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Adopting Circular Economy Principles in Public Transport

NAVIGATE MOBILITY SUMMIT

26th September 2024, Prague

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WHY DO WE NEED TO SHIFT TO CIRCULAR ECONOMY IN TRANSPORT?

The road transport sector is energy-intensive

- The most significant energy consumer in the European Union – about **33%** in 2019

Transport is resource-intensive

- Roughly **12%** of steel produced worldwide
- Approx **70%** of natural rubber production worldwide
- Approx **23%** of aluminium worldwide

The increasing trend to e-mobility - especially private - will demand more energy, raw materials and critical raw materials

- **10%** expected demand energy increase (in the EU) compared to 2018
- **60%** lithium, **30%** cobalt, **10%** nickel just for EV batteries worldwide
- Demand is expected to be **5 -10** times higher compared to 2018

The transport sector is carbon-intensive

Responsible for as much as **25%** of total EU GHG emissions

A journey to carbon neutrality in transport demands a modal, awareness and production-consumption patterns shift

WHY CIRCULAR ECONOMY IN PUBLIC TRANSPORT?

Public transport is called upon to be the backbone of sustainable mobility systems

- Genarally, **a modal shift** to public transport can **cut back tailpipe emissions** (scope 1) by **50-70 %**
- Further significant reductions can be achieved by **shifting to renewable energy** (scope 2) and by **addressing emissions along the whole value chain** (scope 3)
- Just as with electrification and automation, **Public Transport is a pioneer and leads by example as concerns the incorporation of circularity principles.** It is thus at the **forefront of innovation and experimentation** that leads to general **policy and market transformation**

How could circularity in public transport look like in a nutshell referring to more circular use of:

VEHICLES, ENERGY and INFRASTRUCTURE

INITIAL LIFE CYCLE STAGE

In circular public transport systems, **avoidance** is paramount, aiming **to minimize unnecessary resource extraction**. Thus, **refrain** and **resign** from using if you can, i.e. don't use if you don't have to, use only as much as you need **= USE LESS**

MIDDLE LIFE CYCLE STAGE

Once resources enter the value chain, **extension** principles are employed to **maximise their lifespan**. Make most what you already have, use more efficiently eg. maintain well and deploy vehicles as long as possible = **USE MORE**

FINAL LIFE CYCLE STAGE

Finally, when resources can no longer fulfil their initially intended basic function, **transformation** come into play, allowing end-of-life resources to be processed and reintegrated back into the value chain, whether for their original use or a new purpose. **= USE AGAIN**

A CROSS-CUTTING PRINCIPLE - ENABLE

Enabling principles support this framework by **fostering a conducive regulatory and strategic environment**, encouraging collaboration and behavioural shifts, and building the necessary knowledge and capabilities to install circularity throughout the whole value cycle.

But how do we incorporate circularity in public transport?

The circularity compass is a **cradle-to-grave** concept framework that supports incorporating the circular mindset, principles, and solutions throughout the public transport value chain.

From **“take-use-throw“** to “**Avoid-extend-transform-enable“**

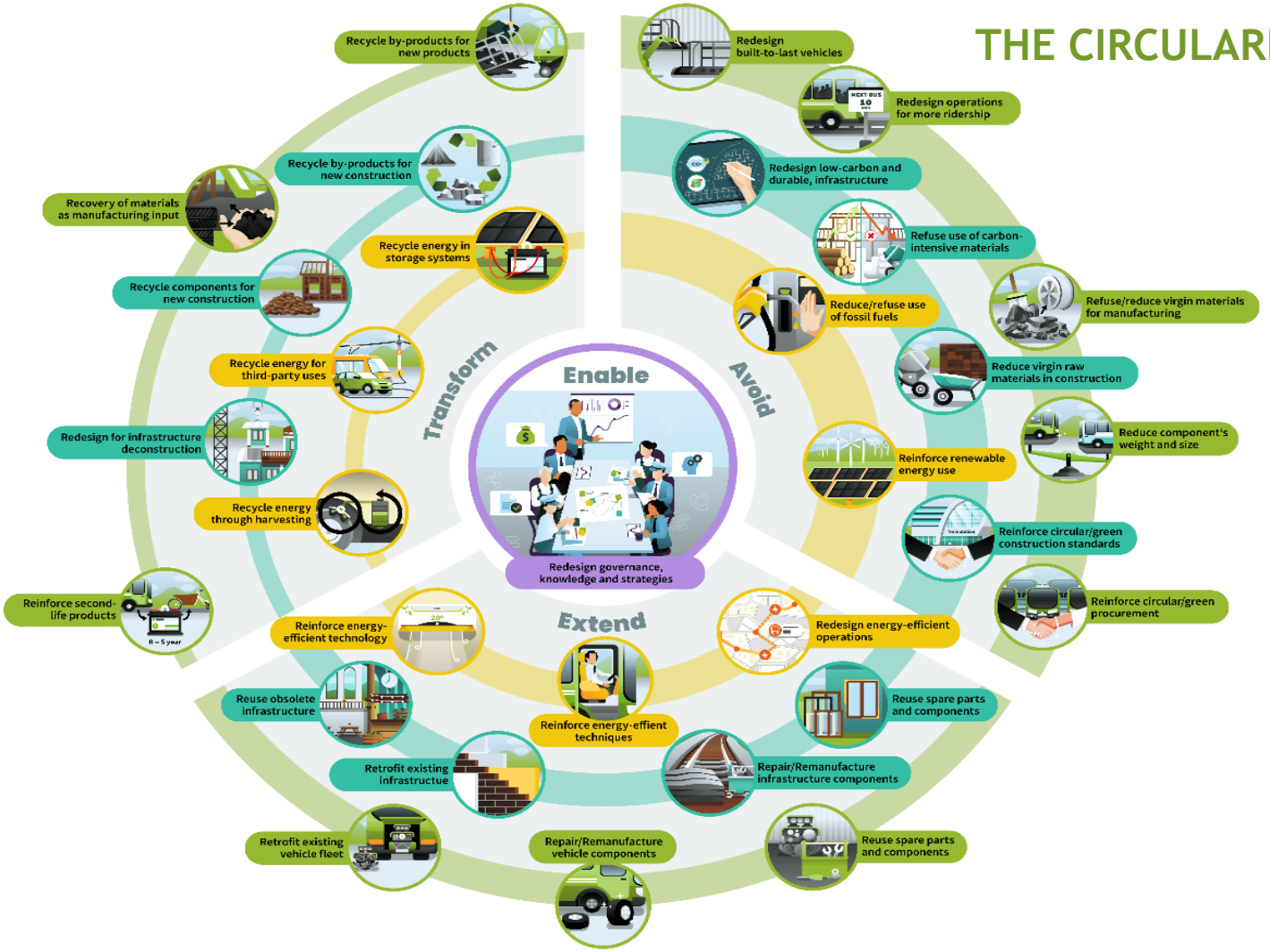
Avoid: Design and optimize systems to prevent unnecessary extraction or generation of raw materials and resources.

Extend: Maximize product or component lifespan, promoting reuse to delay replacements and associated resource consumption.

Transform: Process end-of-life materials or components to either restore them to their original state or repurpose them for other uses.

Enable (cross-cutting): conducive policy frameworks, knowledge and skills, and stakeholders' buy-in, paving the way for actions throughout the value cycle

THE CIRCULARITY COMPASS



Order of priority

High

Low

- **Refuse:** prevent raw materials use
- **Reduce:** decrease raw materials use
- **Renew:** redesign product in view of circularity
- **Re-use:** use product again (second hand)
- **Repair:** maintain and repair product
- **Refurbish:** revive product
- **Remanufacture:** make new product from second hand
- **Re-purpose:** re-use product but with other function
- **Recycle:** salvage material streams with highest possible value
- **Recover:** incinerate waste with energy recovery

THE CIRCULARITY COMPASS

Circularity self assesment

Simplified entry point for mass public transport agencies (TAs) and operators (PTOs) to evaluate their status of integrating circular economy principles, practices, and approaches in their public transport activities.

It reflects not only their direct activities but also their impact along the entire value chain.

Seven independent building blocks, each comprising 10 to 20 questions. Upon section completion, respondents are directed to **the results page**, which provides a summary of the answers, an overall score, and a three-tiered circularity level framework (low, moderate, high)

A stepping-stone toward more detailed evaluations.

Link to the survey in Qualtrics:
https://qeurope.eu.qualtrics.com/jfe/form/SV_4YsotiBK9sDQ6fc
Link to the survey in pdf: Circularity self assesment

Circularity factsheet

- Underlines the importance of incorporating circularity in public transport
- Outlines a vision, approach, and principles for incorporating circularity in public transport, considering the whole transport value cycle.
- Proposes key areas for analysis and action
- Provides an overview of the status of circularity of public transport systems and potential pathways for advancement.

6-10 pages document

THE CIRCULARITY COMPASS

Four building blocks

Vehicles

Self-propelled machines are designed to carry passengers between different locations (buses, trolleybuses, trams, and trains).

Circular vehicles are equipped with energy-efficient technologies and alternative propulsion systems, and are designed for durability, repairability, and recyclability.

Subcategories

- Vehicles
- Batteries

Infrastructure

Underlying system of built and fixed structures, installations and facilities that support public transport operational activities.

Circular infrastructures maximise resource efficiency, prioritize the use, reuse, and recovery of low-carbon and high-quality materials, and are designed for durability and disassembly.

Subcategories

- Railway infrastructure
- Electric Infrastructure
- Buildings

Energy

Fuels (with a particular emphasis on electricity) employed to generate the power, heat, or electricity essential for conducting public transportation activities and operations.

Circular public transport systems are powered by renewable energy, and their use is optimized throughout the lifecycle of processes and operations.

Governance

System of policies, structures, processes, institutions, and mechanisms that guide decision-making, promote stakeholder management and facilitate the transition to a circular economic model.

This section encompasses multi-level policy and planning, knowledge and collaboration, monitoring and evaluation and funding and financing.

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The CE4CE KNOWLEDGE PLATFORM

CE4CE PUBLIC TRANSPORT CIRCULARITY KNOWLEDGE PLATFORM

Objective:

1. To identify and represent the skills and knowledge required for the successful introduction and implementation of circular economy principles in public transport (PT)
2. To increase knowledge and capacities of stakeholders in public transport to identify circularity gaps
3. To provide tools to close these gaps in own organizations through co-creation (circularity compass) and training

Target groups:

- all PT life-cycle actors
- decision takers
- general public

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Circular economy in public transport

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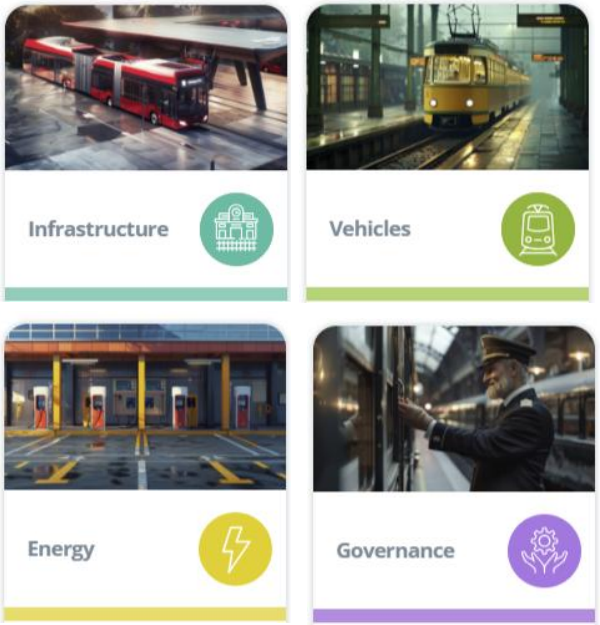
The transition to a circular economy = a transformation that impacts employment



Governance & policy

- Circular business models
- Stakeholder engagement
- Policy & regulation
- …

Competence areas

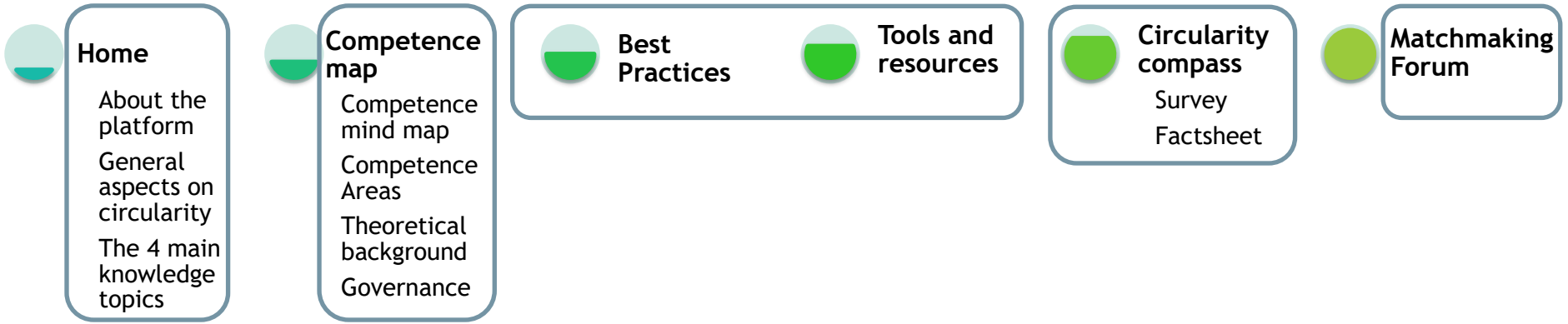
- Avoid
- Extend
- Transform

Circular economy knowledge

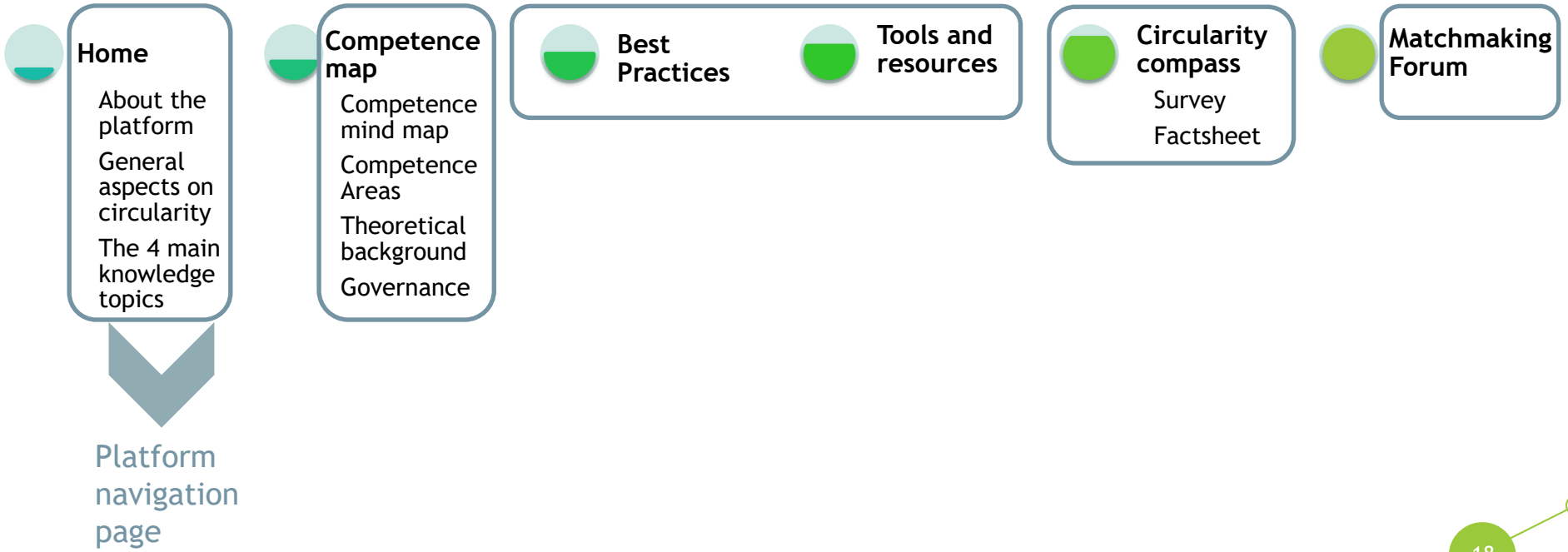
Theoretical background

- Circular economy
- Sustainability
- Systems & design thinking
- …

CIRCULARITY KNOWLEDGE PLATFORM



CIRCULARITY KNOWLEDGE PLATFORM



CIRCULARITY KNOWLEDGE PLATFORM

LINK: https://circularity4publictransport.eu/

Platform navigation page

Skills map matched with knowledge: best practices, tools and resources.

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Platform navigation page

Skills map matched with knowledge: best practices, tools and resources.

Organised by:

1. Competence area (vehicles, infrastructure, energy)
2. Resource type
3. Country

CIRCULARITY KNOWLEDGE PLATFORM

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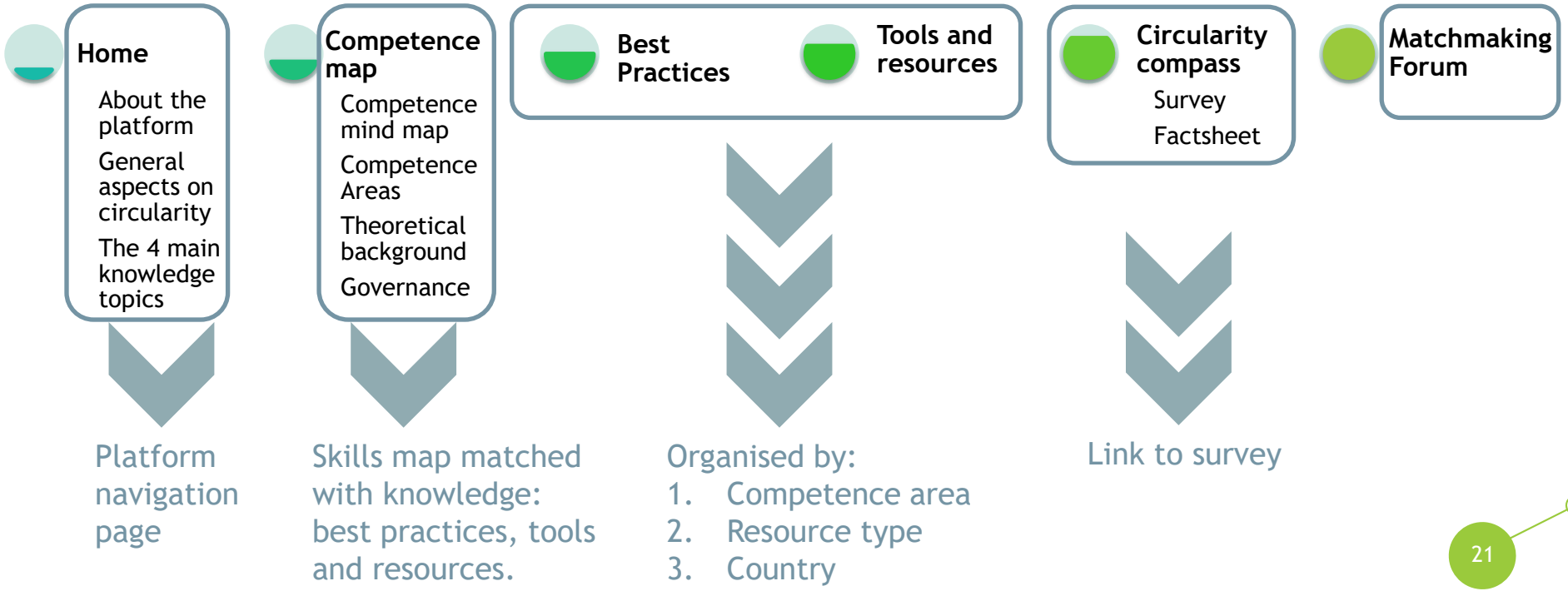
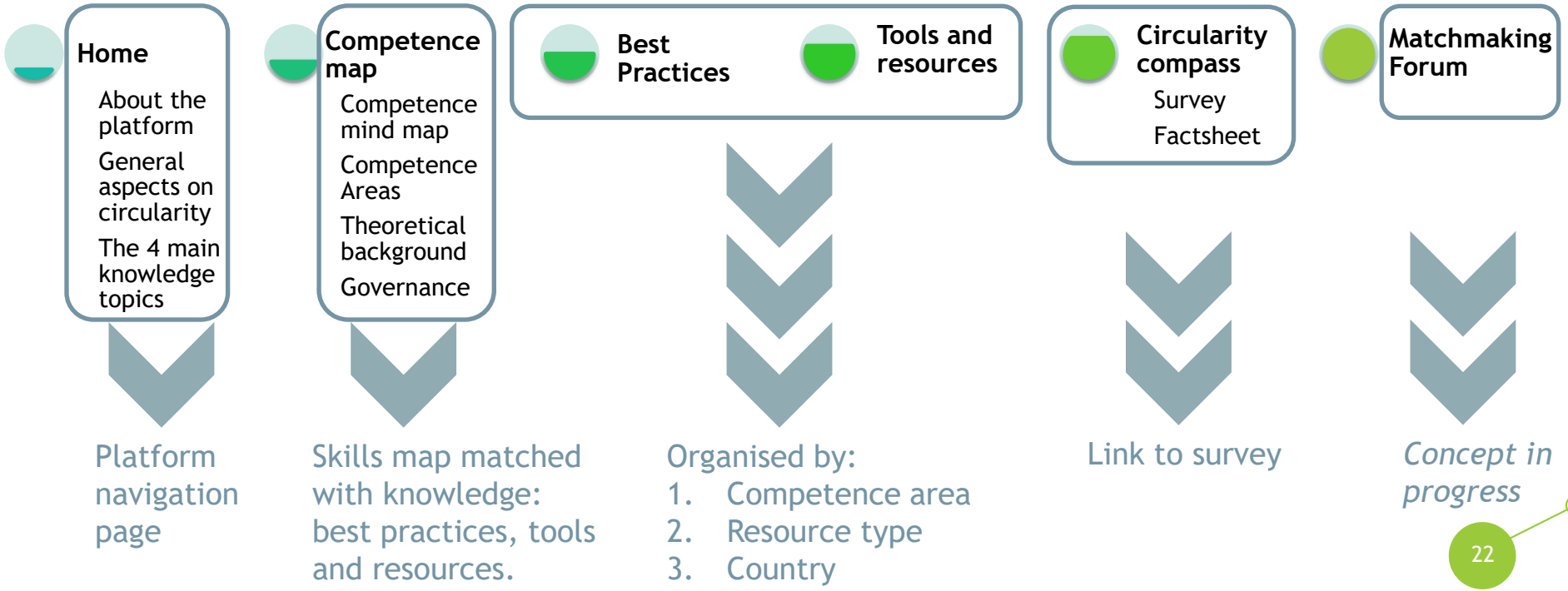


CIRCULARITY KNOWLEDGE PLATFORM



CIRCULARITY KNOWLEDGE PLATFORM

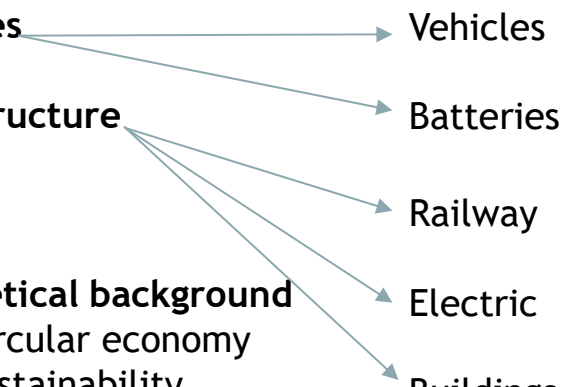
Organisation of best practices, tools and resources

Resource type:

- Guideline
- Tool
- Method
- Software
- Online training
- Best practice
- Report
- Study
- Other

Competence areas:

- **Vehicles**
- **Infrastructure**
- **Energy**
- **Theoretical background**
  - Circular economy
  - Sustainability
  - Design & systems thinking
- **Governance**
  - Policy & regulation
  - Green finance & economics
  - Circular business models
  - Participative project management
  - Stakeholder engagement
  - Communication




GALERIA
MEBLI

CONFERENCE
„Horizon 2030 – ZERO-EMISSION BUS SYSTEMS AS THE BACKBONE OF CLIMATE-NEUTRAL CITIES"

📍 Venue: Clarion Congress Hotel, Prague

🗓️ Date: 23 October 2024

🗒️ Final agenda: https://trolleymotion.eu/.../Finale-Version-September...

📝 Link to the registration: https://forms.gle/eUhp6ji8N33NXZZ88

Free Entrance to the Conference

eBus:conference

23 October 2024 | Prague | Czech Republic

HORIZON 2030 – ZERO-EMISSION BUS SYSTEMS AS THE BACKBONE OF CLIMATE-NEUTRAL CITIES

DRIVING GREENER FUTURE FOR OUR BUS FLEETS

Experience the eBRT2030 Project, featuring advanced electric Bus Rapid Transit systems transforming cities worldwide. Discover the CE4CE Project, where modern trolleybuses align with circular economy principles for a sustainable future. Plan efficient, state-of-the-art trolleybus systems that set new standards in urban transportation.

Shape the future of mobility—sustainable, efficient, and innovative!

Tuesday 22nd October 2024 Dinner at Clarion Congress Hotel

Wednesday 23rd October 2024 eBus:conference , 9.00-17.00

Booking Link: Clarion Congress Hotel, Prague

FREE ENTRANCE REGISTRATION

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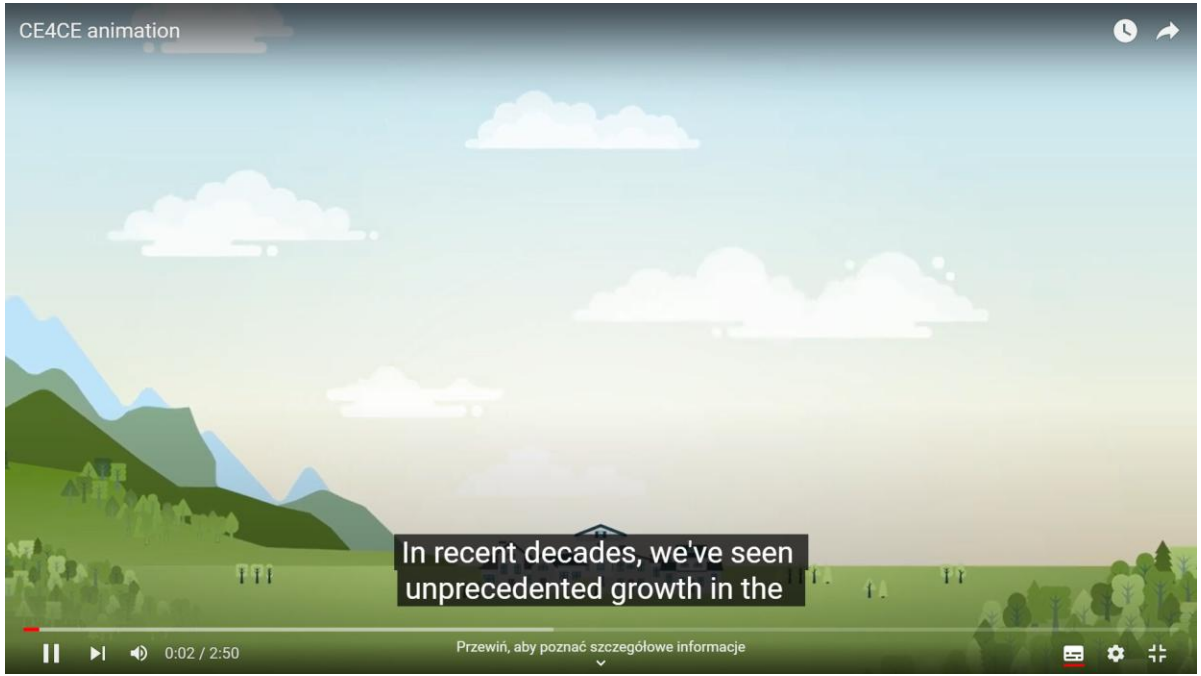
A SHORT VIDEO ABOUT UPTAKING CIRCULAR ECONOMY PRINCIPLES IN PUBLIC TRANSPORT AND A TOOL TO FACILITATE THE PROCESS, I.E. CIRCULARITY COMPASS

YOUTUBE LINK TO THE VIDEO:

https://youtu.be/lbCKKBCudzk



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THANK YOU!

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THANK YOU FOR YOUR ATTENTION!

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