REPAIR

Using Badges to Increase Railway Sustainability

REPAIR supports the Sustainable Development Goals

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INTELLECTUAL OUTPUT 2

REPAIR ECOSYSTEM

An Open Badge ecosystem recognising current, emerging and expected practices

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Project Partners

UIC INTERNATIONAL UNION OF RAILWAYS	adif	fh st.pölten	RECONNAÎTRE	IPS	Slovenske železnice
France	Spain	Austria	France	Austria	Slovenia

TABLE OF CONTENTS

INTRODUCTION

This document reports on the development of the REPAIR ecosystem to make visible emerging practices related to the adoption of United Nations' Sustainable Development Goals (SDGs) in the rail sector. This ecosystem is based on the combination of bottom-up and top-down approaches:

- Bottom-up: communities of practice and Open Badges (ORCA)
- Top-down: Benchmarking with the Rail Sustainability index (RSi).

This document follows the work done for the **REPAIR Framework**, a prospective document, based on the exploration of current practices and technologies that could assist in understanding emergent transformations, identifying early signals, rethinking education for unknown futures, rethinking the role of individuals in the workplace, and leveraging digital technologies for human resource development.

The experience with the REPAIR ecosystem has led to another document, the **REPAIR Analysis**, an evidence-based paper describing the potential, limitations, strengths, and weaknesses of SDG-related digital badges. The central questions of this paper are: How can digital badges be used to promote the SDGs in the rail sector? What is their potential impact? And what are the prerequisites for their implementation?

SETTING-UP THE ENVIRONMENT

The REPAIR ecosystem is designed around the establishment of a Community of Practice (CoP) focused on the adoption and implementation of Sustainable Development Goals (SDGs) within the rail sector. The unique combination of subject-matter focus and communal learning creates a synergistic environment for sharing knowledge, insights, and best practices regarding sustainable rail operations and infrastructure among professionals, stakeholders, and enthusiasts.

In this CoP, the objective is the emergence of new forms of understanding and practices that are rooted in sustainability. Through collaborative problem-solving, shared real-world experiences, and peer-to-peer learning, the community aims to foster a culture of continuous improvement and innovation. Its structure encourages members to not be simply the passive recipients of knowledge but active contributors to the community's collective wisdom.

From awareness-raising to advanced implementation, in this community-driven learning model, Open Badges facilitate the recognition of individual and group contributions, providing milestones for members at varying levels of expertise and commitment. Open Badges serve as tangible *markers* of the recognition of community members, driving engagement and providing a clear path of progression within the community.

At this stage, it is important to insist on the fact that it is the *recognition* that is driving *motivation* and that the Open Badges are just one of the possible *means* to make that *recognition* visible. Open Badges should not be treated as instruments for creating *extrinsic motivation*, to "*motivate,*" but to make visible something, *recognition*, that is fueling *motivation*.

Choosing an Open Badge environment

The initial choice for the REPAIR Open Badges environment was based on the familiarity with a platform[1] widely used internationally. While the system worked well enough for the team to produce the initial ideas and a prototype to study how Open Badges could be used in the railway sector, we discovered that what we had produced would not be *functional* for the targeted audience:

- The complexity of having to manage 2 systems, one to create badges, another to publish them (multiple identifications, no Single Sign On / SSO)
- The complexity of the process from the end user perspective from the moment a badge is claimed to making it visible and shareable (number of steps, clicks etc.)
- The badges claimed by the users were lost in the middle of a big dump of tens of thousands of other badges, 99.99% irrelevant to the needs of the project.
- The underpinning recognition model (individualistic) that is at the opposite from what is required within a community of practice.

Using empirical evidence from the prototype, we concluded that if we continued with this badge system, we could lose over 90% of our potential audience—even a project partner found the system so dysfunctional that it suggested using a spreadsheet to manage the badge attribution!

As one of the REPAIR partners was involved in the development of a new (open source) Open Badge system based on *communities of practice*[2] (CoP), the decision was made to move our efforts to that new system. Although in a prototype phase, ORCA (Open Recognition Community App) solved most of the problems experienced with the initial system: claiming and displaying a badge could be done with 2 clicks —plus a few keystrokes to document the claim!

ORCA enables a streamlined and scalable approach to community building, ensuring that the CoP can adapt and expand in tandem with emerging challenges and opportunities within the rail sector's sustainability landscape. This technology allows for efficient administration and tracking of Open Badges, and offers features to moderate community access, thus maintaining the quality and focus of engagements.

By strategically aligning this CoP with the objectives laid out by the SDGs, the REPAIR ecosystem moved beyond theory to practical application. It positions itself not just as a forum for discussion but as an operational hub where sustainable practices are developed, tested, and implemented, offering a real-world impact that resonates with global sustainability objectives. In doing so, the ecosystem serves as a blueprint for how focused Communities of Practice can act as a transformative engine for sector-specific challenges, driving both local and global change.

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[1] Open Badge Factory and Open Badge Passport.

[2] Most, if not all, Open Badge systems support a very individualistic approach to recognition which didn't fit the requirements of the REPAIR Framework.

Configuring ORCA

The initial configuration of ORCA for the SDG community of practice was based on the SDG Adoption Maturity Matrix, which defines 4 levels of maturity:

- Being aware
- Experimenting
- Integrating
- Transforming

	Awareness Raising	Experimenting	Integrating	Transforming
Definition	Understand the value of SDGs	Experimenting with practices supporting SDGs	SDGs practices are an integral part of the community of practice / organisation	SDGs have transformed the way the communities and organisations operate
Positioning question	What is the degree of SDGs awareness?	Are there SDGs initiatives? Are they encouraged and supported?	Is there a policy for systematic integration of *SDGs practices*	Is there an impact on the organisation and the community (e.g. cross-discipline collaboration, etc.)?
Action (examples leading to)	Seminars, webinars, workshops	Workshops, engaging in SDGs practices, thought experiments, challenges	Create a dashboard to measure the level of "SDG activity"	Benchmark across institutions, organisations and communities
Tools (supporting)	Leaflets, learning resources, polls	Documentation of SDGs practices, observations, suggestions, experimentations, etc.	Statistics, annual reports, policies, etc.	Benchmarking, ad hoc software
People (supporting)	Experts, SDG advocates, managers, ...	Experts, SDG advocates, ...	Managers, executives	Leaders
Indicators (success)	Number of people "SDGs aware"	Number of projects and people involved, impact	Progress indicators at organisation, community and society levels	Network effect
Badges (how it is made visible)	Participation Support *"I support SDGs"* *"SDGs Ambassador"*	Documenting projects and practices *"SDGs Mentor"* *"SDG Practice xxx"*	Documenting organisational practices *"Here we value SDGs"*	*"SDGs Champion"*
Impact (of visibility)	A growing community of SDGs aware individuals, organisations and communities	Documented, shared and recognised practices	Resilience, sustainability	Transformation

SDGs Adoption Maturity Matrix

This led to the definition of the first 5 badges defining 4 different "postures" of the members:

Membership

SDG Practitioner
I'm actively involved in the promotion of SDGs in my professional activities.

SDG Aware
This badge can be claimed by railway professionals aware of the need to address United Nations Sustainable Development Goals (SDGs).

SDG Rail Community Member
This badge can be claimed by railway professionals who want to contribute to address United Nations Sustainable Development Goals (SDGs). The UIC is particularly focused on following 7 key SDGs: 5, 7, 8, 9, 11, 12 & 13.

SDG Champion
This badge recognises rail professionals who have played a leading role in supporting practices contributing to achieving the United Nations Sustainable Development Goals (SDGs).

SDG Explorer
I'm exploring how I can contribute to achieving SDGs

Rail SDG CoP structure badges

The process of maturation within the SDG community of practice as outlined in the SDG Adoption Maturity Matrix is punctuated by four badges, each serving as a milestone on this transformative journey.

The first badge, "SDG Aware," aims to recognize and cultivate basic awareness around the Sustainable Development Goals (SDGs). It operates at a grassroots level, inviting people to introductory sessions such as seminars and workshops facilitated by experts, SDG advocates, and organisational managers. The ultimate aim is to grow a community that is not just aware of but deeply understands the importance of these goals. Tools like leaflets and polls add to the initial engagement, serving both as informative resources and as ways to measure the burgeoning interest in the SDGs.

The second badge, "SDGs Explorer," builds upon this foundational awareness, channelling it into action and experimentation. It recognizes individuals who are keen to apply their knowledge, who are participating in workshops and embarking on SDG-aligned challenges. This is a level of active engagement, where the tools employed are often detailed documentation, capturing the nuances of best practices, observational notes, suggestions, and the results of experimental initiatives. The success here is gauged not just by the number of participants but also by the real-world impact of their initiatives.

By the time community members reach the third badge, "SDG Practitioner" they are deeply embedded within a structure that has systematised SDG-aligned practices. The notion of SDGs has permeated organisational policies, seen in company dashboards tracking various SDG activities, and revealed in annual reports that tout sustainability metrics alongside financial ones. This level demands the involvement of upper management and executives, making the integration of SDGs a top-down initiative as well. Here, success is measured not merely by individual but by organisational, community, and even societal metrics.

The final badge, "SDGs Champion," is reserved for those who have demonstrated that their commitment to the SDGs has had a transformative impact. They are the leaders who have not only adopted SDG best practices but have also instigated changes that result in cross-disciplinary collaborations and a noticeable, beneficial impact. Tools at this stage are more analytical, involving benchmarks and specialised software to evaluate the efficacy and reach of SDG practices. The real success indicator at this level is the network effect—the ability to inspire and involve others, building a resilient and sustainable community around SDGs.

Each badge, therefore, is not just a static symbol but an active part of the community's dialogical process. They serve as both milestones and motivators, not because they are intrinsically inspiring, but because they make the recognition of each community member's journey explicit and visible. This encourages a form of peer-to-peer education and mentorship that makes the entire process cyclical—those who earn badges serve as mentors and guides for those who are just embarking on this journey.

The claim review process

While anybody can claim the badge "SDG Aware" without any verification, the claim rules for the *SDG Practitioner* achievement requires it to be claimed by members who hold the achievement SDG Rail Community Member, and be reviewed by 3 members who hold the achievement SDG Rail Community Member.

The review process within the community of practice (CoP) is intended to serve more than simply evaluating whether the criteria for claiming a badge related to Sustainable Development Goals (SDGs) have been met. While it is essential to validate that the members' practices align with the SDGs and the badge requirements, the review also serves as a learning platform for the community at large.


First of all, the review process itself is an educational opportunity. Examining submissions exposes reviewers to innovative practices, strategies, or solutions they might not be aware of before. This enables members to broaden their understanding of what is possible within the scope of SDGs. Whether it's a unique approach to gender equality, a novel educational initiative, or a ground-breaking community service project, the practice being reviewed can offer fresh perspectives and inspire others to think creatively.

As a result of the review process, gaps in the current badge system can be identified by identifying valuable practices not yet recognized by existing badges. If a member's submission introduces a new or unique approach to achieving SDGs, the community may decide it's worthy of its own badge. In doing so, the CoP can dynamically evolve its recognition system to ensure it is comprehensive and responsive to the range of contributions its members are making.
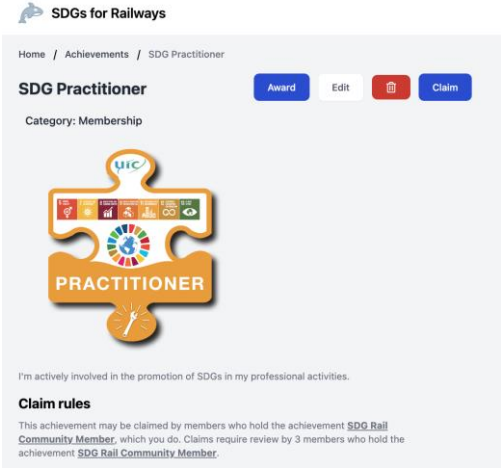
This makes the review process more than a gatekeeping mechanism; it is also a dynamic forum for continuous learning and system improvement. While validating and recognizing individual contributions, it also provides a space for collective growth and the possible expansion of the community's badge-based recognition system

Additional badges have been created to elicit specific practices (Gender Equality Empowerer, Rail Bike Advocate) and interests. If some of those badges are *playful* (e.g. Catering Lover: Railway Organic Food) it is to elicit the message that, while SDGs are a serious matter, there are many ways we can contribute to their achievement.
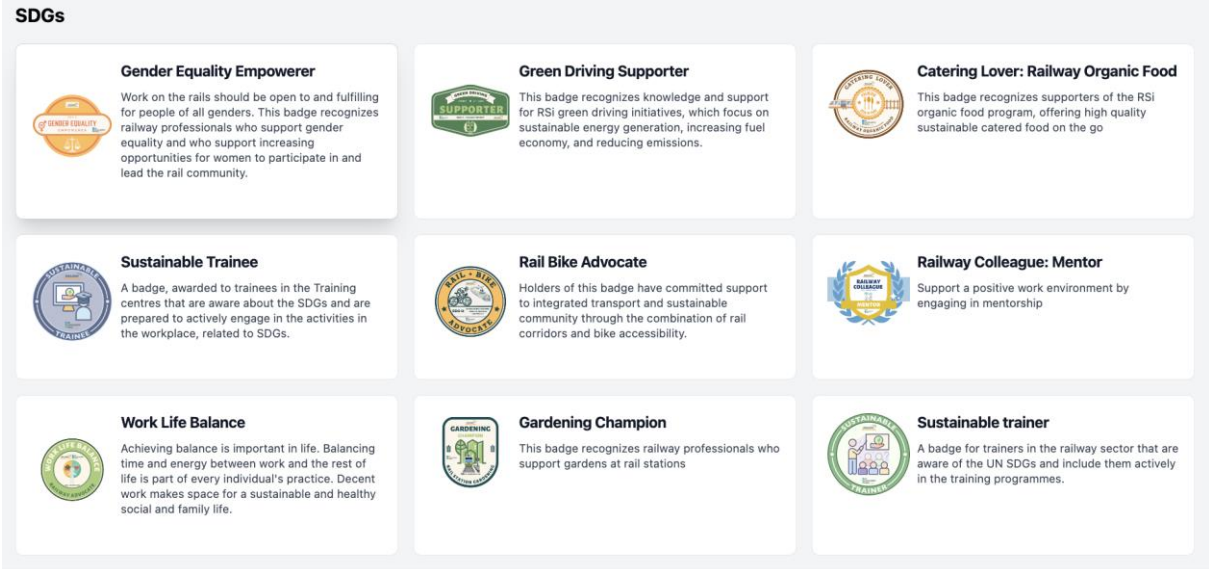
Diverse SDG badges

Rail Sustainability index (RSi)

The RSi working group reviewed the 17 SDGs and came up with a shortlist of 7 key SDGs where the rail sector can make the most demonstrable contribution. From this list, the group selected 24 quantitative and qualitative key performance indicators.

The thrust of the project was to provide a credible demonstration of the rail sector's competence in sustainable development, based on sector progress reports and benchmarks, with a view to improving the rail sector's access to sustainable finance.

The tool allows UIC members to enter their data over a three-year period in order to calculate trends. A literature search was used to define the ideal values for the rail sector. The average score for the sector is calculated from all the data entered into the tool.

In the context of community engagement and development, Open Badges and the Rail Sustainability Index (RSi) serve complementary yet distinct roles by facilitating different types of conversations. Open Badges are particularly effective for initiating bottom-up conversations within the community. These badges empower individual members by making their achievements, contributions, and skills visible

and acknowledged. This visibility, in turn, stimulates peer-to-peer dialogues and encourages a culture where recognition is organically born from within the community itself. Open Badges thus become tools for grassroot-level conversations where the emphasis is on individual experiences, expertise, and participatory learning.

On the other hand, the Rail Sustainability Index (RSi) is designed to guide top-down conversations, often involving decision-makers, policy-setters, or organisational leaders. The RSi offers a quantifiable metric that measures and evaluates the sustainability efforts within the rail sector. By doing so, it provides a unified language and standard that can be referred to in strategic discussions and planning. These high-level conversations aim to align community or organisational activities with broader sustainability goals, and they often dictate the focus and resource allocation for projects.
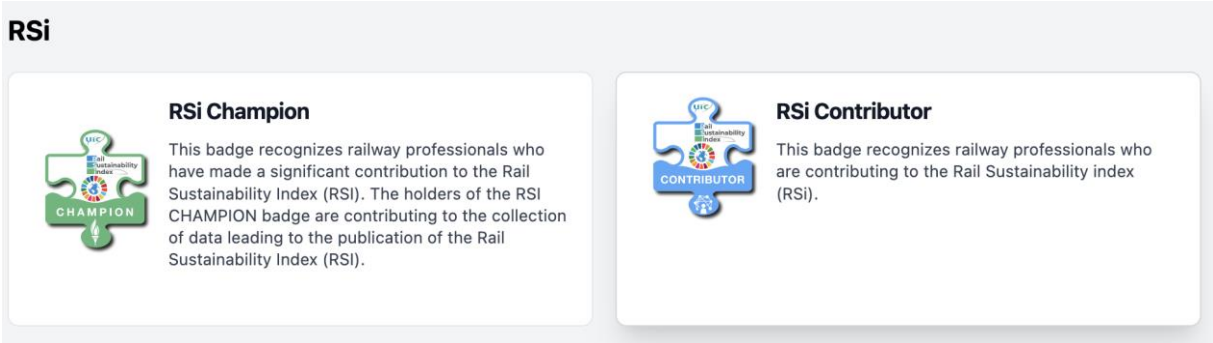
Rail Sustainability index (RSi) badges

Together, Open Badges and the RSi create a synergistic ecosystem that accommodates both the micro and macro perspectives essential for the community's evolution. While Open Badges cultivate the soil for individual growth and intimate community dialogues, the RSi serves as a navigational compass for aligning those bottom-up efforts with the top-down strategies essential for systemic change.

As the first round of RSi benchmark was in 2023, we didn't yet have the opportunity to use the RSi to elicit the practices that led to the improvement of the sustainability indicators. For example, a company obtains a certain score on *gender equality* (SDG 5), but we don't know what the practices are that led to that score. It is something that could be developed in the second round.

OPERATING THE REPAIR ECOSYSTEM

The REPAIR ecosystem is operated at two levels:

- Top: top-down, the RSI, operated from the UIC headquarters;
- Bottom: bottom-up the CoP, operated at the operational level of railway companies.

Through both operations, Open Badges are created and claimed as a means to bring to light emerging practices that promote Sustainable Development.

While the RSi is operated by the UIC, the operational level is led by two partners, the training centres for:

- *Administrador de Infraestructuras Ferroviarias* (ADIF, Spain) and
- *Slovenske železnice* (Slovenian railways)

As training centres, they created the badges *Sustainable Trainer* and *Sustainable Trainee*.

Administrador de Infraestructuras Ferroviarias (ADIF, Spain)

ADIF employees participated in several phases of the Repair project. Initially, a group with a high level of involvement in the company's strategic lines was selected. In this sense, the trainers from the road safety sector met these requirements and represented a group with a high capacity for dissemination due to their day-to-day work. This team of around 75 people

attend weekly monitoring meetings, so it was easy to ask for space at these meetings to spread the word about the REPAIR project and how the Open Badges ecosystem could help drive the SDGs in their day-to-day activities.

After this more direct experience, a survey was used to find out each employee's initial experience with the badge system and the SDGs, for which an invitation was sent to all employees belonging to the training department, made up of a team of 200 people. The invitation was also used to publicise our first "SDG Aware Badge" and to facilitate its application.
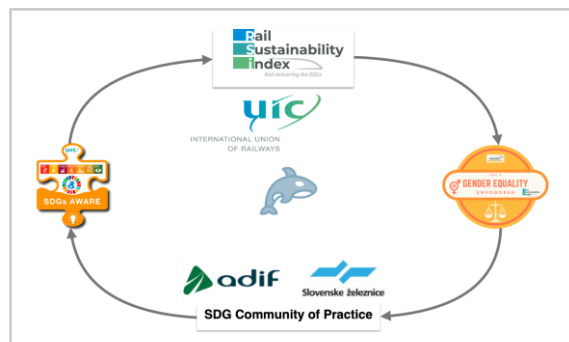
In light of this experience, the target group has been expanded to include trainers in the environment, health, and civil protection sectors. As a team of five people who worked directly on SDG communication, this team was ideal for supporting the project. As a result of the excellent welcome we received, we were able to get a great deal of valuable feedback that will allow us to adjust the future actions of the project.

Finally, at the event held in Madrid in June 2023, we had the opportunity to present the results of the REpair project to a larger group, this time we opted for new employees who have to undergo initial safety training. 63 workers were brought together in the Aula Magna of the Traffic Training Centre to discuss the aims of the Repair project and to present the badges available for their safety training.

Slovenske železnice (Slovenian railways)

The main participants in the Slovenian railways' activities were the trainers from the training centre (15). They took part in the survey on sustainable development awareness, in the workshop at which the sustainable development goals were presented, they were involved in the process of claiming the SDGs Aware badge, in the creation of the sustainable trainer badge, they were interviewed as part of in-depth awareness-raising interviews and shared their ideas on open badges and their usefulness in the education and rail sectors. A larger number of SZ employees were included in the company-wide survey on sustainability awareness and the SDG activities they are involved in (around 2,500 employees were invited, we obtained results from around 500 of them). The participants have many years of experience in the railway sector and are training new generations of railway workers. Their contribution was therefore crucial to gaining a broader view of the project and the planning of future activities.

DISCUSSION

Open Badges offer an innovative way to intertwine the processes of reification and recognition within Communities of Practice. They serve as both concrete representations of knowledge and skills, and as mechanisms for recognising individual contributions, thereby enriching the communal fabric of learning and practice. Instruments initially designed to make visible informal learning can also be used to make visible contributions, artefacts and credentials in a standardised and interoperable format.

For transforming professional practices to support SDGs, there is not a catalogue of predefined "innovative practices" nor "new competences" from which to choose. Transforming practices is about creating the conditions to empower professionals to develop new practices that might (should?) have a ripple effect on other practices. The dynamics of transformative professional innovation are similar to the dynamics of transformative social innovation.
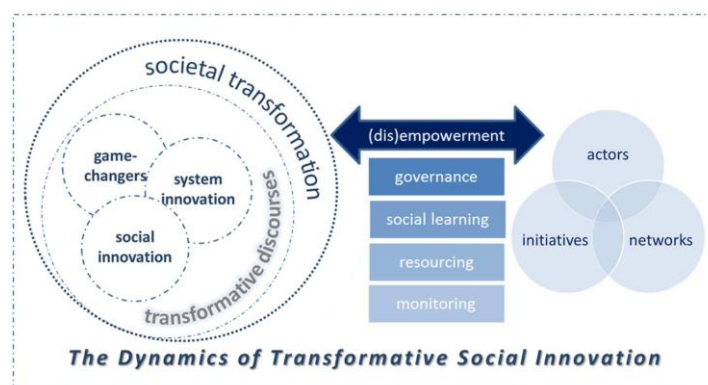
Cognitive map for TRANSIT research questions
(Source: http://www.transitsocialinnovation.eu/)