GREEN CHEMICALS FROM PYROLYSIS OIL AS WOOD PRESERVATIVE AND ADHESIVES - STEP 2

A Bioinnovation hypothesis testing project

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Green chemicals from pyrolysis oil as wood preservative and adhesives - step 2

- **Introduction and background**
  - non-fossil value chain to green chemicals
  - mainly forest residues (biomaterial)
  - technical feasibility
  - market potential
  - rural development possible (“biorurality”)

- **Bioinnovation** (Vinnova - Sweden's innovation agency, Swedish Energy agency, and Formas Research Council)
  - 4,2MSEK (350 000 €) 2,1MSEK Bioinnovation / 2,1MSEK Private partners
  - Continuation project from step 1 project (0,8MSEK).
  - Start June 2023 end May 2025

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Task and basic concepts

- Hypothesis step 1 project
  - commercial producer of high quality biochar (Envigas AB)
  - find valuable compounds from pyrolysis oil
  - initial university tests of pyrolysis oil
  - initial university tests of compounds as wood protection agent

Promising technical results
Interesting wood mold protection results
Difficult to asses further technical feasability
Difficult to asses market potentials

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Task and basic concepts

- References

Bio-oil valorization: A review. 2013. K. Jacobson, K. C. Maheria and K. Dalai. Renewable and sustainable energy reviews (Elsevier). P. 92-105.

GC/MS Characterisation of liquids generated from low-temperature pyrolysis of wood. 2003. C. Branca, P. Giudicianni and C. Di Blasi. Ind. Eng. Chem. Res.(ACS) 42, 3190-3202.

Production and purification of crystallized levoglucosan from pyrolysis of lignocellulosic biomass. 2019. M. R. Rover, A. Aui, M. Mba Wright, R. G. Smith and R. C. Brown. (2019). Green Chem.(Royal Society of Chemistry), 21, 5980-5989.

Bonding performance of wood bonded with adhesive mixtures composed of phenol-formaldehyde and bio-oil. 2014. G. Ösbay and N Ayrilmis. Industrial crops and products (Elsevier). 66, 68-72.

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Task and basic concepts

- Pre - Hypothesis step 2 project

  - value chain formation – May 2022 to November 2022
  - NDA for accessing step 1 results – presumptive partners
  - addition of chemical companies
  - addition of skills and competence
  - addition of downstream partners for evaluation and and validation
  - addition of competence for LCA

<u>Application March 2023</u>

- Value chain from forest company to paint manufacturer and wooden board producer
- Potential and feasibility of green chemical compounds
- Additive in paint formulations and/or in matrix for wooden boards

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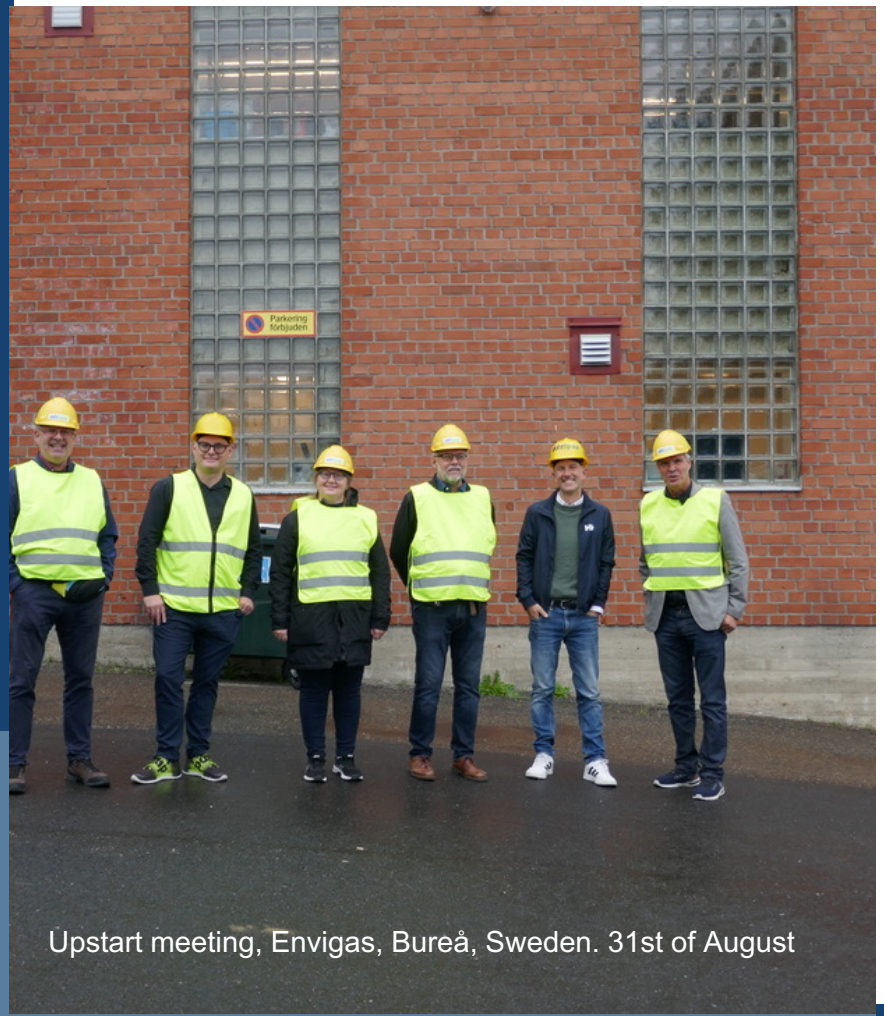

Upstart meeting, Envigas, Bureå, Sweden. 31st of August

The consortium

Holmen AB- forest products company
Envigas AB – biochar producer
Akzo Nobel - glue and chemical producer
Perstorp AB - chemical company
Sherwin Williams AB - paint manufacturer
Byggelit AB – Wooden board manufacturer
RISE Research institute of Sweden
Luleå university of technology

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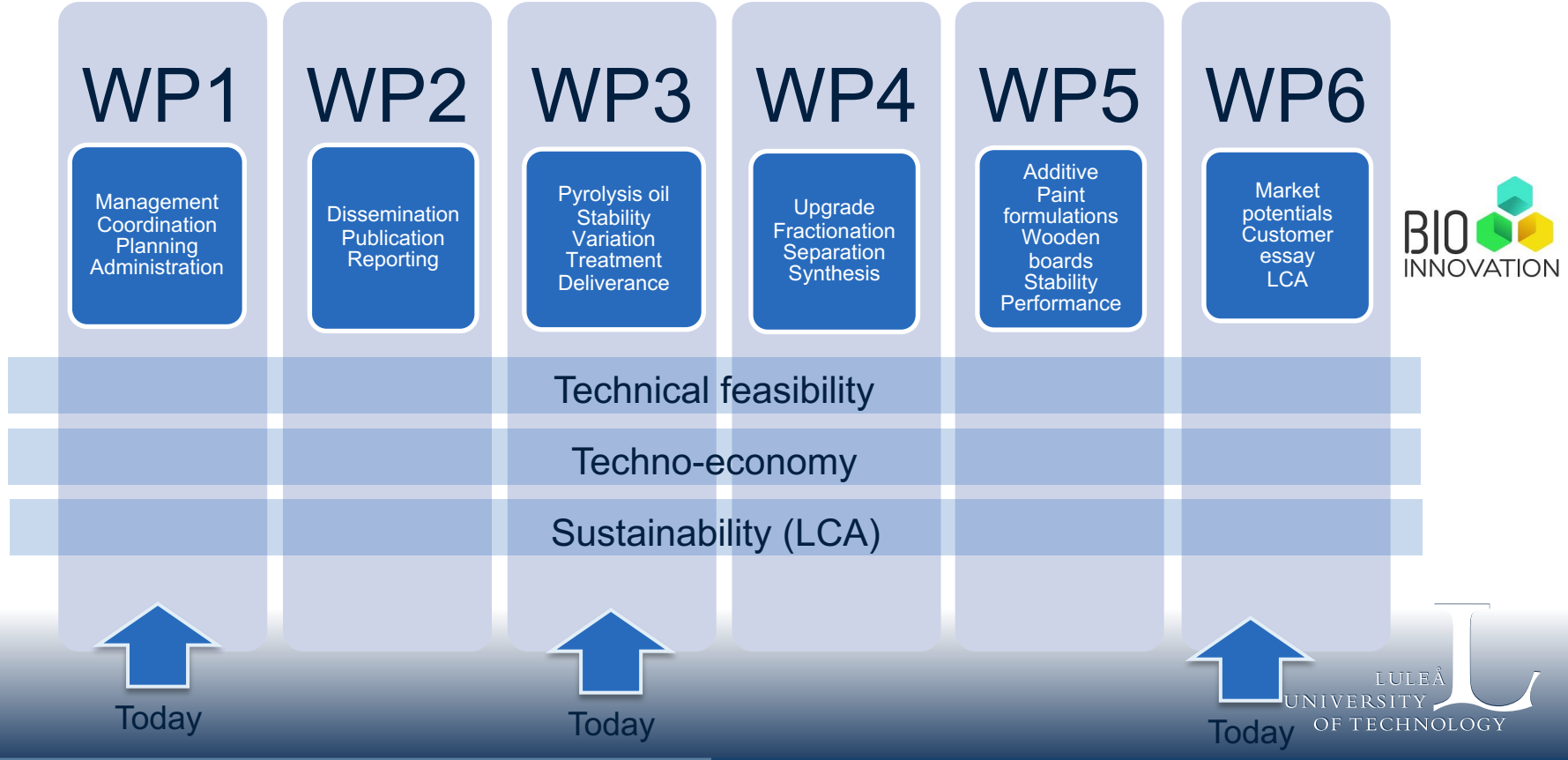
Current project step 2



Operational levels

- TRL Technology readiness level
  3 to 5: Proof of concept **to** validation in relevant environment

- MRL Market readiness level
  1 to 3: Overview of possible market described **to** partnership that verifies unique properties

- SRL Sustainability readiness level
  1 to 3: Hypothesis of contribution to sustainable solutions **to** a systematic sustainable analysis

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Challenges

- Challenges
  - pyrolysis oil stability and variation (biochar plant)
  - effectiveness and economy upgrading (pyrolysis oil to chemicals)
  - suitability of targeted compounds (performance and cost)
  - market need and acceptance (green fee exists?)
  - economy and sustainability of industrial products (function in end products)

- Potential
  - future stable side-stream (pyrolysis oil)
  - huge need for green chemicals
  - increasing need for alternative use of environmentally friendly additives (harder regulations)

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