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Circular Economy in the Danish Furniture Industry

PhD fellow: Aroop Ratan Guha

Supervisors: Camilla Hedegaard Møller & Nicolai de Gier



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Lifestyle & Design Cluster.



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Konservering

PROJECT SUPERVISORS



Camilla Hedegaard Møller

Head of Programme. Associate Professor, PhD,
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Nicolai de Gier

Professor MSO, Head of Programme, Furniture Design - Products,
Materials and Contexts, The Royal Danish Academy

WHO AM I?



Aroop Ratan Guha

PhD Fellow at the Royal Danish Academy, MA
Strategic Design & Entrepreneurship

MY JOURNEY SO FAR



HANDICRAFT WORK



FURNITURE WORK



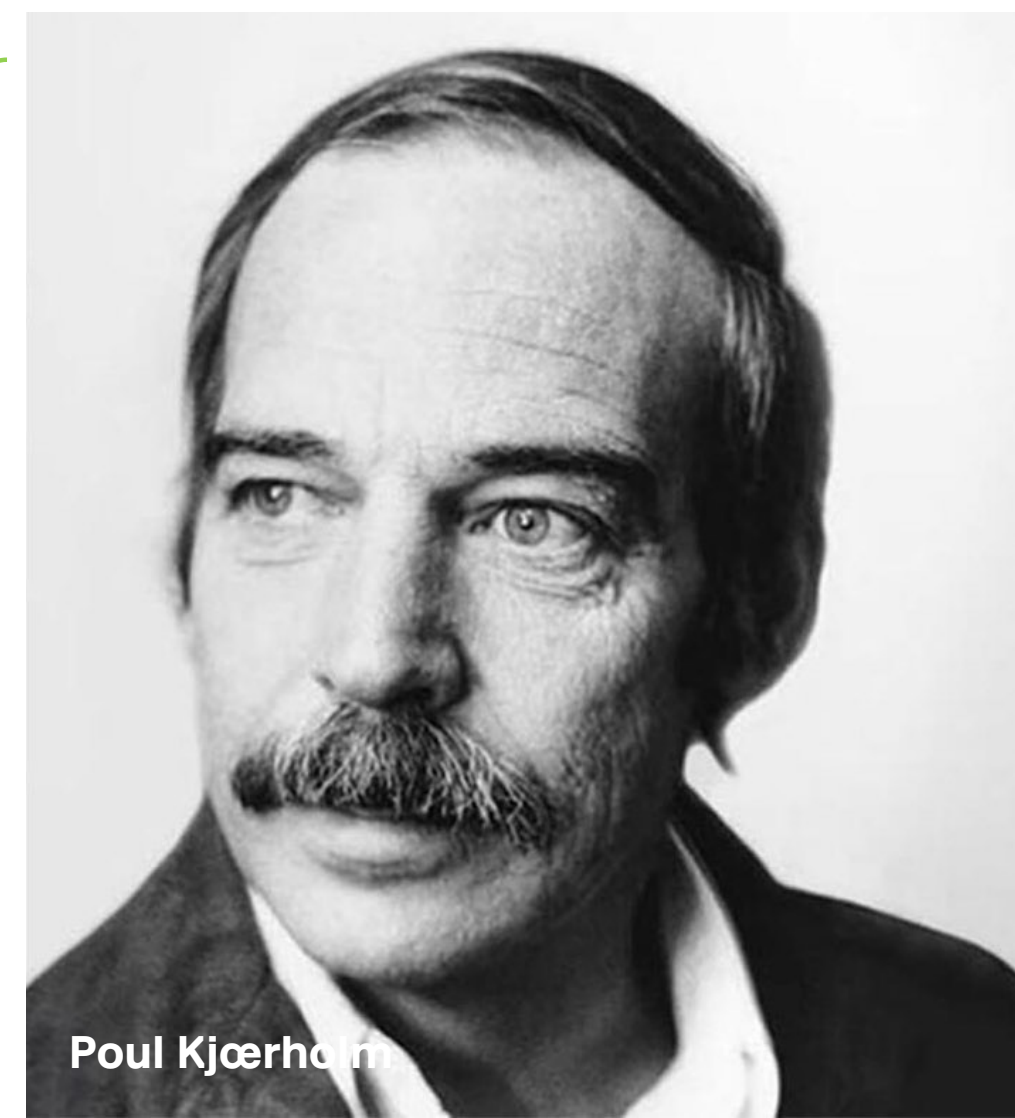
WHY AM I INTERESTED IN DANISH FURNITURE?

**TIME FOR A SHORT;
BUT VERY INTERESTING STORY**

INTERESTING STORY

My teacher's teacher

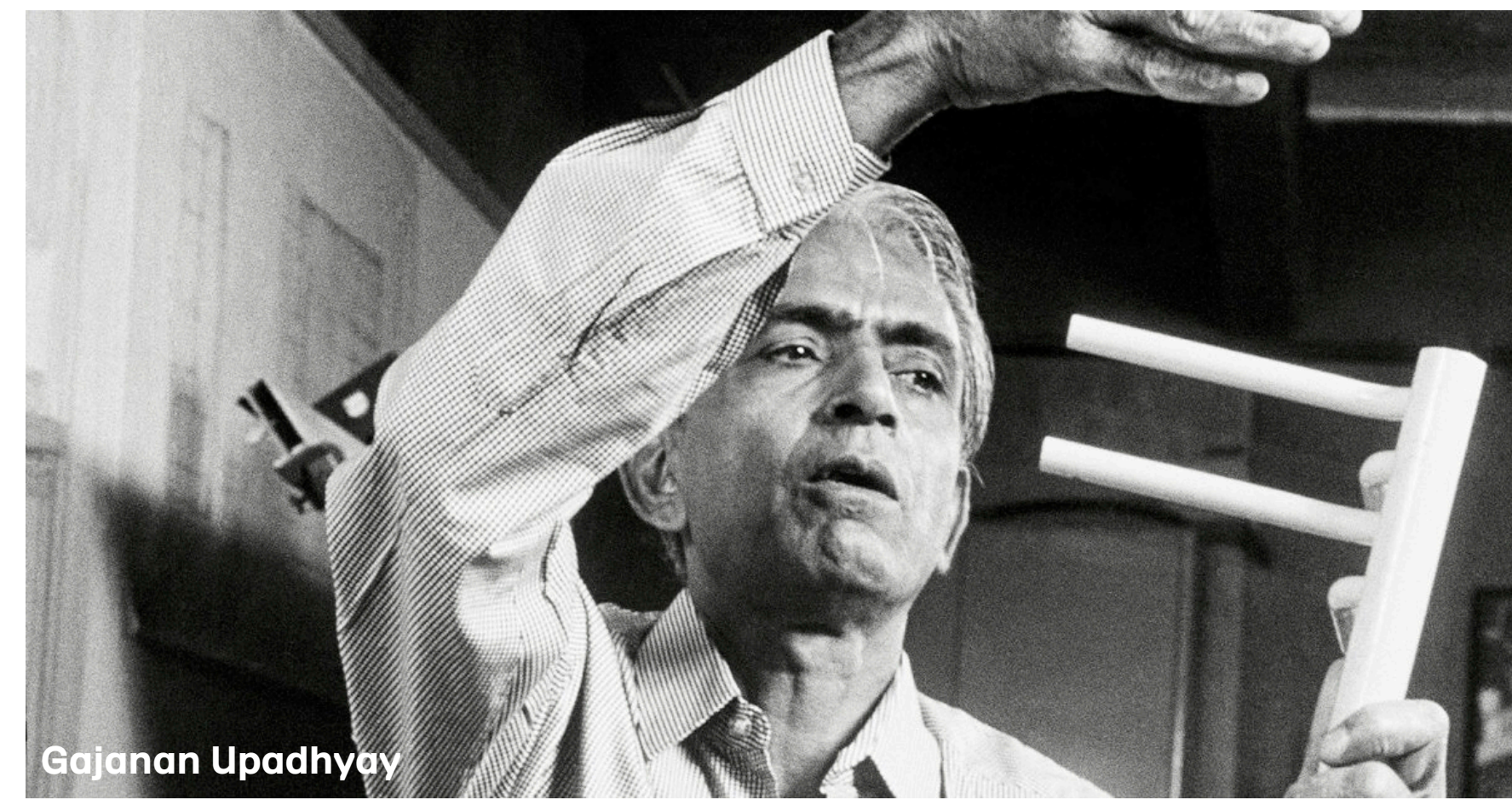
In the 1970s-1980s



Poul Kjørholm

Source: Paustian

My teacher



Gajanan Upadhyay

Source: Phantom Hands

THE PROJECT

Circular Economy in the Danish Furniture Industry

Why this topic?

THE PROJECT

Circular Economy in the Danish Furniture Industry

Why this topic?



THE PROJECT

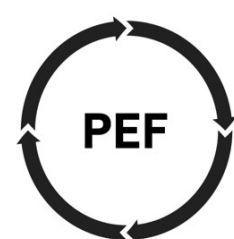
Circular Economy in the Danish Furniture Industry

Why this topic?

- Upcoming EU legislations listed in 'Ecodesign requirements for sustainable products' and it's repercussions for the industry & designers
- How can the industry prepare for that?
- What kind of knowledge is missing?
- The precise EU legislations for furniture are not public yet, it leaves many uncertainties



DIGITAL PRODUCT PASSPORT (DPP)



PRODUCT ENVIRONMENTAL FOOTPRINT (PEF), LCA METHOD



Source (left to right): European Union, 2024 ([https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI\(2022\)733524](https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2022)733524)); European Commission, 2024 (https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/sustainable-products/ecodesign-sustainable-products-regulation_en)

THE PROJECT

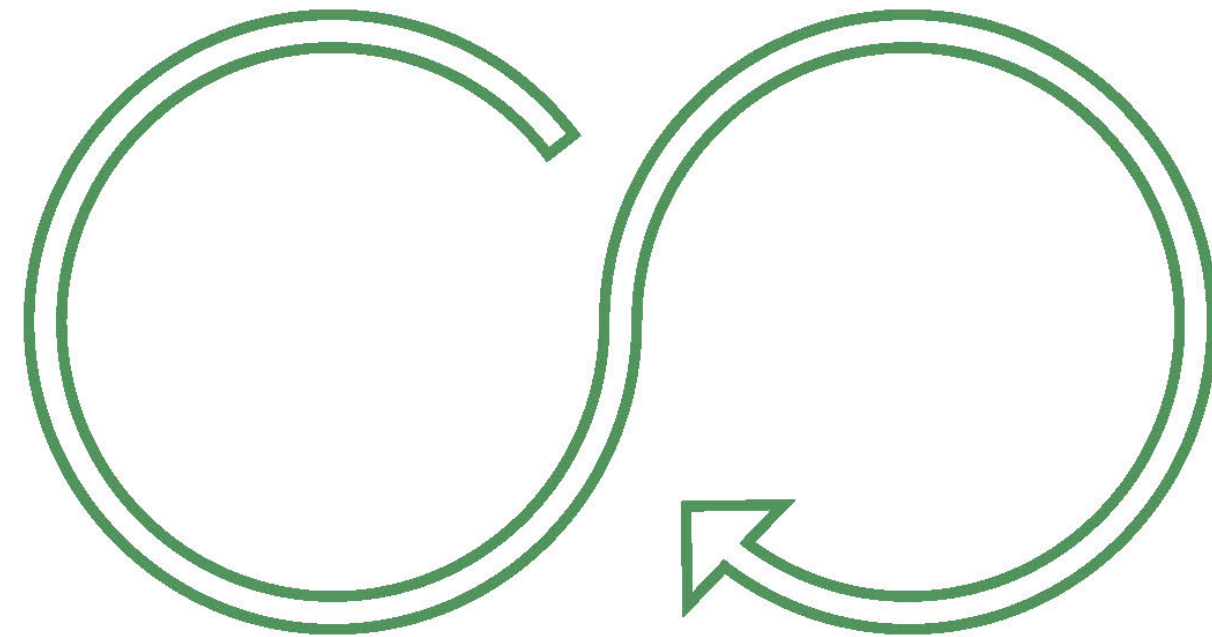
Our objectives

- Publish research-based findings on circularity, barriers, and potentials in relation to the Danish Furniture Industry and the future role of the furniture designer.
- Communicate the research to the industry, professional furniture designers and design students through international and Danish publications.
- Bringing together actors from various sectors and professions in value creating activities (such as workshops, design sprints, webinars etc.)

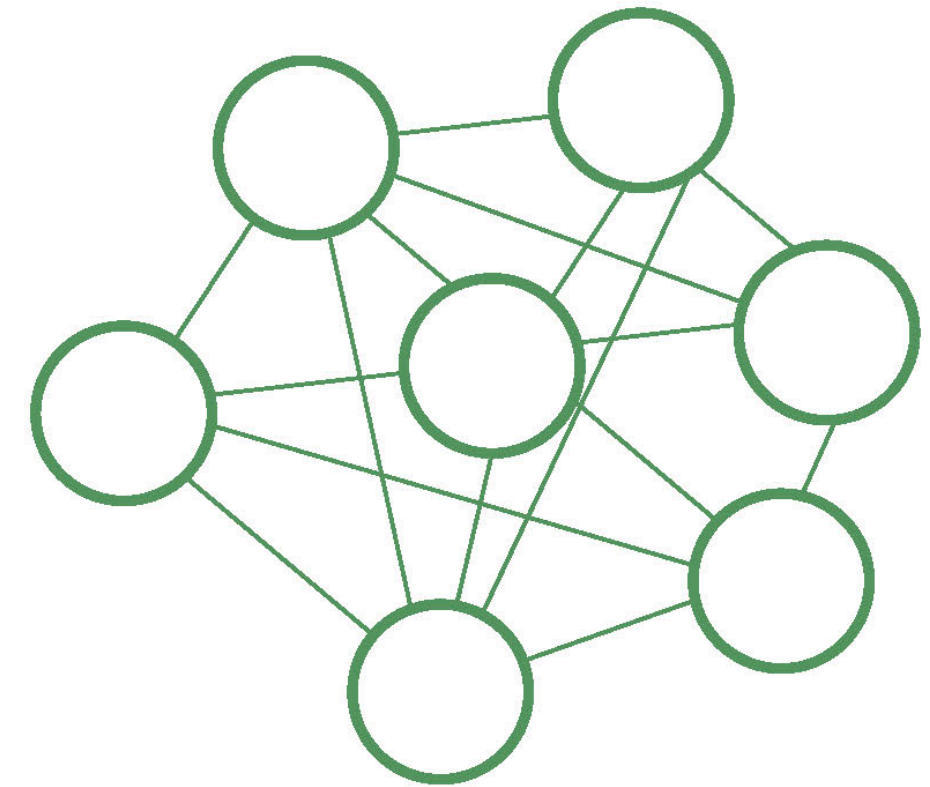
RESEARCH METHODS

- Desktop research
- Qualitative and Empirical research
- Collaborative processes and practices
- Dissemination

THEORETICAL FRAMEWORK



Circular Economy



Actor-Network Theory

WHAT'S PLANNED



Spring

Work Package 1. The Danish Furniture Industry. Data Collection

Booklet 1 - Stakeholders in the industry.

Spring

Work Package 3. Furniture Design Practices

Booklet 2

Research Paper 2

Spring

Work Package 5: Circular Furniture Design. Experiments and analysis

Booklet 5

Fall

Work Package 2. Circular Economy

Project on LCA

Research Paper 1

Fall

Work Package 4: New Materials & EU Legislations for Furniture

Booklet 3

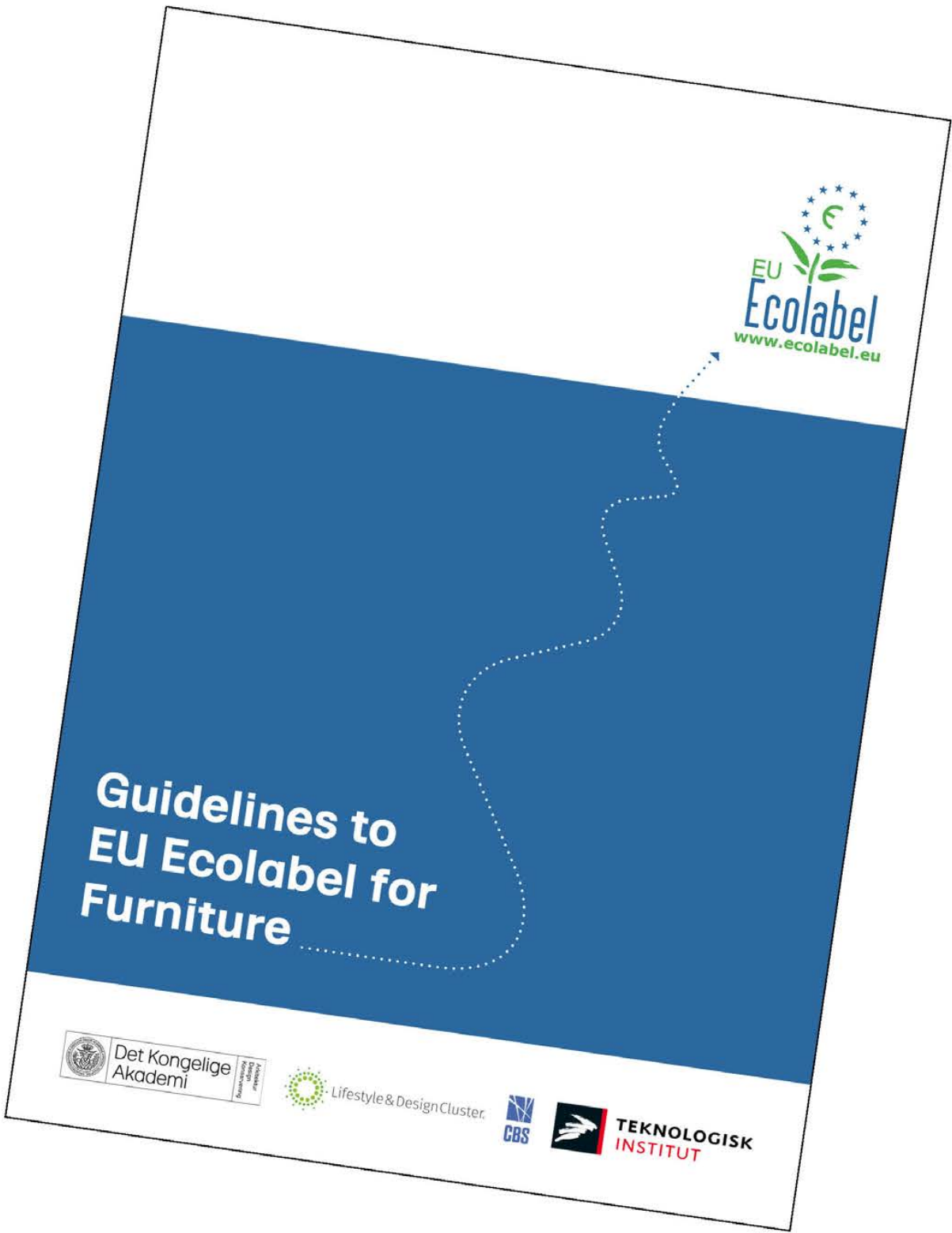
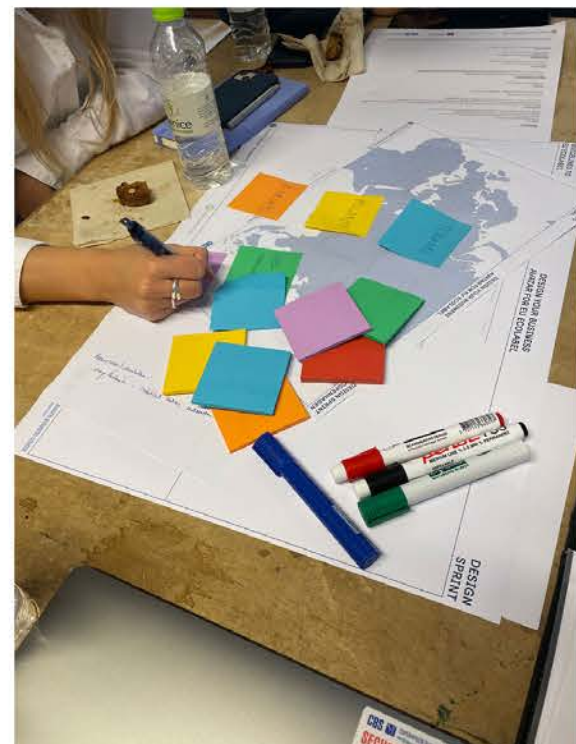
Research Paper 3

Fall

Work Package 6: Finalizing & Communication

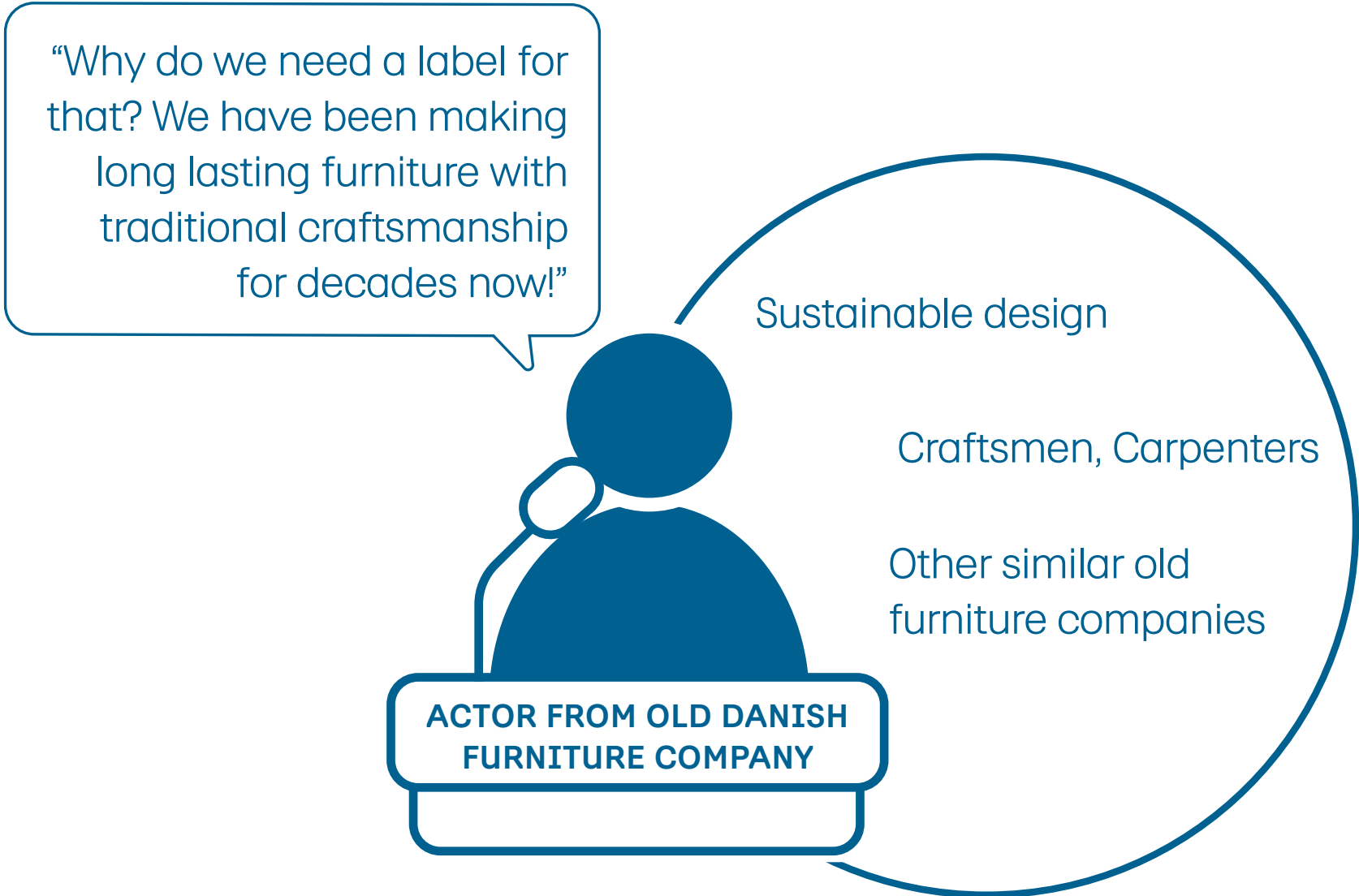
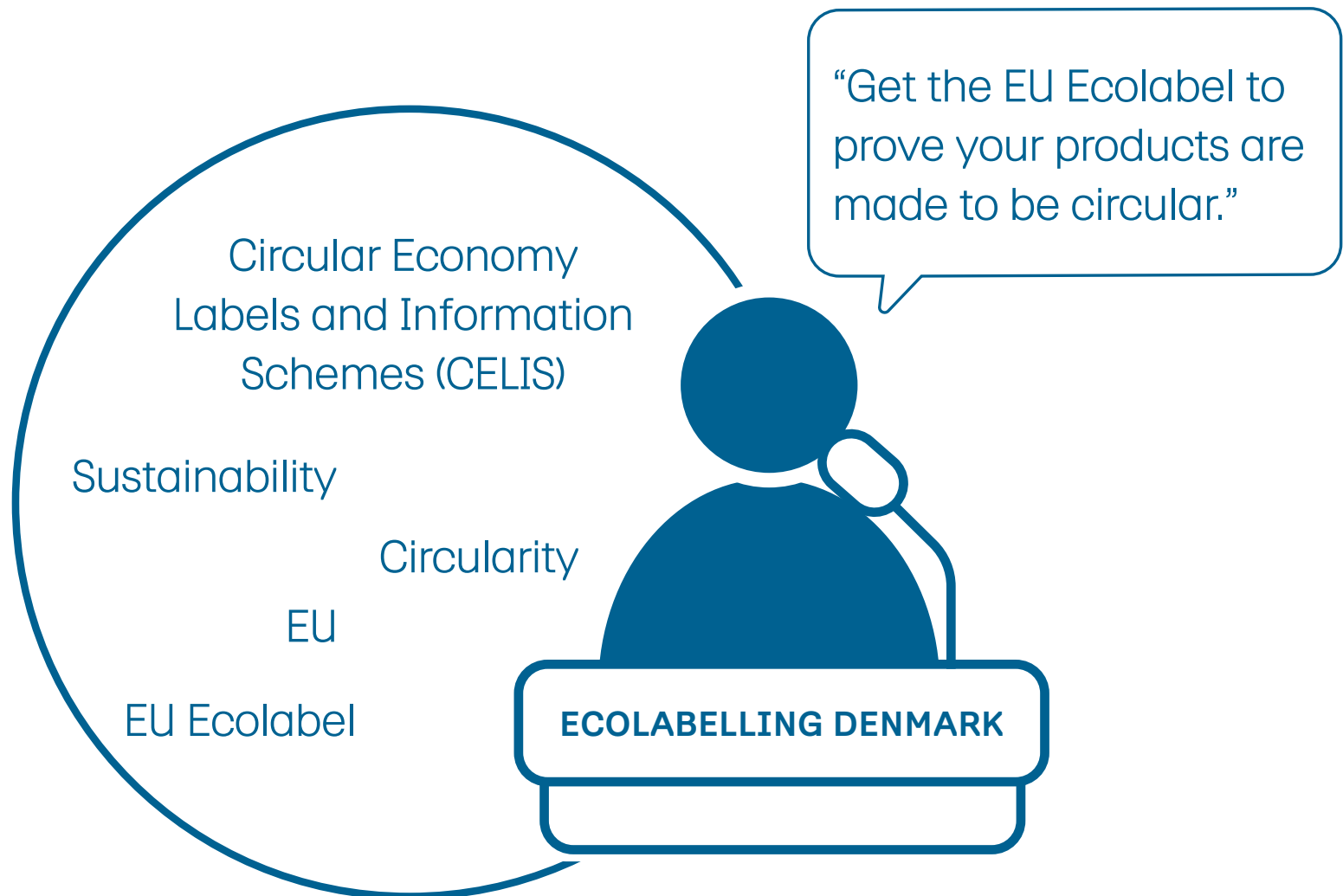
PhD Thesis

PROGRESS THUS FAR



- Project on making a guidelines for 'EU Ecolabel for furniture'. Fall 2023.
- Participants: Danish furniture companies & students from SDE.

PROGRESS THUS FAR

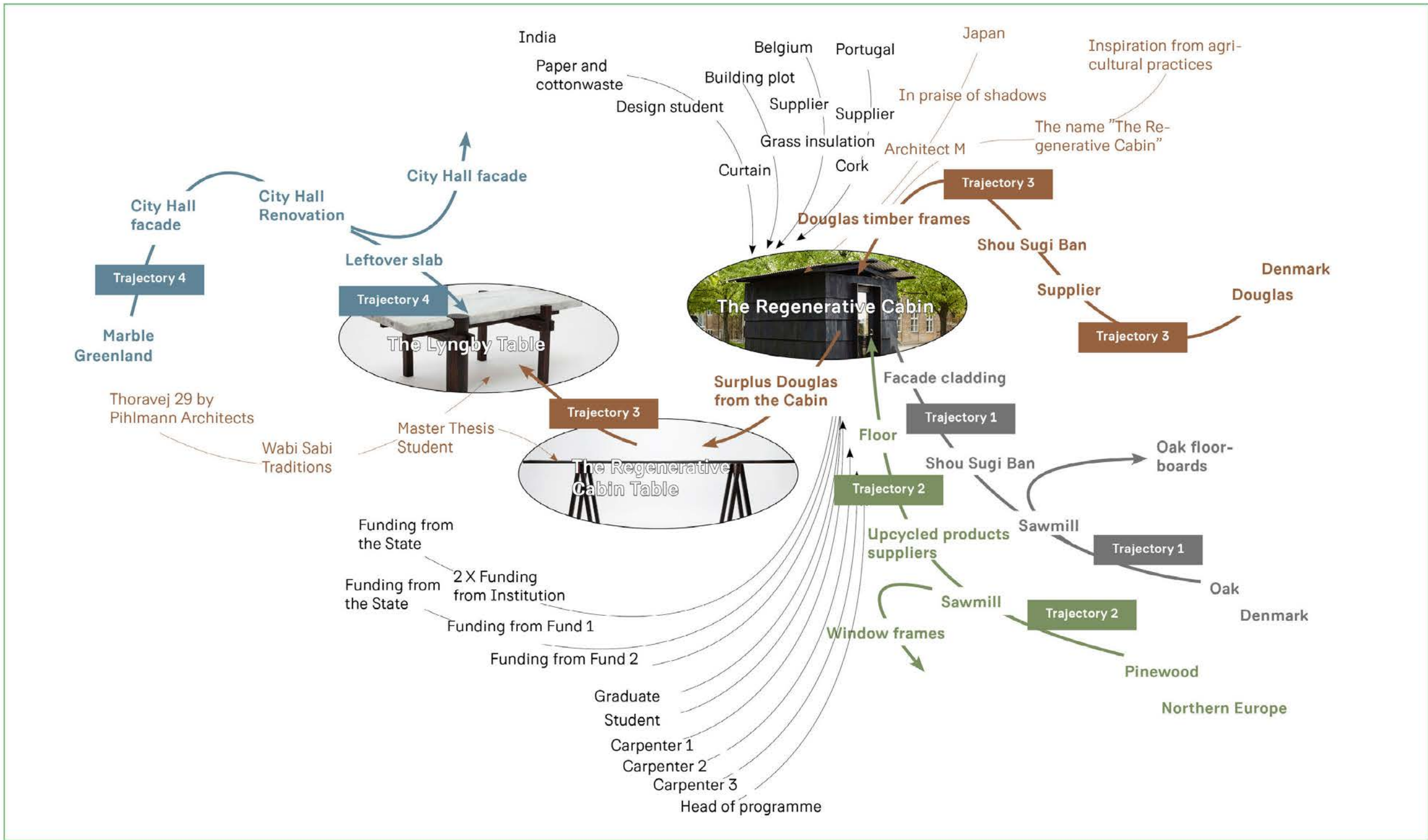


PROGRESS THUS FAR



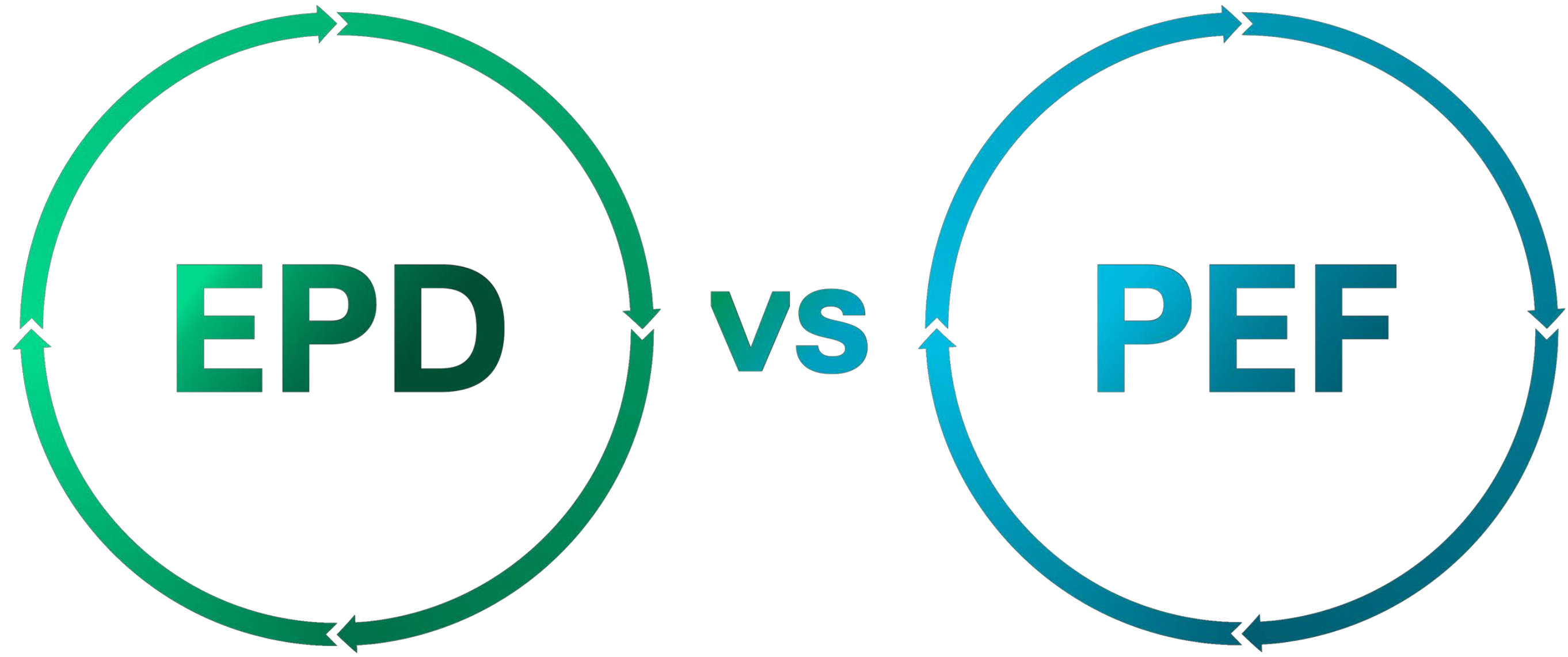
- Paper presentation titled ‘Notions of the EU Ecolabel in the Danish Furniture Industry’ in Valencia, Spain.
- Paper based on observations from the activities and interactions with industry partners from the project ‘Guidelines to the EU Ecolabel for furniture’.

PROGRESS THUS FAR



- Paper titled : Where Architecture & Furniture Design Overlap in Terms of Circularity : A Cross-Disciplinary Field
- Analysing the codependencies the fields of architecture and frurniture can have in terms of CE.

WHAT WE ARE WORKING ON NOW



Lifecycle Analysis for Furniture:
Environmental Product Declaration (EPD) methodology vs Product Environmental Footprint (PEF) methodology



WHAT WE ARE WORKING ON NOW

An engaging way to learn about LCA; EPD & PEF

Player sheet

Good to know & Need

Crucial steps in a LCA study

- Define the Goal and Scope:** Clearly outline the purpose of the PEF/EPD study, specifying intended applications, intended audiences, the reasons for conducting the study, and the boundaries of the study. Define the functional unit to be compared, the scope of the study, and the stages and environmental aspects included in the analysis.
- Develop the Life Cycle Inventory:** Collect and document material and energy flows, waste, and emissions for each stage of the product's life cycle, from raw material extraction (including background) to end-of-life (EL). Use both primary (company-specific) and secondary (EF-compliant) data where possible. Secondary data should be of a similar quality to the primary data. The phase is iterative. Additional data collection and refinement may be required.

Life-Cycle Analysis (LCA) is a process of evaluating the effects that a product has on the environment over the entire period of its life, from raw material extraction through production, distribution, use, and disposal. (European Environment Agency).

There are different stages in a product's life cycle as seen in Fig. 1. Cradle-to-gate assessment considers impacts at each stage of a product's life cycle, from the time a product's resources are processed from the ground and subsequent stage of manufacturing, transportation, product use, and ultimately disposal.

LCA is defined by ISO 14040.

Environmental Product Declaration (EPD) for furniture

EPD is not a certification or an ecolabel, rather it is a declaration for the communicating information regarding energy, resource consumption and the environmental impacts arising from the manufacture, use, and disposal of a product. (source: EPD Danmark)

Overview of getting a PEF

- Check for internal resources and external experts
- Check for existing PEFCR
- Carry out PEF based on general PEF method (no PEFCR)
- Verification and validation

Overview of getting an EPD

- Check for internal resources and external experts
- Check for existing PEFCR
- Carry out PEF based on general PEF method (no PEFCR)
- Verification and validation

Player 01 (Your role)

Player 03 (Your role)

How to play the WHEEL OF FOOTPRINTS

Step 01: Gather - Welcome to Wheel of Footprints! Bring together your team. Up to 4-5 players—ideally a mix of designers, engineers, and product compliance managers. Each role brings a unique LCA, EPD and PEF perspective. To make the most out of playing the 'Wheel of Fortune' we suggest helping your team learn together and understand LCA, EPD and PEF together.

Step 02: Read - Once you have read the sheets and have an overview of LCA, EPD and PEF, it is time to designate players roles. Use the player sheet for this. Roles to choose from: Designer, Engineer, Compliance manager & Sales person. It doesn't matter what your actual roles in the company are for this exercise. Using the company's portfolio in the center circle, put the furniture from your various value chain members with your circle. Based on your roles, list down documents that you will have to collect in the forms of data sheets or existing EPDs/PEFs from your suppliers who will need to gather for your LCA. These are documents in the forms of data sheets or existing EPDs/PEFs from your suppliers who will need to gather for your LCA. Write in the white area or use post-its. Once you have gathered these documents, please bring them to the center circle.

Step 03: Play - You will have to collect in the forms of data sheets or existing EPDs/PEFs from your suppliers who will need to gather for your LCA. Write in the white area or use post-its. Once you have gathered these documents, please bring them to the center circle.

Glossary

- Program Operator (Only for EPDs and PEFs):** A program operator is the administrative unit that handles the publication of EPDs and ensures that they meet the requirements set out in the standards ISO 14025 and EN 15804. The program operator also ensures that data is independently verified. An EPD is not valid until it has been verified according to the requirements of ISO 14025.
- PEFCR (Only for PEFs and EPDs):** Product Environmental Footprint Category Rules (PEFCRs) are specific guidelines developed within the Product Environmental Footprint (PEF) framework to ensure consistent and comparable environmental assessments across different product categories by listing detailed instructions on how to perform PEF studies for particular types of products, taking into account the unique environmental impacts and life cycle processes relevant to each category.
- Life Cycle Inventory (LCI):** LCI is a key phase in Life Cycle Assessment (LCA) that involves collecting and quantifying all inputs and outputs associated with a product or service throughout its life cycle. This phase aims to compile a comprehensive dataset that covers materials, energy, emissions, and waste across each stage of the products' life—from raw material extraction to manufacturing, distribution, use, and disposal.
- Life Cycle Impact Assessment (LCIA):** LCIA is the phase in Life Cycle Assessment (LCA) that takes the data from the Life Cycle Inventory (LCI) and translates it into environmental impacts. LCIA is designed to assess the significance of the inventory data in terms of potential impacts on the environment and human health, offering insight into the products or services' overall ecological footprint.

Environmental Product Declaration (EPD) for furniture

EN 15804, Environmental reporting for mainly B2B	Product Environmental Footprint (PEF)
ISO 14025, Environmental reporting for mainly B2C	Product Environmental Declaration (EPD)
ISO 14025, Environmental reporting for mainly B2C	Product Environmental Declaration (EPD)

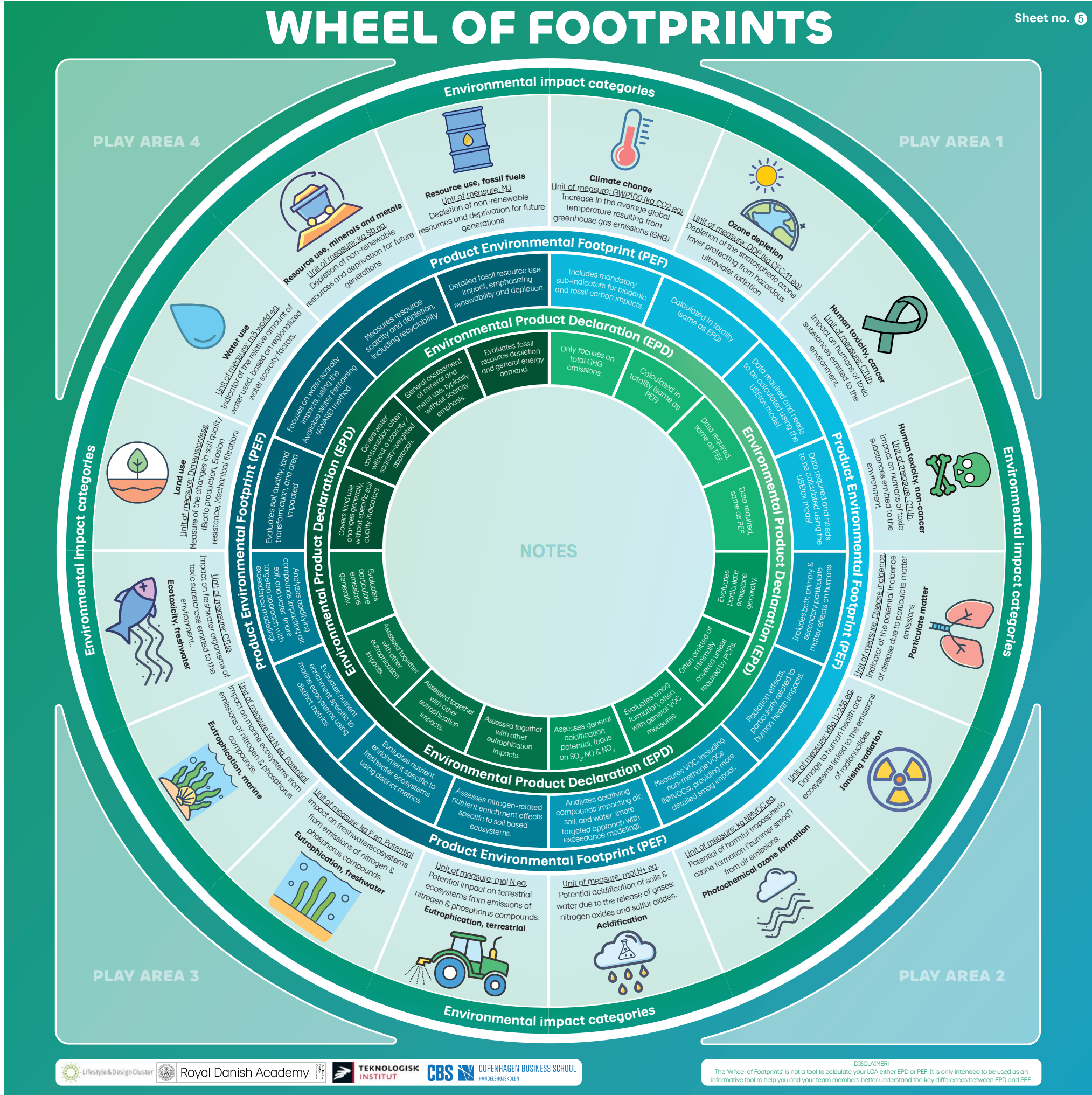
Sensitivity analysis

Lower requirements for data quality	Required
Required	Required
Higher requirements for data quality	Required

Uncertainty analysis

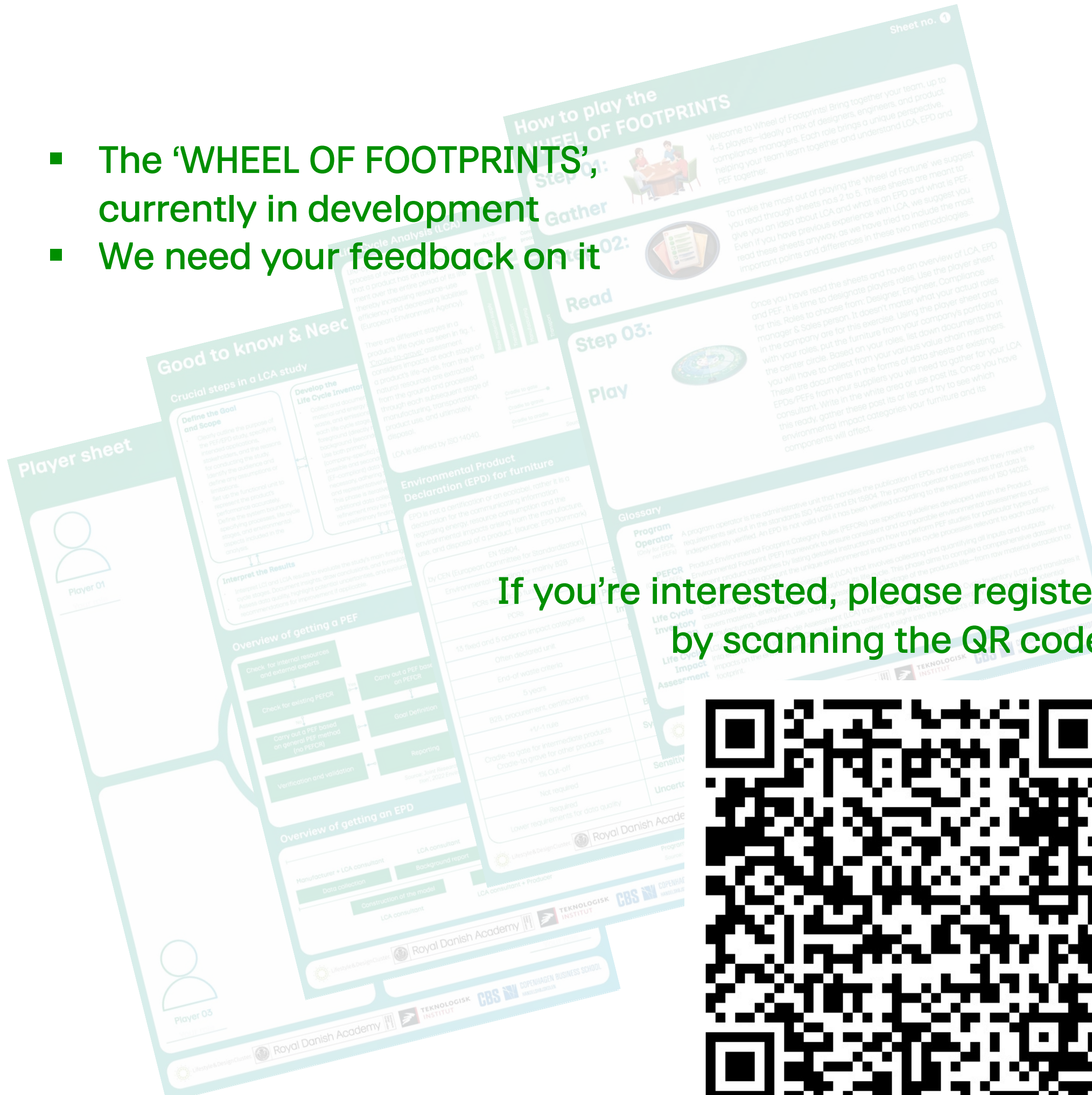
Lower requirements for data quality	Required
Required	Required
Higher requirements for data quality	Required

Logos: Lifestyle & Design Cluster, Royal Danish Academy, TEKNOLOGISK INSTITUT, CBS, COPENHAGEN BUSINESS SCHOOL, HANDELSHØJSKOLEN.

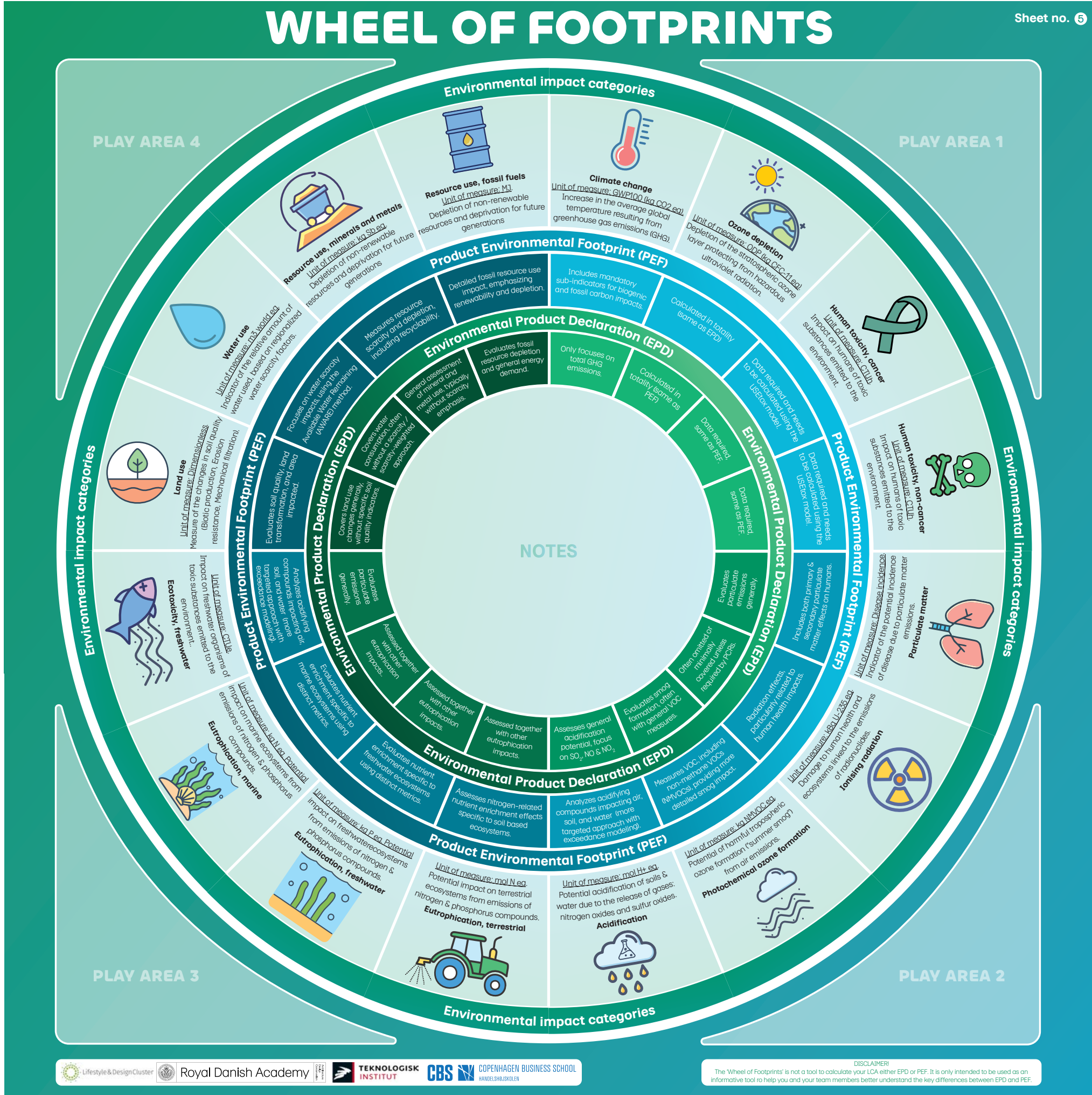


WHAT WE ARE WORKING ON NOW

- The 'WHEEL OF FOOTPRINTS', currently in development
- We need your feedback on it



If you're interested, please register by scanning the QR code



QUESTIONS?

If you're interested, please register
by scanning the QR code



Please feel free to reach out.
Email: aguh@kglakademi.dk