

## D24.2

# Roadmap for sustainable interiors final report

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1	29/11/2024	Version 1
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## 1 Executive Summary

The WP24 allowed a state of the art of the technological status but also about the ambitions of the partners to develop sustainable interiors. The previous deliverables have defined the targets and the first technical ways.

The current deliverable D24.2 is not the progress report of the partners but is focused on the roadmap for the next 2 years (end of the Call1).

The main results expected by the tasks of WP25 will be presented:

- Priority topics
- Expectation by topic

This document is split in several main parts:

Chapters 4 to 8 present the deliverable compared to the MAWP

Chapter 9 defines the roadmap 2025-2026

Chapter 10 is the conclusion

## 2 Abbreviations and acronyms

Abbreviation / Acronym	Description
EU-RAIL	Europe's Rail : European research consortium
ISO	International Standards Organization
FP	Flagship Project
LCA	Life Cycle Analysis
MAWP	Multi Annual Work Plan
SP	Subproject

### 3 Background

The present document constitutes the Deliverable D24.2 “Roadmap for sustainable interiors final report” in the Subproject 6 Attractiveness, Work Package 24 Sustainable Interiors, Knowledge and Opportunities, as described in the EU-RAIL MAWP and contributes as well to the Flagship Project 4 – Rail4Earth.

This roadmap has been identified following the results from the D24.1 and the additional working progress of the partners during the year 2024.

## 4 Objective/Aim

The objective of this deliverable is to clarify and identify the expectation for the two next years and finalise the inputs for the WP25 which is dedicated to developing solutions.

## 5 Gantt

*Task 24.1 – State of the Art (M1-M8).*

*Task 24.2 – Analysis of opportunities (M6-M12).*

**Task 24.3 – Proposal of the main areas to develop (M10-M24).**

## 6 Deliverables

### Deliverable D24.2 – Roadmap for sustainable interiors final report

<b>Deliverable Number</b>	D24.2	<b>Lead Beneficiary</b>	21. SNCF
<b>Deliverable Name</b>	Roadmap for sustainable interiors final report		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	PU - Public
<b>Due Date (month)</b>	24	<b>Work Package No</b>	WP24
<b>Description</b>			
List of actions: ideas and knowledge to develop during the Call 1 and next calls			

## 7 Milestone tables

No milestone WP24 in 2024.

## 8 Introduction

According to the deliverable D24.1, opportunities and priorities have been identified and consolidated during the year 2024 between partners.

The work package WP24 is divided in two main topics:

- Circularity: materials, reuse, second life
- Modularity: fixing system, design to cost

Each topic is built in three main steps: knowledges, concepts, and demonstrators with the objective to offer several mock-ups scale one as the final deliverable Call 1 in 2026.

In this deliverable we will focus on roadmap defined between partners.

## 9 Roadmap

### 9.1 Topics

#### 9.1.1 Definition

The partners have defined 5 main topics/concepts to develop during the Call1 ERJU FP4 SP6 WP25:

- 1- Circular materials
- 2- Modular design
- 3- Less materials
- 4- Standardization for reuse
- 5- Low impact analysis

#### 9.1.2 Description

Each topic has its own target and could be split in 2 subtopics to work more in details.

- Circular materials

This topic is dedicated to search and test new materials with great sustainability. To guide more specifically this topic, partners have decided to create two subtopics.

**1A - Recycled and/or reused materials:** new materials without using new resources. A finish that differs from current finishes in railway.

**1B - Renewable materials:** new materials which integrates the capability to be renewed without changing it. A finish that evolves over time.

One of the main works will be to realize testing (smoke and fire mainly) and identify few realistic applications to have a clear vision of the potential use of these new materials.

- Modular design

This topic is dedicated to search new fixing systems which facilitate to evolve the positioning of the passenger's equipments.

**2A – Quick assembly:** new fasteners to fix and defix quickly even for strong equipments like seat or table. The objective is also to limit the impact of weight with classic solution if we increase the modularity.

**2B – Separable design:** design for allowing to easily separate parts of an equipment to evolve the finishing or to increase the capability of recyclability at the end of life. The target is to find alternatives of glue for example (textile to foam for seat, PVC layer to internal panels, ...).

One of the main works will be to find how increasing of the modularity could be done without



increasing the global cost or the complexity to realize the interiors design.

- Less materials

This topic is dedicated to search how to reduce the number of parts in our design interiors by the design itself or by using new technologies.

**3A – Additive manufacturing:** the 3D printing could allow the capability to realize on-demand design for low volume market. It could be another way to design and so could simplify or reduce the number of pieces. A least the target is also to search the most sustainable printing process (3D printing with wood fiber for example).

**3B – Simply design:** It could be another way to design, to simplify the design with the clear objective to strongly reduce the number of pieces.

One of the main works will be to simplify with less materials, less components, less process of production.

- Standardization

This topic is dedicated to analyzing the impact of European standards and how it should be update to accelerate the sustainability, specially the problematic of the reuse.

**4 – Standardization for the reuse:** the objective is to facilitate the harmonization between car builders and operators to, at the end, facilitate the carry-over of pieces train to train.

One of the main works will be to identify precisely the issues of the current standards and propose new wording for great sustainability.

- Low impact analysis

This topic is dedicated to analyzing the impact in terms of sustainability to help to select our solutions to develop.

**5 – Global impact analysis:** the objective is to clarify the environmental impact with using Life Cycle Analysis and energy consumption (weight).

One of the main works will be to give the data of the KPIs of the project FP4. The progress of KPIs will be defined in the next deliverables. The WP25 will supply the KPIs defined for the FP4 of CO2 impact by using new sustainable materials and allow to increase the capacity of passengers by modular layout.

### 9.1.3 Synthesis

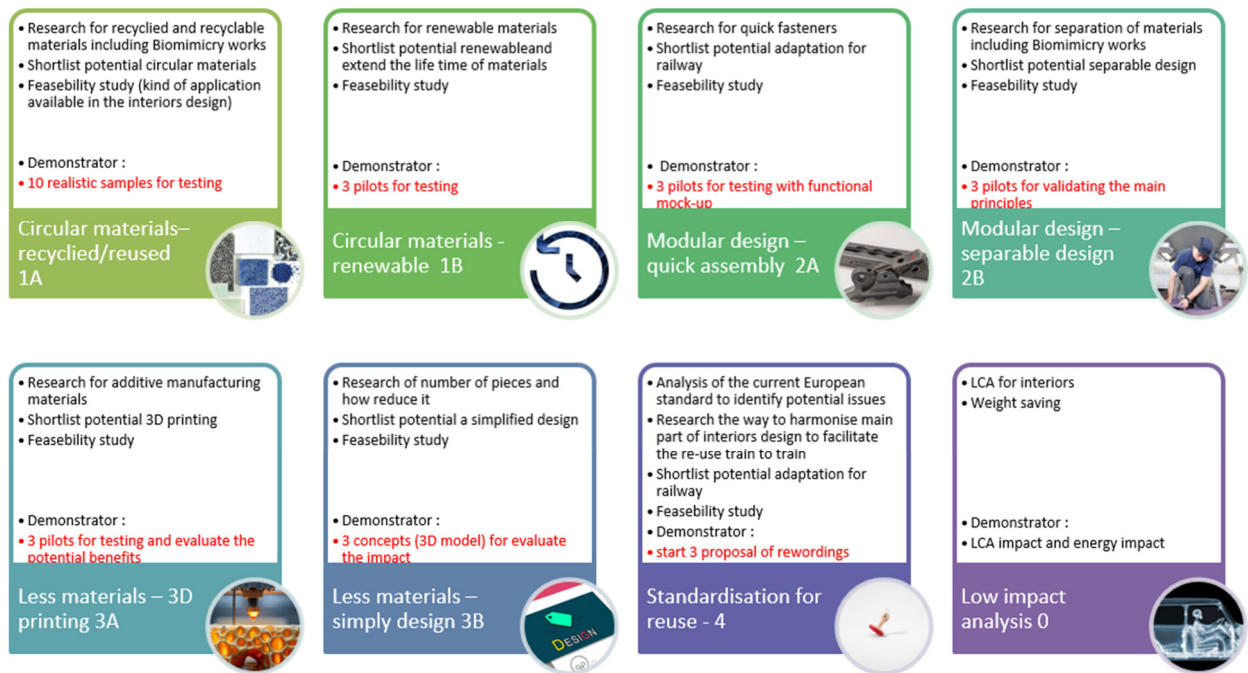


Figure 1: roadmap WP25

The roadmap defined allowed to give the keys of the partner to organise the studies of each company. A correlation between the proposed actions and stakeholders has been established. The work packages 24 et 25 assembly several innovative actions and concepts with a global coherence to enhance the attractiveness of sustainable interiors. The following figure allows to understand the links between partners crossed with the strategic topics of the roadmap with three main developments: circular design in green, modular design in blue and standardization in orange).

Circular material 1A recycled/reused materials	Circular material 1B rapidly renewable materials	Modular design 2A Quick fasteners	Modular design 2B Separable design	Less material 3A 3D printing	Less material 3B Simply design	Standardisation 4A Analysis EN standards vs sustainable	Standardisation 4B Analysis EN standards vs modular layout
ALSTOM interiors panels in recycled and reused composite	ALSTOM -	ALSTOM strong part of interiors (seat, luggage rack, ...)	ALSTOM interiors panels	ALSTOM -	ALSTOM -	ALSTOM contribution	ALSTOM leader
HITACHI -	HITACHI -	HITACHI -	HITACHI Ceiling panel and wall	HITACHI -	HITACHI One seat beam multi confort	HITACHI contribution	HITACHI contribution
NS -	NS interiors panels + Woodflow	NS Fasteners for ceiling panels	NS Ceiling panels	NS interiors panels « Woodflow »	NS One ceiling panel multifunctions	NS leader	NS contribution
SNCF interiors panels with reused materials	SNCF -	SNCF strong part of interiors (seat, luggage rack, ...)	SNCF partition wall	SNCF -	SNCF partition wall	SNCF contribution	SNCF contribution
TALGO seat beam in recycled composite fiber	TALGO -	TALGO sliding bowl of toilet day/night	TALGO Toilet panels	TALGO interiors panels « Woodflow »	TALGO One seat beam multicapacity One toilet day/night	TALGO contribution	TALGO contribution

Figure 2: Stakeholders of the consortium

To complement this short time Roadmap, a global calendar of development has been built with the partner. The following figure shows this view of works for the next years:

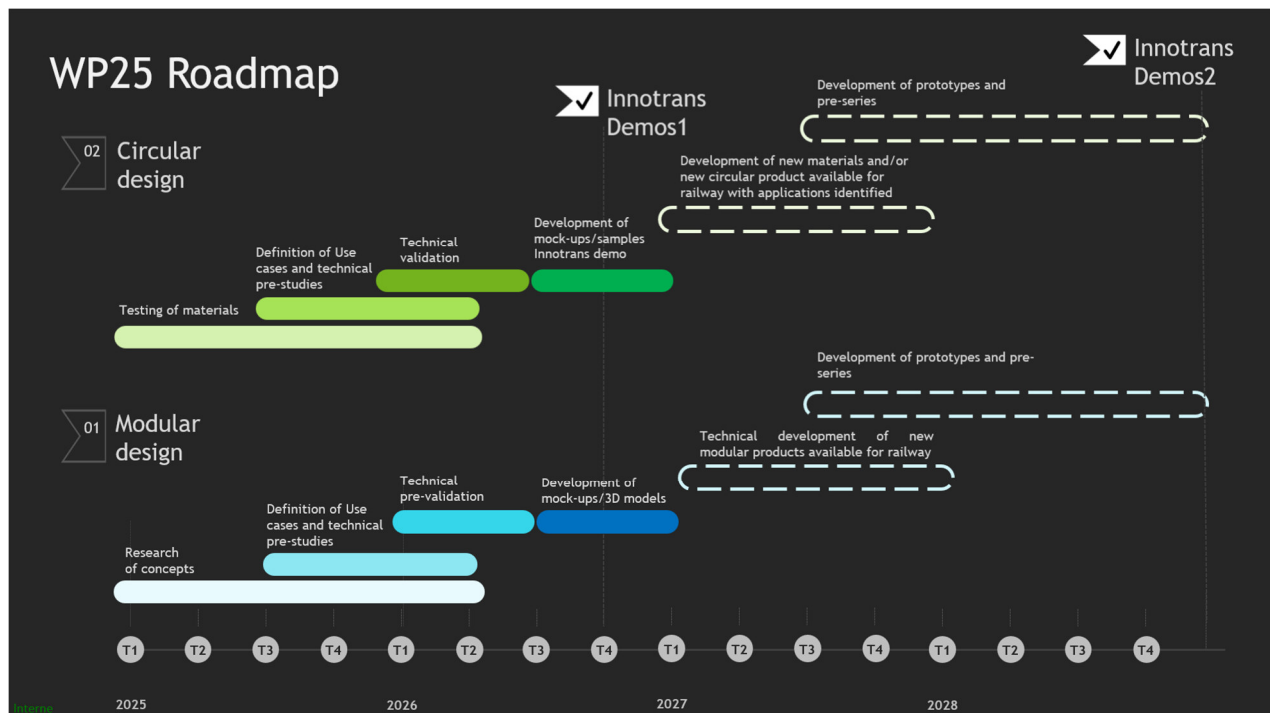


Figure 3: Calendar of development

## 10 Conclusions

This roadmap allows partners to identify the main topics and expectations in terms of priorities to develop for the next two years. It comes from the state of the art done previously and the capability in term of resources.

By this roadmap, the partners have in mind to propose several demonstrators at Innotrans 2026. The next step will be to define in detail the subleaders and the teams, topic by topic to start the development phase.

It closes the WP24. The WP25 is now dedicated to follow this roadmap and study concepts with proof of concepts at the end of the year 2026.