only cadmium has received attention.
3. There is a need for risk assessment and consumer awareness related to use of raw sewage sludge in agriculture. Recycled phosphorus as a fertilizer from these sources might be considered unsanitary among the general public.

STANDARDIZATION IS KEY

1. Reused nutrient products are still an emerging market with a lot of uncertainties. Regulations and standardization criteria will help.
2. Recycled fertilizers are more expensive today but have environmental benefits which motivate subsidies.
3. Certification by a well-known third-party actor could provide credibility and quality assurance. A sustainability label for food could provide added value.
4. Need to provide good examples or role models associated with people with high social capital.
5. Legislation on mandatory reuse – we need to learn from other sectors. Germany and Switzerland are legislating mandatory phosphorus recycling from various sources including incinerated sludge.

THANK YOU TO OUR PARTICIPANTS!

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