

Enhancing the Value of Agricultural and Forestry Residues

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SAVONIA

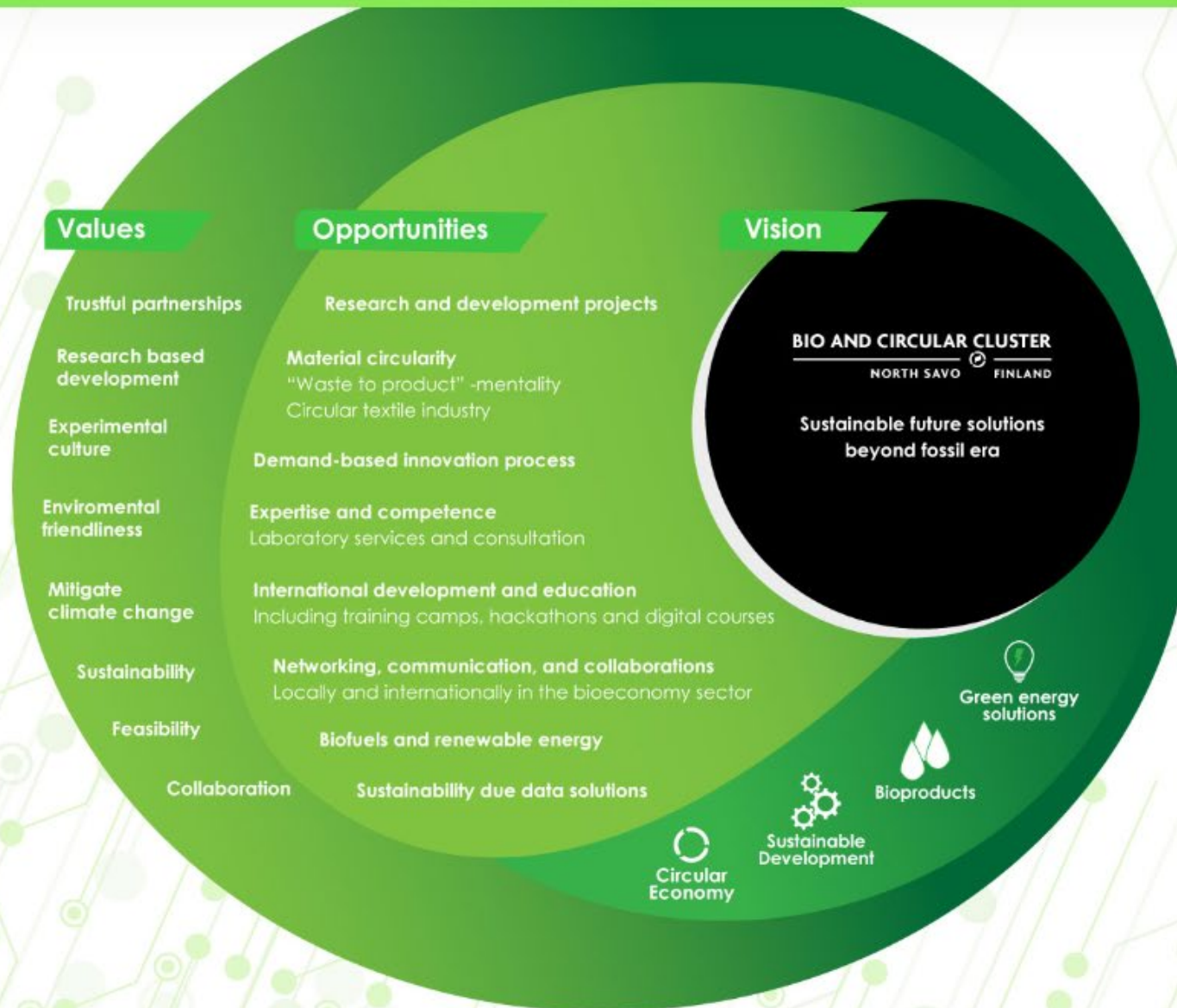
University of Applied Sciences

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www.biocc.fi/en/

Bio and Circular Cluster

Bio and Circular Cluster Strategy

Supporting the growth of companies in the industry by bringing together state-of-the-art knowledge in technologies, products and services to develop circular economy





Bio and Circular Economy

POHJOIS-SAVO - NORTH SAVO

- We support the utilization and valorization of industrial side streams with various biorefining technologies
- **Bio and Circular Cluster** has been registered at the European Commission's Cluster Platform ECCP, 2022)
- We promote a **sustainable bioeconomy and circular economy**
- Our aim is to support the development of the **waste management globally**
- We support the growth and internationalization of companies in North Savo, Finland.



Biosphere North Savo

1.4.2020 – 31.3.2023



BIOSFÄÄRI
POHJOIS-SAVO



Project objectives



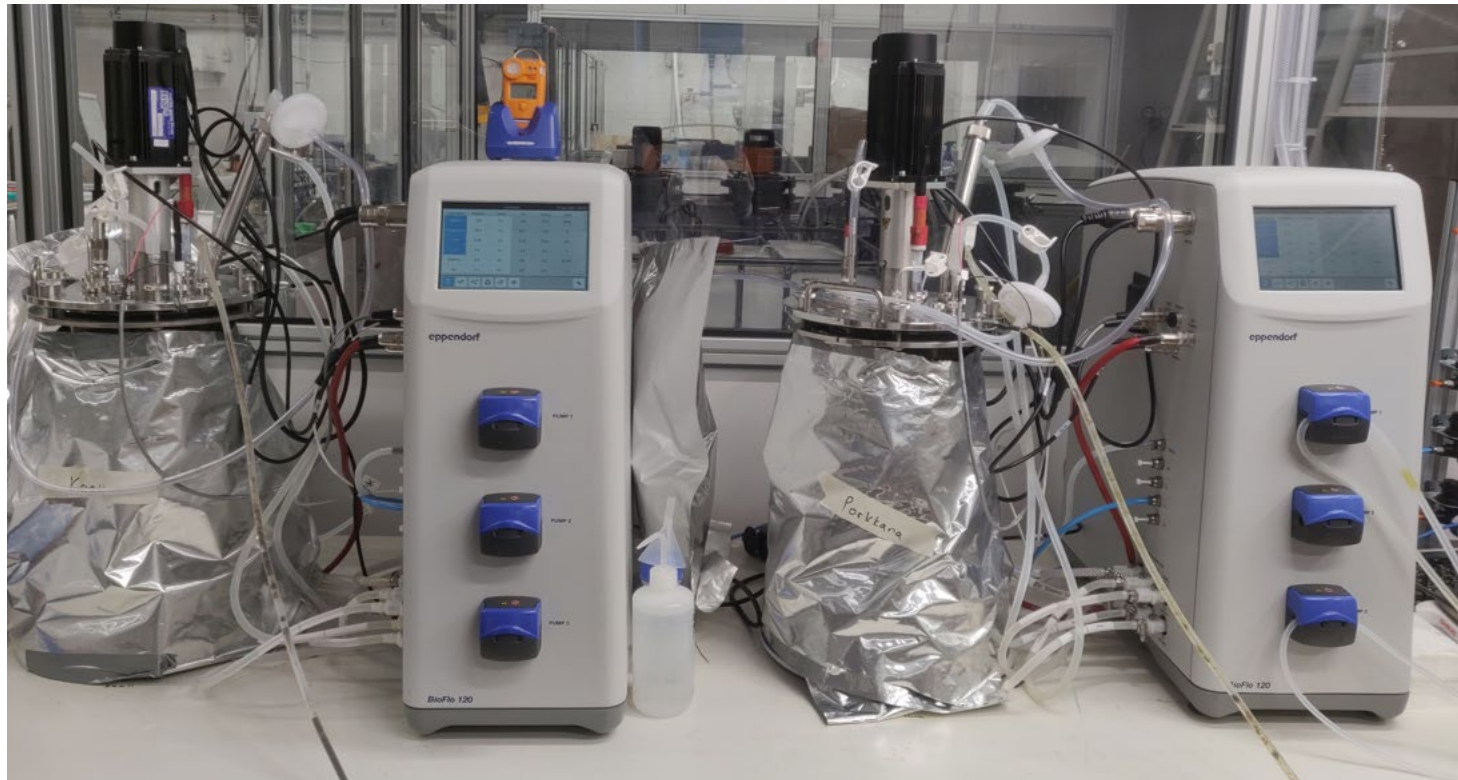
The aim of this project was to continue concrete development actions together with companies, educational and research organizations and other partners.

These spearheads are

- a) thermal and/or biologic treatment of biomass to liquids, gases and solid products and their further refining,
- b) **circular fertilizer/soil improvement** products by utilizing local **industrial side streams** and above mentioned processing techniques and expertise, and
- c) clarifying the critical issues required for wide utilization by using literature, testing and experiments (functionality, cost efficiency, safety and environmental issues).



Fermentation R&D



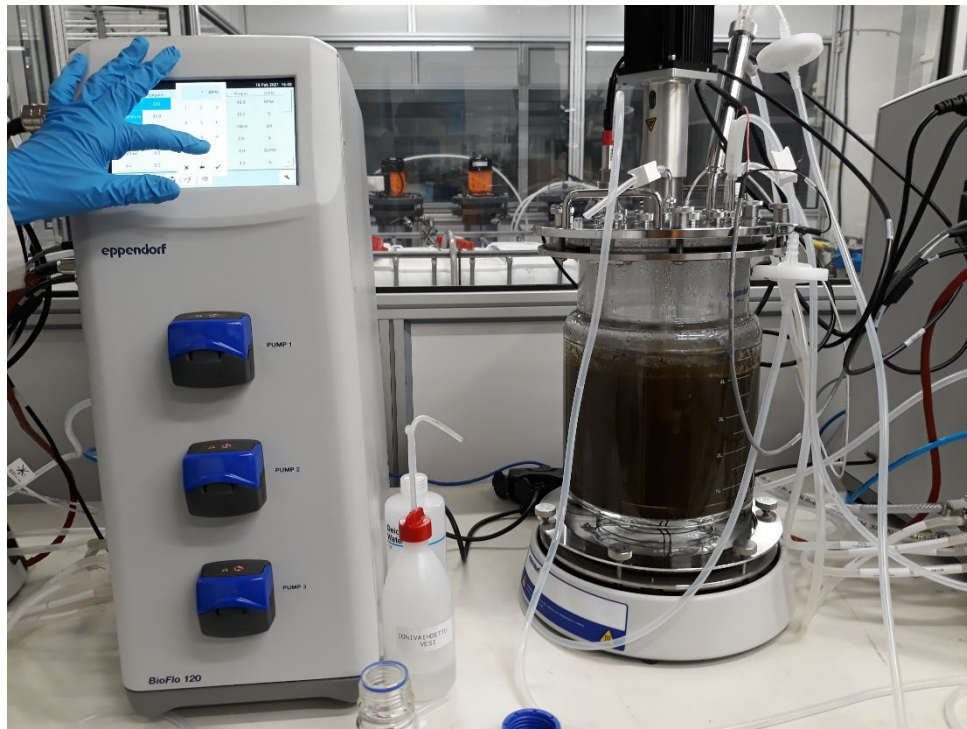
Bio and Circular Economy laboratory has two fully automated fermentors for microbiological studies.

Growing conditions in the fermentors can be adjusted as needed including:

- Gaseous environment (aerobic/anaerobic)
- Feed of nutrients
- Mixing rate
- Temperature
- Batch/continuous mode

Metabolite end products (both liquid and gaseous) can be collected and analysed separately.

Fermentation - Hydrogen potential



Dark fermentation is a favourable technique for the production of renewable bio hydrogen.

- Bacteria: *Clostridia*-, *Esherichia*-, *Citrobacter*- and *Bacillus*- genus.
- Substrates: carbohydrates, proteins, and lipids.
- End products in the liquid phase: acetate, butyrate, butanol, ethanol, acetone or 2-propanol.
- Various materials that are anaerobically biodegradable are suitable as substrates for **hydrogen production**.

Soil improvers from industrial side streams



Soil improvers from industrial side streams



Green house, 18 m²:

- Development of new recycled fertilizer products based on local raw material flows.
- Greenhouse capacity 100 pots.
- Randomizing the order of pots.
- Test matrices in 3-4 parallel pots with several soil types.
- Knowledge of the test calculation for set-up to correspond to agriculture.



Soil improvers from industrial side streams

Industrial ashes:

- Iisveden metsä
- Kuopion Energia HP2
- Fortum Waste Solutions

Biochar:

- Spruce biochar
- Pine-spruce biochar
- Deciduous tree

Composted materials:

- Fish waste
- Offal

- By-products: brewery mash
- Bioprocessing digestate
- As a comparison:
 - Raw manure + salt shaker
 - 0 pots

The test matrices were examined in 3 parallel pots with two soil types.



Small scale tests with circular fertilizers



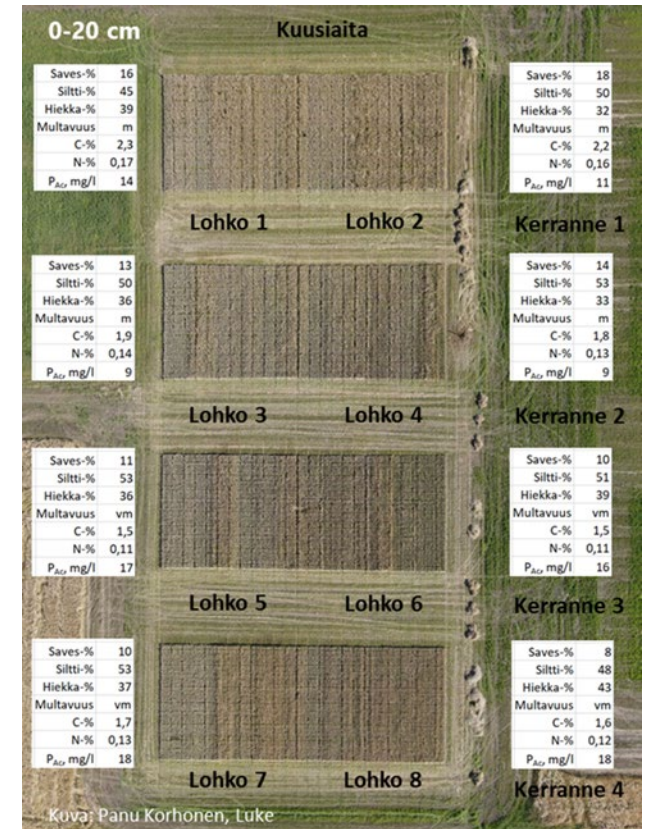
Composted material 2A, 1B, Deciduous tree biochar A, Spruce biochar B, Pine + spruce biochar A. First harvest **7.7.2021**, second harvest **27.7.2021** & third harvest **16.8.2021**.



Field tests in Kuopio



Kuva: Panu Korhonen, Luke



Kuva: Panu Korhonen, Luke

Green house- Soil improvers from side products



As a result:

- Crude protein
- Calcium, Ca (g / kg ka)
- Potassium, K (g / kg ka)
- Phosphorus, P (g / kg ka)
- Magnesium, Mg (g / kg ka)
- Sodium, Na (g / kg ka)
- Copper, Cu (mg / kg ka)
- Manganese, Mn (mg / kg ka)
- Zinc, Zn (mg / kg ka)
- Iron, Fe (mg / kg ka)
- Selenium, Se (mg / kg ka)

More information and Contacts



Website: <https://www.biosfaari.fi>

Facebook: <https://www.facebook.com/biosfaaripohjoissavo>

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Pohjois-Savon liitto tukee
maakunnan
menestystä



Vipuvoimaa
EU:lta
2014–2020



Collaborators of the Biosphere project

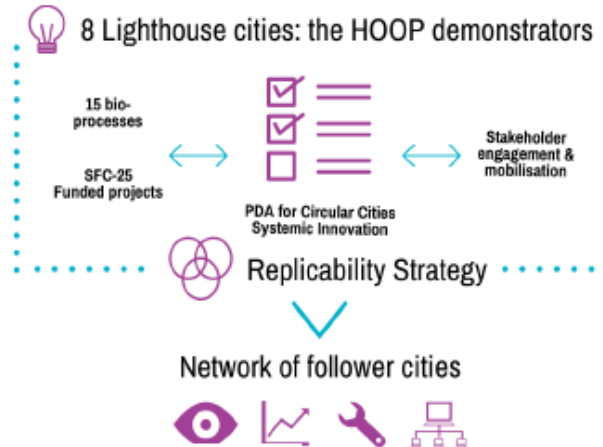


HOOP (Horizon 2020), 1.10.2020 – 30.9.2024



**HUB OF CIRCULAR CITIES
BOOSTING PLATFORM TO
FOSTER INVESTMENTS
FOR THE VALORISATION
OF URBAN BIOWASTE
AND WASTEWATER**

The HOOP Approach

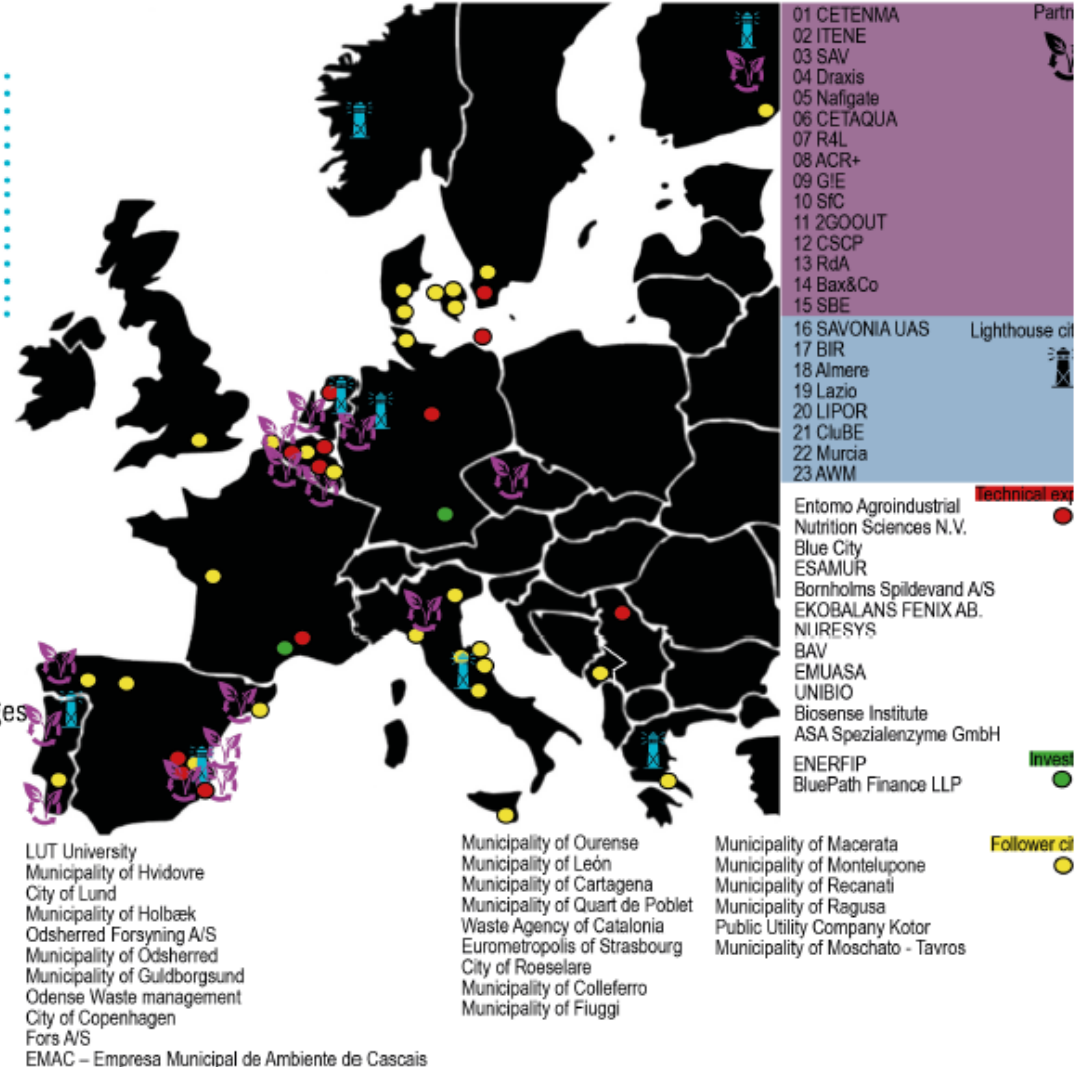


Financial Information

- 9,00 M€** Budget
- 5,78 M€** for PDA Management
- 51,7 M€** Investment Induced
- 8,00 M€** EC contribution

Implementation

- 48 months**
- 9 Work Packages**
- 10 countries**
- 23 partners**



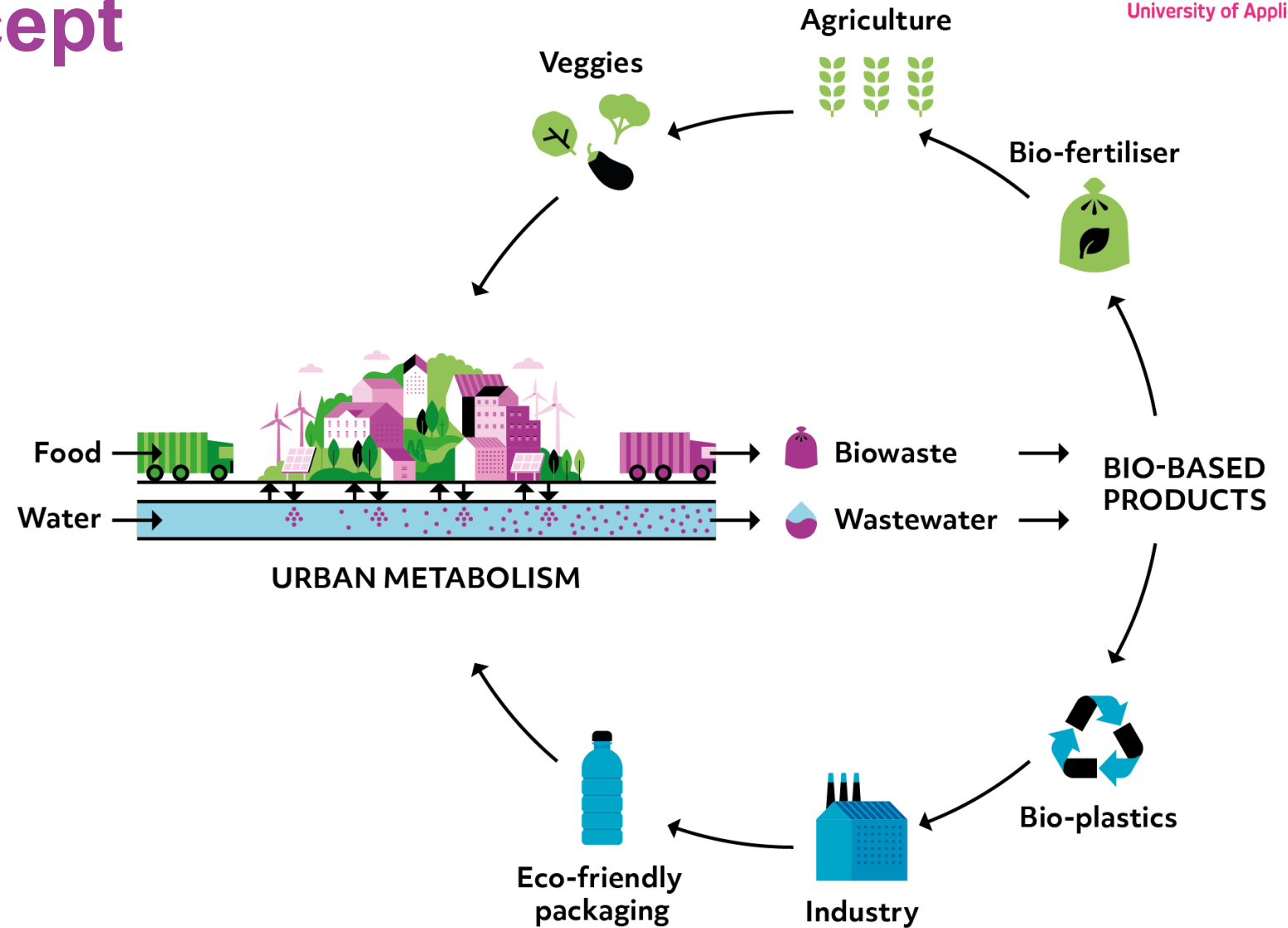
The HOOP portfolio of 15 Bio-based Processes

The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101000836



The HOOP Concept

The **HOOP project** supports **8 lighthouse cities and regions** in developing large-scale **urban circular bioeconomy initiatives** that will focus on making bio-based products from urban biowaste and wastewater.



HOOP 8 Lighthouse Cities & Regions



MURCIA



MÜNSTER



REGION OF WESTERN MACEDONIA



PORTO



ALBANO LAZIO



ALMERE



BERGEN



KUOPIO

HOOP main impacts

- 1. Deliver circular bio-based economy investments** to support the valorisation of urban biowaste and wastewater via bio-based products.
- 2. Create a European network of cities** to facilitate the exchange of good practices and lessons learned to advance the circular economy.
- 3. Increase recycling of urban biowaste and wastewater** to avoid landfilling and reduce the associated greenhouse gas (GHG) emissions.
- 4. Create long-terms jobs** in local economies for recovering valuable resources and for making bio-based products.



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Thank you!

Dr. Harri Auvinen, Research and Development Manager
Bio and Circular Cluster, Savonia UAS 2024

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